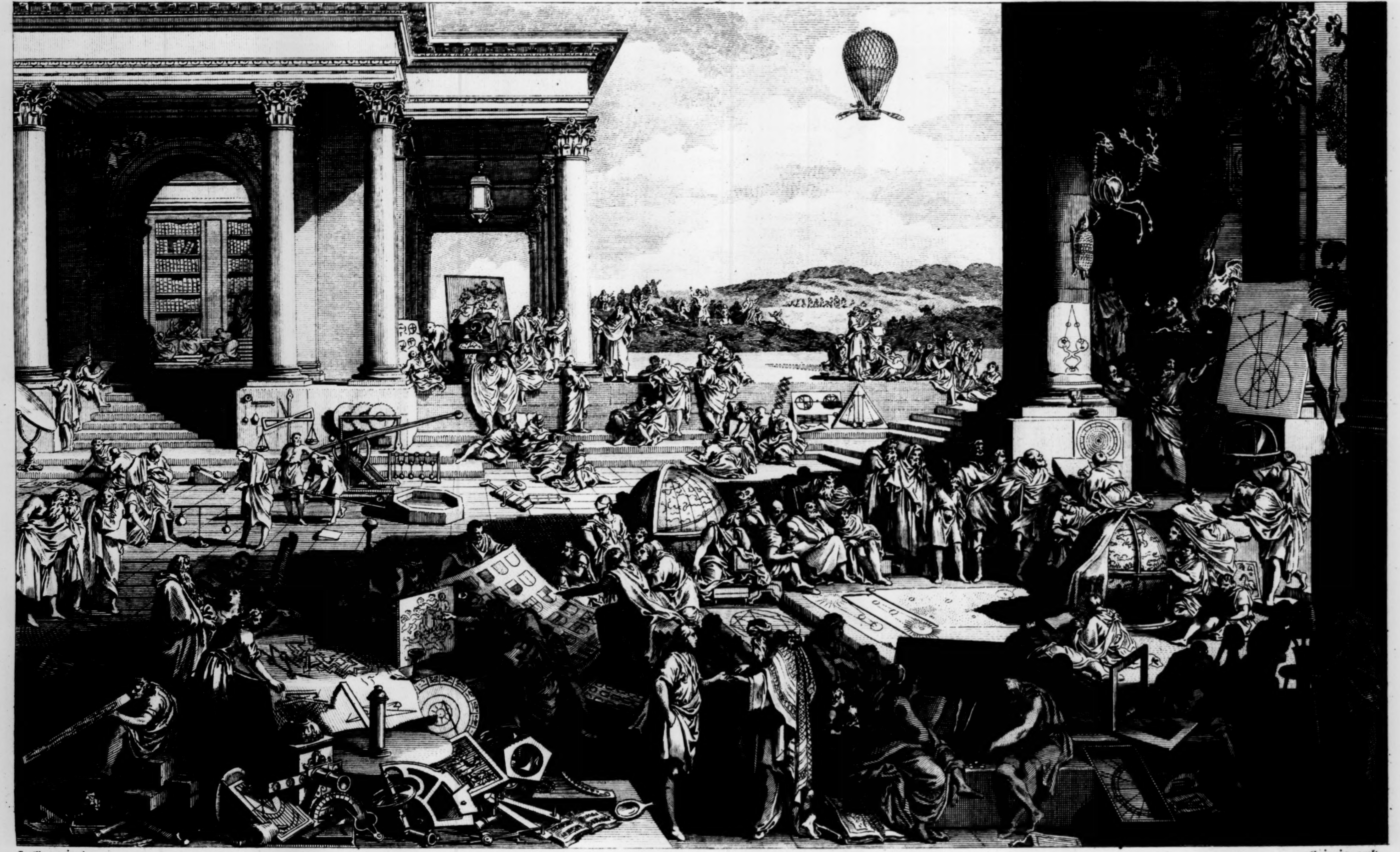
FRONTISPIECE to the ROYAL ENCYCLOPÆDIA.



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OR, COMPLETE MODERN

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ON AN IMPROVED PLAN.

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IN THREE VOLUMES.

VOL. I.

NON SIBI, SED PATRIÆ. CATO.

k By WILLIAM HENRY HALL, ESQ. *Millman Place, Bedford Row, London.*

ASSISTED BY OTHER LEARNED AND INGENIOUS GENTLEMEN.

LONDON: PRINTED FOR C. COOKE, No. 17, PATER-NOSTER ROW.

BRITISH MUSEUM

Abſtract of the Genuine Copy of His Majeſty's Royal Privilege and Licence, granted under his own Hand and Seal, at St. James's, for the ſole Printing of this Work.

GEORGE R.

GEORGE the Third, by the Grace of God, King of Great Britain, France, and Ireland, Defender of the Faith, &c. To all to whom theſe Preſents ſhall come Greeting. Whereas CHARLES COOKE, of Pater-noſter Row, London, Bookſeller, hath, by his Petition, humbly repreſented unto Us, that he hath been at a very great Labour and Expence in employing WILLIAM HENRY HALL, Eſq. of Millman-Place, Bedford-Row, London, with other learned and ingenious Gentlemen, to write and compile a Work, entitled, "The NEW ROYAL ENCYCLOPÆDIA; or, "Complete Modern DICTIONARY of ARTS and SCIENCES. Containing a New, "Univerſal, Accurate, and Copious Diſplay of the Whole Theory and Practice "of the Liberal and Mechanical Arts, and all the reſpective Sciences, human and "divine, arranged ſyſtematically, and digeſted into diſtinct Treatiſes. Alſo the various "detached Parts of Knowledge, copiouſly and critically explained, according to the "beſt Authorities. Comprizing a regular and general Courſe of Ancient and Modern "Literature, from the earlieſt Ages down to the preſent Times; including all the "lateſt Diſcoveries and Improvements in the various Branches of Literature. The "Whole entirely freed from the Errors, Obſcurities and Superfluities of former "Writers on the various Subjects; and forming a more Methodical, Intelligent and "Complete Repoſitory of ARTS and SCIENCES, than any other Work of a ſimilar "Nature, ever publiſhed in the Engliſh Language. Illuſtrated with upwards of 150 "large ſuperb Copper Plates, beautifully Deſcriptive of the ſeveral Subjects to which "they refer."

We being willing to give all due Encouragement to this Undertaking, are graciouſly pleaſed to condeſcend to the Petitioner's Requeſt. And we do therefore, by theſe Preſents, grant unto him the ſaid CHARLES COOKE, his Heirs, Executors, and Aſſigns, Our Royal Licence and Authority, for the ſole printing, publiſhing and vending the ſaid Work, for the Term of Fourteen Years. Given at our Court at *St. James's*, this 13th Day of *Auguſt*, 1788.

By His Majeſty's Command, SYDNEY.

ADDRESS TO THE PUBLIC.

A Knowledge of the various branches of Art and Science has ever been conſidered the greateſt acquiſition that can adorn, ornament, and dignify human nature: the ſtudy of them naturally enlarges the mental faculties, poliſhes the behaviour of mankind, and introduces an happy correſpondence between the ſeveral members which compoſe extended ſociety.

It is preſumed that little apology need be made for the publication of ſuch a Work at this time, notwithſtanding there have been others of a ſimilar nature uſhered into the world. The great and glaring defects in theſe productions have been too conſpicuous to paſs unnoticed, as all abound in erroneous principles, whether ſimply, in detached parts; or complexedly, in ſyſtems. To point out theſe defects would be endleſs, as we mean not to ſeek for reputation from the imbecility of others.

In order to avoid theſe imperfections, it ſhall be our invariable plan, through the whole courſe of the work, to draw our deſcriptions clear and intelligent, without ſcholaſtic pedantry, unintereſting prolixity, or unmeaning brevity; at the ſame time to retain every technical term applied to the various branches of Art and Science, in their detached parts: the ſyſtematical order of acquired knowledge regularly arranged, juſtly diſplayed, critically defined, and illuſtrated according to its real principles, ſtrictly adhering through the whole, to purity and elegance of diction.

The plan of the New Royal Encyclopædia is founded on ſuch principles as to bring the Advancement of Science to its ultimate perfection, by a critical diſcrimination in expunging obſolete hypotheſes and uſeleſs theories, and adapting only thoſe that are truly valuable, of which proofs have been obtained under their various denominations. The method we have alſo adapted of treating of the different kingdoms of nature, and the true ſcientific diſcrimination of their component parts, muſt neceſſarily render it not only a work of ſuperior merit, but of unrivalled reputation in the annals of literature.

⁂ *The Proprietors of the* NEW ROYAL ENCYCLOPÆDIA, *even in this early Stage of the Work, have expended upwards of* ONE THOUSAND POUNDS *in the Purchaſe of* New Publications, *in all the* different Languages, *conſequently* Novelty *and* Utility *will abound throughout every Page, diſdaining to offer to the Public ſuch Chaotic Compilations as have hitherto appeared founded in* Error *and* wrong *Conſtruction.*

ADVANTAGES attending this NEW PUBLICATION.

I. Inſtead of the cuſtomary plan of giving only *one* copper-plate in every *fourth* number; in this work will be delivered one or more *gratis*, with *every* number.

II. The purchaſe of this work, will be near *ten guineas* cheaper than any other Cyclopædia, or Encyclopædia, and the time of compleating it conſiderably leſs.

III. That the page being made much *larger* than that of the Cyclopædia, each number will contain a greater quantity of letter preſs.

IV. In this work all the *new* improvements and *important* diſcoveries that have taken place down to the preſent æra, not only in this kingdom, but in every poliſhed nation in the known world, will be ſtrictly preſerved, whereby the arts will be brought to a criterion of perfection unknown in former ages.

V. The plates are engraved from original deſigns, drawn on purpoſe for this work, by the moſt ingenious artiſts; and will be found, on examination, to ſurpaſs every other publication extant, as the ſubjects will be more *numerous* and *accurately* delineated.

VI. The whole work will be printed on fine paper, elegant type, with uniformity, accuracy and preciſion; and in order to preſerve an *invariable beauty of printing* throughout the whole, *each volume* will begin with an *entire new letter*, ſo that the work cannot contraſt a *worn appearance*, as is really the caſe with other publications.

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Animated with a laudable deſire of making myſelf uſeful to the public, I have, in this arduous undertaking, dedicated my whole time for ſeveral years paſt to the ſtudy and improvement of the various branches of the Arts *and* Sciences; *and flatter myſelf that the great pains I have taken in compoſing and completing the Work (on which I build my literary reputation) will meet with a candid reception from the public.*

Millman Place, Bedford Row, Auguſt 26, 1788. *W. H. HALL.*

TO THE

KING.

SIR,

PERMIT me to lay before your *Majeſty* thoſe Labours and Efforts, which have been exerted to diſplay the advanced State of the Arts and Sciences to which they have attained under your *Majeſty's* Influence and Encouragement from the Commencement, to the preſent Period of your *Majeſty's* auſpicious Reign.

There is a Time reſerved in the Fate of every Nation to arrive at its Perfection, and the riſing Genius of Britain bears a promiſing Aſpect of attaining, under your *Majeſty's* Protection, to the Summit of Excellence in the Purſuits of *Philoſophy* and *Literature.*

There certainly cannot be any literary Production better calculated for diſſeminating and promoting Univerſal Knowledge, or that deſerves more the Countenance and Protection of the Great, than a Work which comprehends the whole Circle of Arts and Sciences: and it is for this Reaſon, as well as your *Majeſty's* known Patronage, and thorough Knowledge of the Polite Arts, that the Editor is emboldened to lay this Work at your *Majeſty's* Feet; eſpecially, as Productions which tend to enlarge the Boundaries of Science have a peculiar Claim to the Countenance and Protection of *Monarchs*; for, by the Diffuſion of Science, Man is civilized, the Inlets to Happineſs are opened, and Society is formed on a firm, advantageous, and ſolid Baſis.

The elegant Enjoyments of Life are heightened in Proportion to our Knowledge of thoſe Sciences, which owe their Birth to an Acquaintance with the Powers of Nature and Art, without which, Rank and Fortune would be of little value. It is the Source of Happineſs, as it extends the Views and enlarges the Comprehenſion of the Human Mind, by which means the Dignity of our Nature is ſupported, and the beſt Foundation laid for the Advancement of intellectual Happineſs.

In the Scientific Departments of this Work, the Attention of the Reader is directed to thoſe Laws of Divine Order by which the Univerſe

verſe is governed and ſupported. In the Survey of Animated Nature, we ſee that the Protection of the great Creator is extended to the minuteſt Parts of his Creation; Beings, infinitely ſmall, manifeſting to the aſtoniſhed Eye, the ſame Proportion, Regularity, and Deſign as thoſe of the firſt Magnitude; all of which enjoy their reſpective Comforts, and triumph in the Bounty of the Sovereign of the Univerſe.

The Mind, from a Review of the Beauty and Order in which all things are formed, and the ſeveral Uſes to which they are appropriated, is led to contemplate the wonderful Effects of Divine Omnipotence, and adore the benificent Creator in all his Works, which proceed from Wiſdom, and originate in Love.

As the Arts and Sciences are at this Period ſo generally cultivated, and ſo liberally encouraged, thoſe who labour to advance them, even in the humble Department of collecting and arranging the Diſcoveries of others, eſſentially conduce to facilitate their Attainment, and, by ſhewing what is already obtained, excite Emulation, and quicken Invention.

I have ſelected impartially the Communications of the learned and ingenious of every Nation; but feel a peculiar Pleaſure in ſtating thoſe modern Inventions, Diſcoveries, and Improvements which do equal Honour to my native Country, and the diſtinguiſhed Liberality and Munificence of its Sovereign.

Theſe Diſcoveries and Improvements in the Arts and Sciences, which owe their Progreſs ſo materially to the Protection of your *Majeſty*, muſt be productive of the moſt happy Tendency; and the Knowledge they communicate muſt diffuſe that permanent Glory which cannot be obtained either by Conqueſt or Dominion.

That your *Majeſty* may long enjoy the exalted Satisfaction of promoting the Arts and Sciences, ſo worthy of your Royal Protection, is the ſincere Wiſh of

Your *Majeſty's* moſt dutiful,
And obedient Subject,
And Servant,
W. H. HALL.

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PREFACE.

IT is certain that no compoſition whatever can tend ſo effectually to the advancement of *general* knowledge, as that of a Dictionary of Arts and Sciences, wherein every article, of which the whole ſyſtem of nature conſiſts, is depicted in all its beautiful colours.

In eſtimating the importance and utility of a Scientific Dictionary, it is a mattter of no ſmall conſideration, that it ſupplies, in a great meaſure, the want of a large library, by furniſhing the inquiſitive and curious with hints and abſtracts of ſcience, that are diſperſed in many volumes, which cannot be procured without difficulty, and without conſiderable expence. Such a work, therefore, muſt appear of very high importance, the eſtimation of which ariſes from the knowledge purſued and promoted throughout its progreſs.

A work of this kind, from its extent and arrangement, is ſuited to the occaſions, and to the convenience of many perſons, who have neither leiſure or opportunity to recur to thoſe different ſources of information, whence the materials of which it is compiled are collected. To others, whoſe acquaintance with particular branches of ſcience, precludes the neceſſity of their application to ſuch a work, it will communicate general information concerning ſubjects, to which their attention has not been ſo immediately directed; and thus afford them leiſure for gratifying their taſte, or inclination, in reſearches, which they may deem more important or more pleaſing; and in which they may be more ambitious of excelling. It muſt likewiſe be remembered, that this Dictionary records and tranſmits to future ages, many inventions and improvements, which might otherwiſe have ſunk into oblivion; that it forms a compendious hiſtory of ſcience; that it furniſhes the outlines of its gradual progreſs and advancement; and that, by preſerving a ſummary of what has been already done and diſcovered, it lays a farther foundation for more extenſive diſcoveries and improvements. In this latter view of its importance and uſe, it may not be improperly compared to a map of ſcience, in which the line that terminates the *terra cognita* is diſtinctly marked out, for the direction of thoſe, whoſe ingenuity and induſtry are employed in extending the circle of knowledge, and in exploring thoſe regions that are ſtill unknown.

It is admirably adapted to the nature and neceſſary limits of a popular work; deſigned not merely for public libraries, and for the uſe of thoſe who ſpare no expence in obtaining the beſt means of information, but for diſſeminating literature and ſcience through the ſubordinate claſſes of mankind. With this view we have adopted the happy medium between a work conſiſting merely of definitions, etymologies, and references, and a voluminous collection of diffuſe and elaborate treatiſes on various ſubjects, the price of which muſt reſtrict it to few purchaſers, and the peruſal of which would be thought tedious by many, who had occaſion for conſulting it.

The deviation made from the plan of Chambers, and others, by introducing detached Syſtems on the Sciences, Treatiſes on the Arts, and Diſſertations on Philoſophical Subjects, it is hoped will meet with the approbation of the Readers: and, in order to exhibit theſe important branches of knowledge in their full extent and luſtre, we have re-united all the detached parts, that their proportions, their relations one to another, and to the general Syſtem, of which they are conſtituents, might be more clearly and obviouſly perceived. This method has been purſued throughout the courſe of the work; and it is certain, that ſuch a plan, regularly and ſucceſsfully proſecuted, muſt be productive of numberleſs utilities and advantages. But when ſubjects, inſtead of being digeſted into Syſtems, or diſpoſed in their natural order, are dilacerated, diſſected, and diſſeminated, without regard to connection, or ſyſtematic combination, merely as the ſucceſſion of the letters, which conſtitute their technical terms, determine, without mentioning their antecedents, and conſequences, ſuch a work ſhould rather be called a collection of Miſcellanies than a *Dictionary of Arts* and *Sciences:* works executed upon this plan cannot have a due influence on the mind, and an underſtanding, formed upon ſuch models, is rather a chaos of detached and heterogeneous ideas, than a regular intellect.

It is only by thinking in method, by reducing our ideas to a proper and rational order, by obſerving what they poſſeſs in common, and what are their relations or differences, that our reaſoning faculties are capable of making any progreſs at all. Without theſe aſſiſtances, we might be ranked amidſt ſenſitive, or conſcious beings, but could never attain to the human or rational character.

Leſt any objection ſhould be ſuggeſted in the mind of the Reader to Syſtems and Treatiſes, from an idea of the neceſſity of peruſing a whole Syſtem for information, concerning a particular part only, the Editors, to obviate this objection, have been attentive in the alphabetical department of the Dictionary, to give a compendious, yet clear account of the ſeveral detached parts, which refer for further information to the Syſtem to which they appertain. Detached articles may be divided into three kinds. The firſt conſiſts of ſuch as, independent of particular Syſtems, admit of a full and complete illuſtration as they ſtand; the ſecond, of ſuch as require partly to be diſcuſſed under the Syſtems to which they belong, and partly under their own proper denominations; the third, of ſuch as are ſufficiently elucidated in the Syſtems to which they appertain. Thoſe of the firſt kind need no references. Thoſe of the ſecond, being only partially explained under their particular denominations, demand references to the Syſtems where the illuſtrations are completed. For thoſe of the laſt, as no explication is found neceſſary under the terms, we refer to the Syſtems of which they are conſtituents, where the ſubjects are fully diſcuſſed. Theſe our readers may conſult as emergencies require, or their own diſpoſitions impel them.

Thus the Syſtematic Reader will be fully and regularly informed, by referring to the general name of the ſcience he wiſhes to explore; and the proficient who wiſhes to refreſh and ſtrengthen his memory in any particular part, may find the ſame by turning to the Alphabet, which, having general references, ſerves as an index to the Syſtems and Treatiſes, whilſt others, who are willing to content themſelves with partial and detached views of ſubjects, will find them explained under the articles, by which they are denominated, as by a courſe of references, form particulars to generals, from premiſes to concluſions, from cauſe to effect, and *vice verſa*; i. e. from more to leſs complex, and from leſs to more: a communication is thereby opened between the ſeveral parts of the work. Thus the Syſtem is rendered an improvement of the Dictionary, and the Dictionary an advantage to the Syſtem, which is the only method, by which the whole circle, or body of knowledge, with all its parts and dependencies, can be fully diſplayed.

The great utility of detached Syſtems and Treatiſes will obviouſly appear from the following particular inſtances; in which may be ſeen, how abortive and impotent the attempts of the Compilers of Dictionaries have proved, who have endeavoured, by their references, to direct their readers to form Syſtems and Treatiſes from the detached and ſcattered parts of the Alphabet; as for inſtance; in Chambers's Dictionary, in the Preface of which, adverting to the plan of the work, he mentions amongſt an enumeration of articles; *Agriculture*, to obtain a compleat knowledge of which all the component parts are ſeparately to be referred to; as *Tillage* and improvement of *Soils*, *Clay*, *Sand*, *Earth*, &c. by the operations of *Ploughing*, *Fallowing*, *Burning*, *Sembradore*, *Semination*, *Manuring*, &c. to produce *Corn*, *Hemp*, *Flax*, *Liquorice*, *Saffron*, &c. for *Malt*, *Farina*, &c. *Granary*, *Threſhing*, &c. The culture of *Trees*, *Timber*, &c. by *Planting*, *Shrowding*, *Barking*, &c. for *Coppice*, *Park*, *Paddock*, *Hedge*, *Paſture*, &c.

But how extremely difficult it would be to follow a ſubject through ſuch a multitude of references, as well as new ones which ſpring up at every one of them, any perſon may eaſily conceive. From theſe obſervations, we hope that our Plan in the introduction of Syſtems and Treatiſes will be allowed to be good, whatever exceptions may be taken to the execution of it.

We have endeavoured to give the ſubſtance of every thing that has been hitherto diſcovered in the ſeveral branches of knowledge, both natural and artificial; that is, in the knowledge of *nature*, firſt, as ſhe appears to our ſenſes, either ſpontaneouſly, as in *Natural Hiſtory*; or with the aſſiſtance of art, as in *Anatomy*, *Chemiſtry*, *Medicine*, *Agriculture*, &c. ſecondly, to our imagination, as in *Grammar*, *Rhetoric*, *Poetry*, &c. thirdly, to our reaſon, as in *Phyſics*, *Metaphyſics*, *Logics* and *Mathematics*: with the ſeveral ſubordinate arts ariſing from each, as *Agriculture*, *Painting*, *Sculpture*, *Trade*, *Manufactures*, *Policy*, *Law*, &c. and numerous remote particulars, not immediately reducible to any of theſe heads; as *Heraldry*, *Philology*, *Antiquities*, *Cuſtoms*, &c. To accompliſh a taſk ſo arduous and important, neither labour nor expence has been ſpared. Every reſearch has been made; particular ſciences have been collected and compared. Such as could be abridged without diſadvantage, have been epitomized with all poſſible care; while others, who were more conciſe and tenacious in their ſubjects, have been more cloſely purſued, and more faithfully retained. When topics have been obſcurely or imperfectly treated, the utmoſt endeavours have been uſed to ſupply theſe defects; and upon ſuch parts of ſcience as the compilers have not found properly illuſtrated by other authors, original eſſays are inſerted.

We have not been content with taking what was already collected, but have augmented our work with a large acceſſion from other quarters. Few parts of the commonwealth of learning but have been applied to on this occaſion. Recourſe has been frequently had to the originals themſelves on the ſeveral arts; and not to mention what ſmall matters could be furniſhed from our own ſtock, the reader will here find extracts and accounts from a great number of books of all kinds, either overlooked by former lexicographers, or not then extant; and a multitude of improvements in the ſeveral parts, eſpecially of natural knowlege, handed down to the lateſt period.

After embarking in ſo great an undertaking, we were determined to perſevere with unremitting attention, and to make every effort, of which we were capable, for improving the work, and ſecuring the approbation of our readers. With an induſtry and ardour, which the hope of giving ſatisfaction to the public animated, and which the extent and importance of the undertaking both deſerved and required, we have devoted to the accompliſhment of it all that time and attention, in the courſe of many years, which our other engagements would permit; and we think ourſelves happy, that no accident has prevented the progreſs of a publication, to the completion, as well as the reputation and ſucceſs of which, our wiſhes and labours have been uniformly directed.

We reflect with pleaſure, and with grateful reſpect to the numerous purchaſers of this new Work, that our labours, in the cauſe of ſcience, have been ſo favourably received. We truſt, that we may be allowed to interpret the extenſive ſale, with which it has been honoured, as a teſtimony of the approbation, as it is a full proof of the candour, of the public. Acknowledging that candour, and confiding in it, it is needleſs to urge thoſe apologies, which are furniſhed by the magnitude of this publication, and the variety of ſubjects it comprehends; but we ſhould have been unworthy of the indulgence we have experienced, and to which we farther appeal, if we had not conſidered it as an encouragement to unremitting application.

The Editors gratefully acknowledge the hints and communications, which they have received, both in converſation and writing, for the improvement of the work; and think themſelves under peculiar obligations to the friendſhip of thoſe gentlemen, who have formed Syſtems and Treatiſes on various ſubjects, according to their reſpective abilities, and to which, as a teſtimony of their being original, they have affixed their ſignatures.

Several flattering teſtimonies of approbation, from unknown correſpondents, demand alſo the reſpectful acknowledgements of the Editors; as they have contributed to animate their aſſiduity and perſeverance, in the proſecution of an undertaking, which required reſolution, patience, and every effort that could combine to eſtabliſh their reputation as compilers; and gratify the wiſhes and expectations of the public.

It is very natural to ſuppoſe, that a work of ſuch magnitude as this, and containing ſuch a variety of articles, muſt be ſubject to errors, though every poſſible means have been uſed to avail ourſelves of ſuch defect. But the moſt careful cannot elude human fallibility. Accidents of this kind will not appear ſurpriſing, when we conſider, in what a variety of ways man is open to error. Perhaps an author, on whom we depend, deceives us; our own judgment betrays us; our attention leaves us for a moment; or, ſuppoſe we eſcape all theſe ſnares, we may be brought into a ſcrape by an amanuenſis; or, if we get clear here too, we are in imminent danger of miſcarrying in the hands of the printer. In ſhort, the moſt we can ſay is, that we hope there will be but few errors found in this work, in compariſon with others of the like kind. Many thouſands we have corrected, both in the Dictionaries and other writings, from whence we have collected, and this by means of the light, which other parts of knowledge afforded. We therefore, flatter ourſelves, that what we have overlooked, the reader will frequently be enabled to correct; and that there will not be many errors found in the book, which the book itſelf will not help to rectify.

In a collection ſo large and multifarious, as that which is now recommended to the public attention, the critic muſt be ſevere, and the genius minute, who could ſtop to animadvert upon every trivial inaccuracy of ſtyle. We think it indeed indiſpenſibly incumbent on every author who would be read with intelligence and pleaſure, after ſufficiently attending to the nature and importance of what he ſubmits to the public obſervation, that he ſhould, in the next degree, regard the vehicle by which it is conveyed. But where the ſubjects are ſo indefinitely varied, and where propriety requires that each ſhould be expreſſed in a manner ſuitable to its nature, it can ſcarcely be imagined, that the ſame exactneſs and uniformity ſhould equally prevail in this as in compoſitions of a nature leſs extenſive and complex.

After all, though the compilers are conſcious of having done their utmoſt to render this work as extenſively and generally uſeful as it could poſſibly be; yet, ſince no human production, even from the origin of literature to the preſent period, has ever been found perfect in its kind, it would be cruel, if not unjuſt, to expect abſolute perfection in the preſent attempt. From every candid and benevolent inquirer after truth, therefore, they hope, that the merit of their intention and the utility of their plan will in a great meaſure atone for ſuch trivial or unavoidable faults as may be found in its execution. When the nature of a work ſo extenſive and multiform is duly conſidered, it will immediately occur to every reader of candour and indulgence, how eaſy it is for the utmoſt care and aſſiduity to fail in ſome inſtances. Theſe, however, it is hoped, will be found few and of little imporance; the work, during its whole progreſs, having been ſuperintended with unremitting vigilance and aſſiduity.

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THE NEW ROYAL
ENCYCLOPÆDIA;
OR, COMPLETE MODERN
DICTIONARY
OF
ARTS and SCIENCES.

A

A, The firſt letter of the alphabet in all the known languages of the world, except the Ethiopian tongue, of which it is the thirteenth letter. The Hebrews call it *aleph*, the Greeks *alpha*, the Syrians *oleph*, the Arabians *eleph*, and all the modern living languages of Europe call it *aw*, the Engliſh nation excepted, who called it *ày*. Its ſimplicity of ſound has deſervedly given it the firſt place in the alphabet, very little more being neceſſary to its pronunciation than opening the mouth pretty wide and emitting the air from the lungs.

This character in the Engliſh language is marked with three different ſounds, viz. 1, open, as in *war*, *talk*; 2, cloſe, as in *wake*, *take*; 3, broad, or wide, as in *hall*, *wall*. Note, the cloſe ſound is frequently called the ſlender A.

The ſlender or cloſe A, is peculiar to the Engliſh language, and reſembles the ſound of the French *e*, maſculine, which ſound it invariably retains in the termination of words that are purely Engliſh. Herries, Holder, and Wallis, have, with great ingenuity and philoſophical nicety, treated of the various ſounds of this leading letter in their learned Treatiſes on the ſounds in our language.

Mr. Sheridan's ſcheme of the ſounds is too complex to be of real utility. As to the performances of others, they are too trivial to be critically examined.

To treat minutely on the variety of ſounds in which this letter occurs, would be incompatible with our plan, as it would run into an unintereſting prolixity that could anſwer no intention whatever.

A is always a vowel, and frequently ſtands for a word in the Engliſh language, which grammarians call an *article*. See Syſtem of GRAMMAR.

A, is alſo a name in aſtronomical calculations, being uſed as a character to ſignify the firſt Dominical letter; the Julian calendar containing ſeven. It had been in uſe among the Romans long before the Chriſtian æra, as the firſt of the eight *nundinales litteræ*, nundinal letters, in imitation whereof the Dominical letters were firſt introduced. See Syſtem of ASTRONOMY.

A, is in abbreviature uſed with different intentions; viz. in logic, A denotes an univerſal affirmative propoſition, according to the verſe——

Aſſerit A, *negat* E, *verum generaliter ambæ.*

Thus in the firſt figure, a ſyllogiſm, conſiſting of three univerſal affirmative propoſitions, is ſaid to be in Bār-bā-rā; the A, thrice repeated, denoting the number of the propoſitions to be univerſal.

In commerce, A, ſignifies *accepted*, when prefixed to the name of an acceptant on a bill of exchange. It is alſo uſed as a numeral letter to expreſs the number of the counting-houſe books; for inſtead of marking the waſte-book, journal, or ledger, with 1, 2, 3, &c. the letters A, B, C, &c. are always ſubſtituted.

In hiſtory, and other records, ancient and modern, the letter A is uſed with various intention.

In the Roman ſenate, A was uſed in the giving of votes or ſuffrages. When a new law was propoſed, each voter had two wooden ballots put in his hand, the one marked with a capital A, ſignifying *antiquo*; q. d. *antiquam volo*; and the other with V. R. for *uti rogas*. Such as were againſt the law, caſt the firſt into the urn, as who ſhould ſay, I refuſe it, I antiquate it, or I like the ancient law, and deſire no innovation.

In criminal cauſes that came before them for trial, A, denoted *abſolution*; whence Cicero, *pro Milone*, calls it *littera ſalutaris*, the ſaving letter. Then three ballots were diſtributed to each judge, marked with the letter A, for *abſolvo*, I acquit; C, for *condemno*, I condemn; and N. L. for *non liquet*, it is not clear: from the number of each caſt into the urn the prætor pronounced the fate of the priſoner: But if the ſuffrages for condemning and acquitting were equal, then the accuſed perſon was always ſet at liberty.

In inſcriptions on medals, ancient and modern, A ſignifies *Auguſtus*, *ager*, *aiunt*, *ante*, *ære*, *ædes*, *aula*, *anima*, *amicus*, *amica*, *alba*, *acta*, *alia*, *&c.* when double, AA, ſignifies *Auguſti*, and triple, AAA, ſtands for *auro*, *argento ære*; or *aurum*, *argentum*, *æs*; and ſometimes it is underſtood, according to Iſidore, when it occurs after *miles*, ſoldier, to denote him young. On the Greek and Roman medals, the letter A denotes the name of the place where they were ſtruck, as Athens, Argos, Antioch, Aquileia. On modern coins, a ſingle A is the mark of Paris, and a double AA, that of Metz.

In modern arts, A carries a further ſignification. Thus, A. B. ſignify, *Artium Baccalaureus*, Batchelor of Arts; A. M. *Artium Magiſter*, Maſter of Arts; A. B. ſometimes ſtands for *alia bona*, A. C. for *acta cauſa*, A. D. *Anno Domini*, &c.

The Romans in their writings dated all matters of buſineſs from the building of Rome; and A. U. C. were uſed as abbreviating the words *anno ab urbe conditâ*. The Greeks uſed A, prefixed to a word, as a privative particle; alſo as a numeral letter, which ſtood only for an unit, or one.

In the ancient records of Rome, A ſtood for 500, but with a ſtroke thus Ā, it was accounted 5000.

In medical preſcriptions of phyſicians, A, or ā, or āā, denotes equal parts of the ingredients ſpecified: ā ſignifies *ana*, and is uſed for a contraction of the Greek prepoſition, *ανα*, of each; e. g. ℞. Mel. Sacchar. et Man. ā vel. āā ℥j. i. e. Take of ſugar, honey and manna, of each an ounce. See Syſtem of PHYSIC.

In chemiſtry, AAA, ſignifies an amalgama, or the operation of amalgamation. See Syſtem of CHEMISTRY.

In algebra, A, or *a*, ſignifies a known quantity. See Syſtem of ALGEBRA.

AABAM, the French chemiſts ſignify *lead* by it.

AAM, or HAAM, a meaſure of capacity, chiefly for liquids, and uſed among the Dutch, containing 63℔ avoirdupois weight, or 228 Engliſh pints = to 148$\frac{2}{3}$ French pints.

AAVORA, a kind of fruit produced by the American palm tree, the kernel of which is good to check a diarrhœa, being of a very aſtringent nature.

AB, in the Syriac calendar, is the name of the laſt ſummer month. The firſt day of which is called, *Saum Miriam*, the faſt of the Virgin; and is continued to the 15th, which they call *Fahr Miriam*, the end of the Virgin's faſt.

Ab, in the Hebrew chronology, the eleventh month of the civil year, and the fifth of the eccleſiaſtical year, which commences with Niſan. The month Ab, anſwers to the time from the new moon in July, to the new moon in Auguſt, and contains 30 days. The Jews obſerve a ſolemn faſt on the 9th of this month, in commemoration of the deſtruction of the Temple of Jeruſalem, in the year of the world 3446, or 558 years before Chriſt, by Nebuchadnezzar, king of Babylon. Alſo in remembrance of the deſtruction of the Temple, by the Romans, after the aſcenſion of Chriſt. On the 1ſt and 18th are two other faſts; the former in memory of Aaron's death, and the latter, becauſe of the extinguiſhing of the lamp in the ſanctuary, in the days of Ahaz.

Ab, is often uſed as an abbreviation for abbey; and when prefixed to the names of places, denote that they belong to abbies.

ABACA, the flax produced in the Philippine iſlands, and is prepared in the ſame manner as European flax, by ſteeping it, and then drying it for the break, after which it is hackled, and properly dreſſed; the teer makes fine hank yarn, and the tow is uſed in cordage, having the properties of hemp in the toughneſs and durability of its contexture.

ABACATUAIA, in ichthyology, the name given to a ſpecies of the zeus vomer, ſomewhat like the European doree, and is in ſize and ſhape ſomewhat the reſemblance of a plaiſe. It is of the Thoraic order of Linnæus; for its deſcription, ſee the article Zeus, and its reference to the tables of *fiſhes*.

ABACAY, a ſpecies of parrot, called callagay, in the Philippine iſlands.

ABACINARE, or Abbacinare, a word derived from the Italian *bacino*, a baſon; and *bacio*, a dark place; in writers of the fourteenth and fifteenth centuries, it implied a ſpecies of puniſhment, according to Du-Cange, conſiſting in blinding of the criminal, by holding a red hot baſon or bowl before his eyes.

ABACK, in ſea language, the ſituation of the ſails, when, by force of the wind, they are flatted againſt the maſts. The ſails are placed in this poſition by ſlackening their lee braces, and hawling in the weather ones, by which means the whole force of the wind is exerted on the fore part of their ſurface, and wholly tend to puſh the ſhip aſtern, and are often laid in this poſition to effect an immediate retreat without turning aſide. When the ſails are brought into this ſituation, either by a ſudden change of the wind, or by an alteration in the ſhip's courſe, the ſails are ſaid to be taken *aback*. When the ſhip rides with a ſingle anchor in a road, it is common to ſpread ſome ſail near the ſtern, ſuch as the mizen top ſail, &c. *aback*, in order to prevent her from approaching it by the motion of the tide, ſo as to entangle the flukes by her ſlackened cable, and by that means looſen it from the ground.

ABACOT, an ancient cap of ſtate, worn by the kings of England, the upper part of it was in the form of a double crown.

ABACTOR, or Abactores, a perſon or perſons who ſteal herds or droves of cattle; the Romans called ſuch, *abigeus*, or *abigevus*, and are properly diſtinguiſhed from *fures*, or petty thieves, who ſteal but one at a time. The phraſe is common in law books; the name is derived from the Latin word *abigo*, to drive away. The puniſhment annexed to ſuch a crime, was, in former times, to perpetually confine the offenders; but in ſome caſes it was death, namely, where the king's cattle were drove away. In Chambers' Dictionary, the editor (Dr. Rees) has it as a compound word, viz. *ab*, from, and *actor*, a driver, from *agere*, to drive; that this compoſition is wrong, remains no doubt.

ABACTUS, or Abigeatus, among the ancient phyſicians, was a word uſed for a miſcarriage procured by art, in contradiſtinction to *abſorſus*, natural. This diſtinction in the modern practice is very deſervedly exploded.

ABACUS, among the ancients, implied a kind of cupboard or beauſet. It is a Latin word, derived from the Greek αϐαξ, a table.

Abacus, in architecture, ſignifies a quadrangular piece, which ſerves as a crowning to the capitals of columns; and, in thoſe of the Corinthian order, repreſents a kind of a ſquare tile covering a baſket, ſuppoſed to be encompaſſed with leaves.

The original of which was: an Athenian matron happening to place a baſket, covered with a ſquare tile, over the root of an acanthus, or branca urſina, bearsfoot; which grew on the grave of a young Corinthian lady, the plant ſhooting up the following ſpring, encompaſſed the baſket all round, 'till meeting with the tile, it curled back in a kind of ſcroll. Calimachus, according to Vitruvius, a celebrated ſtatuary of Athens, paſſing by, obſerved the ſingularity of the appearance, and immediately executed a capital on that plan; repreſenting the tile by the abacus, the leaves of the acanthus by the volutes, or ſcrolls, and the baſket by the body of the capital.

In this manner was the firſt regular order in architecture invented, ſince called the Corinthian order.

There are two ſorts of acanthus, or bears-foot, the one wild, and armed with prickles, and the other ſmooth, and cultivated in botanical gardens. The former of which is repreſented in Gothic buildings, and the latter in thoſe of the Antique.

In the Tuſcan, Doric, and Ionic orders, every ſection of the abacus is parallel to the horizon, which is ſquare. The ſides are generally round, and ſometimes plain, without any ogee, agreeably to the taſte of the workman or artiſt. But a fillet is frequently added inſtead of an ogee. The height of it in the Tuſcan and Doric orders, is one half of that of the capital; in the Ionic, one fourth of it. In the Corinthian and Compoſite orders, the figure of the abacus is concave on the faces, having a roſe in the middle of each, and the four corners cut off. The height of it in the Corinthian ſhould be ſix fortieths, (or, according to Vitruvius, one ſeventh) of the whole capital. In the Compoſite order, the height ſhould be one twenty-fourth of that of the lower part of the column. The due proportion of it is, that its diagonal be twice its height. Scammozzi calls a concave moulding, an abacus, in the capital of the Tuſcan pedeſtal.

Abacus, or Abaciscus, in ancient architecture, denoted certain compartments in the Moſaic pavements. There were abaci of jaſper, alabaſter, porphyry, marble and glaſs, of various ſhapes and forms.

Palladio calls the plinth above the eclimus, or coultin, in the Tuſcan and Doric orders, by the ſame name. See Syſtem of Architecture.

Abacus, among mathematicians, was uſed in ancient times to draw diagrams upon it. The method was, to ſtrew it over with duſt, and take a ſkewer to perform the repreſentations neceſſary. In this ſenſe the word ſeems to be formed of the Phœnician אבק, *abak*, duſt.

Abacus is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. It is variouſly contrived. That chiefly uſed in Europe, is made by drawing any number of parallel lines, at the diſtance of the two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies one; on the ſecond, ten; on the third, one hundred; on the fourth, one thouſand, &c. In the intermediate ſpaces, the ſame counters are eſtimated at one half of the value of the line immediately ſuperior.

The abacus is alſo divided croſſwiſe, into areolæ, by means whereof ſubtractions are made. *Wolf. Lex. Math. p.* 171. *Seq.*

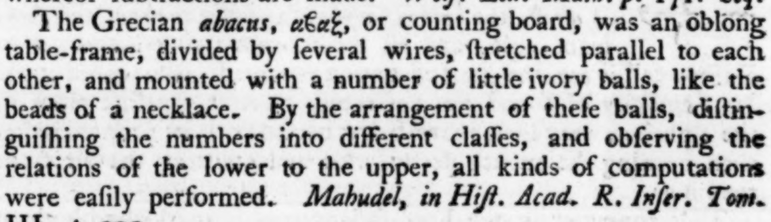
The Grecian *abacus*, *αϐαξ*, or counting board, was an oblong table-frame, divided by ſeveral wires, ſtretched parallel to each other, and mounted with a number of little ivory balls, like the beads of a necklace. By the arrangement of theſe balls, diſtinguiſhing the numbers into different claſſes, and obſerving the relations of the lower to the upper, all kinds of computations were eaſily performed. *Mahudel, in Hiſt. Acad. R. Inſcr. Tom.* III. *p.* 390.

The Roman *abacus* was much the ſame with the Grecian, except that inſtead of ſtrings, or wires and beads, in the Roman we find pins and grooves for them to ſlide in. It is deſcribed by ſeveral authors; but notwithſtanding theſe deſcriptions, we ſhould have had a very obſcure idea of the ancient manner of reckoning, had there not been figures of it found among the ancient marbles. *Phil. Tranſ.* N°. 180.

The Chineſe *abacus*, conſiſts, like the Grecian, of ſeveral ſeries of beads, ſtrung on braſs wires, extended from the top to the bottom of the inſtrument, and divided in the middle by a croſs piece from ſide to ſide; ſo that in the upper row, each ſtring has two beads, which are reckoned for five; and in the lower row, each ſtring has five beads of different values; the firſt being reckoned as 1, the ſecond 10, the third 100, &c. as above mentioned; but inſtead of four pins for digits, or units, in the Roman *abacus*, the Chineſe have five beads.

We have two different figures and deſcriptions of the Oriental *abacus*, one from Dr. Hook, and the other from F. Martinius, the latter reſident for many years in China. See Schwan-Pan.

But to illuſtrate the abacus table, reſpecting the values of the figures, on or between the lines, the following will ſuffice, viz. between the firſt and ſecond, 5, between the ſecond and third, 50, &c. The ſcheme is thus, upon which we ſhall record 1788.



Abacus *Pythagoricus*, the common multiplication table, ſo called from its being invented by Pythagoras.

Abacus *Logiſticus*, is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers 1 to 60, and its æra the facta of each two of the numbers perpendicularly oppoſite. This is called a *canon of ſexageſimals*.

Abacus *et Palmulæ*, denote, in ancient muſic, the machinery, whereby the ſtrings of polyplectra (or inſtruments of many ſtrings) were ſtruck with a plectrum, made of quills.

Abacus *Harmonicus*, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands, or the feet.

Abacus *Major*, in metallurgic operations, the name of a trough, uſed in the mines where the ore is waſhed.

ABADDON, or אגריכ, in the Greek *απολλυων*, names given to the devil in the 9th chapter of the Revelation of Saint John the Divine, both of which imply, *a deſtroyer*.

ABADIR, a title which the Carthaginians gave to gods of the firſt order. In the Roman mythology, it is the name of a ſtone, which Saturn ſwallowed by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence, it ridiculouſly became the object of religious worſhip.

ABAFT, a ſea term, ſignifying the hinder part of a ſhip, or all thoſe parts both within and without, which lie towards the ſtern, in oppoſition to afore; which ſee.

Abaft, is alſo uſed as a prepoſition, and ſignifies further aft, or nearer the ſtern, as the barricade ſtands abaft the mainmaſt, i. e. behind it, or nearer the ſtern.

ABAGI, ſometimes called Abassi, worth 36 ſols, French money: four chaouris make one abagi, in the French American dominions.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALIENATUS, among phyſicians, means corrupted; when applied to the body, it ſignifies, that a part is ſo deſtroyed as to require amputation; when applied to the ſenſes, it expreſſes their total deſtruction.

ABANGA, the name of the fruit of the palm-tree, in the iſland of St. Thomas.

ABAPTISTON, or Abaptista, a name anciently given to the terebella, a perforating part of the inſtrument, called a trepan, which by its conſtruction is prevented from ſinking into the brain, when the bone is cut through. The word is derived from the negative *α* and *βαπτω*, I immerge, implying to ſink under.

ABARCA, an ancient kind of ſhoe, uſed in Spain to paſs over the mountains, made of raw hides and bound with cords, which ſecured the travellers againſt the ſnow.

ABARNAHAS, a term uſed by alchemiſts for magneſia.

ABARTAMEN, a chemical term for lead.

ABARTICULATION, in anatomy, a ſpecies of articulation, the ſame with diarthroſis; which ſee.

ABAS, a weight uſed in Perſia for weighing pearls, being an eighth part lighter than an European carat.

Abas, a kind of epilepſy.

ABASED, Abaisse, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the ſhield, or when the wings are ſhut, the natural way of bearing them being extended.

ABASSI, a Perſian coin of the value of 16d. ½ ſterling.

ABATAMENTUM, a term in law, ſignifying an entry to lands by interpoſition, i. e. when a perſon dies ſeized, and another, who has no right, enters before the heir.

ABATE, in law, implies to overthrow, or pull down, both in the active and neutral ſenſe of the Engliſh common law: 1. In abating a writ, by exception. 2. Abating a demandant by an appeal in covin, whereby the accuſation is defeated by deceit.

Abate, generally means an error in or an exception to the pleadings.

Abate, in the manege, implies the performing any downward motion properly: thus a horſe is ſaid to abate, or take down his curvets, when he puts both his hind legs to the ground at once, and obſerves the ſame exactneſs in all the times.

ABATELEMENT, in commerce, a term uſed for a prohibition of trade to all French merchants in the ports of the Levant, who will not ſtand to their bargains or refuſe to pay their debts. This ſentence muſt be taken off by the French conſul, who impoſes it, before they can ſue any perſon for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure, which is ſaid to have been added to coats of arms, in order to denote ſome diſhonourable demeanor or ſtain, whereby the dignity of the coat of armour was rendered of leſs eſteem.

Abatement, in the cuſtoms, an allowance made upon the duty of goods when the quantum damaged is determined by the judgment of two merchants upon oath, and aſcertained by a certificate from the ſurveyor and landwaiter.

ABATIS, the chief officer who looks to a king's ſtables.

ABATOR, in law, implies a perſon who takes poſſeſſion of another's inheritance, until the injured perſon brings a writ of *intruſione*; which ſee.

ABAVI, or Abavo, a ſynonime of the Adanſonia.

ABB, a term among clothiers, for the yarn of a weaver's warp; hence the wool, of which it is compoſed, is called abb-wool.

ABBA, in the Syriac and Chaldee languages, literally ſignifies father, and figuratively, a ſuperior, reputed as a father in reſpect of age, dignity or affection. It is alſo a Jewiſh title of honor, given to ſome of the claſs called Tanaites.

Abba, in the Coptic, Syriac and Ethiopic churches, means a biſhop.

ABBATIS, in a military ſenſe, is formed by cutting down many entire trees, the branches of which are turned towards the enemy, and, as much as poſſible, tangled one into another; they are made either before redoubts, or other works, to render the attacks difficult, or ſometimes along the ſkirt of a wood, to prevent the enemy from getting poſſeſſion of it. In this caſe, the trunks ſerve as a breaſt work, behind which the troops are poſted, and for that reaſon ſhould be diſpoſed ſo that the parts may, if poſſible, flank each other.

ABBE, ſynonimous, in a monaſtic ſenſe, with abbot; which ſee.

Abbe, a modern, curious, popular character in France, very little known in Great Britain. They are admiſſible in all companies, and no degradation to the beſt, notwithſtanding they are ſometimes found in the worſt. Their dreſs is rather of an academic, or of a profeſſed ſcholar, than of an eccleſiaſtic.

Theſe abbes are very numerous, and no leſs uſeful. They are, in colleges, the inſtructors of youth; in private families, the inſtructors of young gentlemen; and many of them procure a decent livelihood by their literary and witty compoſitions of all kinds, from the profoundeſt philoſophy to the moſt airy romances. They are, in ſhort, a body of men who poſſeſs a fund of univerſal talents and learning, and are inceſſantly employed in the cultivation of every various branch of literature and ingenuity. No ſubject whatever eſcapes them; ſerious or gay, ſolid or ludicrous, ſacred or profane, all pay tribute to their reſearches; and as they are converſant in the loweſt, as well as the higheſt topics, their fame is equally great in the learned and ſcribbling world. A diſtinguiſhed part of their character, is their devotion to the fair ſex, whoſe favourites in return they have the honour of being in the moſt enviable degree; the wit and ſmartneſs for which they are uſually remarked, agreeably ſuit the volatile caſt of the French ladies. In fine, theſe abbes are ſought after by moſt people on various accounts, as they are equally men of buſineſs and pleaſure, not leſs expert in the moſt ſerious tranſactions, than fond of enjoying their ſhare of whatever occupies the gay world. Hence they diligently frequent all public places, which are thought incomplete without them, as they compoſe the moſt intelligent part of the company, and are the moſt weighty approvers or condemners of what paſſes in almoſt every aſſemblage of people.

ABBESS, the ſuperior, or governeſs of an abbey, or convent of nuns. The abbeſs has the ſame rights and authority over her nuns, that the abbots regularly have over their monks. Her ſex precludes her from the performance of ſpiritual functions annexed to the prieſthood, wherewith the abbot is uſually inveſted; but there are inſtances of ſome abbeſſes who have a right, or rather a privilege, to commiſſion a prieſt to act for them. They have even a kind of epiſcopal juriſdiction, as well as ſome abbots, who are exempted from the viſitation of their dioceſans. Formerly they confeſſed their nuns, but now the deputed prieſt takes upon him that care: however, the abbeſs has a privilege to be preſent, if ſhe requires it. *St. Baſil's Rule of Faith.*

ABBEY, a monaſtery, or religious houſe, governed by a ſuperior, under the title of an abbot, or abbeſs. In the Latin records, called *abbathy*. By 31 Hen. VIII. Cap. 13. all forfeited to the king. Abbeys differ from priories, only in being under the government of an abbot, inſtead of a prior, which the ſuperiors of priories are called.

The inſtitution of theſe religious houſes was, doubtleſs, originally pious and uſeful, as they were intended for ſeminaries of religion, and aſylums for ſanctity; but, like many other good foundations, they have been wretchedly perverted, and are now nothing more than eccleſiaſtical colleges in which people retire from the world to ſpend their lives in ſolitude and idleneſs.

They prevailed in Great Britain before the reformation, particularly in England, and as they increaſed in riches, ſo the ſtate became poor; for the lands which theſe regulars poſſeſſed, were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave riſe to the ſtatutes againſt gifts in mortmaine, which prohibited donations to the religious houſes; and Lord Coke tells us, that ſeveral lords, at their creation, had a clauſe in their grant, that the donor might give or ſell his land to whom he would, *exceptis viris Religioſis et Judæis*, i. e. excepting Monks and Jews.

Theſe places were wholly aboliſhed in England, at the time of the reformation. Henry VIII. having firſt appointed viſitors to inſpect into the lives of the monks and nuns, which were found very diſorderly: upon which, the abbots perceiving their diſſolution unavoidable, were induced to reſign their houſes to the king, who, by that means, became inveſted with the abbey lands. Theſe were afterwards granted to different perſons, whoſe deſcendants enjoy them at this day; they were then valued at the enormous ſum of 2,853,000l. per ann. now upwards of 7 millions a year.

ABBOT, or Abbat, the ſuperior of a monaſtery of monks, erected into an abbey or prelacy.

The name abbot is originally Hebrew, where it ſignifies father. The Jews call father in their language אב, *ab*; the Caldeans and Syrians, *abba*; thence the Greeks *αϐϐας*, which the Latins retained *abbas*. Hence our abbot and the French abbé.

The Apoſtles uſed, in the Greek language, the Syriac word *abba*, by reaſon it was then commonly known in the ſynagogues, and the primitive aſſemblies of the Chriſtians, adding to it by way of interpretation, Aϐϐα ϖατηρ, (i. e. "Abba father.") Thus the Hebrew writers ſay, Pirk Abbath, or Avoth, (i. e. The chapters of the fathers.) It was an alluſion to this affectation of the Jews, that Jeſus Chriſt forbad his diſciples to call any man their father on earth, which St. Jerome turns againſt the ſuperiors of the monaſteries of his time, for aſſuming the title of abbots, or fathers.

The name abbot, although as ancient as that of monk, has been ſrequently confounded with it, as well as that of the clergy; but, in fact, it is a degree, between a layman and a perſon in orders.

In thoſe early days the abbots were ſubject to the biſhops and the ordinary paſtors, their monaſteries being remote from cities, and built in the fartheſt ſolitudes: they had no ſhare in eccleſiaſtical affairs. They went on Sundays to the pariſh church with the reſt of the people, or, if they were too remote, a prieſt was ſent them to adminiſter the ſacraments, till at length they were allowed to have prieſts of their own body. The archimandrite, or ſuperior, was uſually the prieſt; but his function extended no further than to the ſpiritual aſſiſtance of his monaſtery; and he remained ſtill in obedience to the biſhop: but this ſubjection was ſoon worn off, which occaſioned ſome ſevere laws to be made againſt them at the council of Chalcedon; notwithſtanding which, many of them carried the point of independency, and got the appellation of lord, with other badges of the epiſcopate, particularly the mitre. Hence aroſe the diſtinctions of mitred, croziered, œcumenical and cardinal abbots. Thoſe titles are as follow; the mitre implied epiſcopal authority, within the abbot's precinct; the crozier, the ſign of paſtoral care, as a ſtaff is given to ſignify the ſhepherd of ſouls; œcumenical, ſignified an univerſal or patriarchal juriſdiction. Cardinal abbots had juriſdiction over all other abbots.

In England, the mitred abbots were lords in parliament. Of theſe, Sir Edward Coke reckons 27, beſides two mitred priors.

There were other diſtinctions, namely, abbots elective, and abbots preſentative; but now underſtood by regular and commendatory. The firſt are real monks, who wear the habit of their order. The latter *in commendam* are ſeculars, though they have undergone the tonſure, and are obliged, by their bulls, to take orders when they come of age. The ceremony of their creation is properly called a benediction, which the vulgar term a conſecration.

A biſhop, whoſe ſee was formerly an abbey, is uſually ſtiled an abbot; ſuch are, Montreal and Catanea, in Sicily.

In Genoa, a chief magiſtrate, is called the abbot of the people.

In Paris, the rector of St. Geneviere, is called an abbot.

ABBREVIATION, or Abbreviature, a contraction of a word or paſſage, made by dropping ſome of the letters, or by ſubſtituting a mark or character in its ſtead; thus M. ſtands for *munipulus*, an handful.

ABBREVIATOR, in a general ſenſe, a perſon who abbreviates any large book into a narrow compaſs.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who drew up the Pope's brieves, and reduced petitions, when granted by him, into proper form, for being converted into bulls: it ceaſed to exiſt in the latter end of the 15th century. The buſineſs is now done by ſeven notaries. *Ciampini*, *Lib.* 2. The chief perſon who is intruſted with the papers of the holy father, the pope, is called an *abbreviatore*, whoſe office is to aſſiſt the vice chancellor to prepare the pope's bulls.

ABBREUVOIR, in maſonry, the joint, or ſtructure, of two ſtones, or the inteſtice, or ſpace, left between them, filled up with mortar. It alſo implies a watering place.

ABBUTALS, ſignify the buttings or boundaries of land towards any point. Limits were anciently diſtinguiſhed by artificial hillocks, which were called *botentines*; hence, butting. In deſcriptions of ſcite land, the ſides on the breadth are more properly called *adjacentes*, and thoſe terminating the length are, *abbutantes*, which, in old ſurveys, were ſometimes expreſſed by *capitaire*, to head, whence *abbutals* are now called headlands.

ABCEDARY, or Abcedarian, an epithet given to compoſition; the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay, Abcedarian pſalms, hymns, lamentations, &c.

ABDALS, in the Eaſtern countries, a kind of ſaints, ſuppoſed to be inſpired to a degree of madneſs. The word comes from *abdallah*, which, in the Arabic, implies the ſervant of God. The Perſians call them *devanch khoda*, agreeably to the Latins way of ſpeaking of their prophets and ſybils, *q. d. furentes Deo*, i. e. raging with God!

They are often carried by exceſs of zeal, eſpecially in the Indies, to run about the ſtreets and kill all they meet of a different religion, of which travellers furniſh many inſtances. The Engliſh ſeamen call this ſort of madneſs, *running a muck*, from the name of the inſtrument, a ſort of poignard which they employ on thoſe deſperate occaſions. If they are killed, as it commonly happens, before they have done much miſchief, they reckon it highly meritorious, and are eſteemed by the vulgar, martyrs for the faith.

ABDELAVI, an Egyptian melon; very acute at the extremities.

ABDEST, a Perſian word, properly ſignifying the water placed in a baſon for waſhing the hands, but it is uſed to imply the legal purifications practiced by the Mahometans, before they enter on their religious ceremonies.

ABDICATION, the action whereby a magiſtrate, or a perſon in office, renounces and gives up the ſame before the term of ſervice is expired.

This word is frequently confounded with reſignation, but differs from it, as being done purely and ſimply; whereas reſignation is in favour of ſome other perſon. It is ſaid to be a renunciation, quitting and relinquiſhing, ſo as to have nothing further to do with a thing, or the doing of ſuch actions as are inconſiſtent with holding of it. On king James II. leaving the kingdom and abdicating the government, the lords would have the word *deſertion* made uſe of, but the commons thought it was not comprehenſive enough, for the king might then have liberty of returning.

Abdication, in law, implies the expulſion of a child by his father, from the family; or diſcarding him. This cuſtom was common to the Greeks and Romans, who called it, *a familia alienato*; or, αποκηρυξις.

ABDITÆ Causæ, are the ſecret or remote cauſes of diſtempers, which phyſicians, of the rational ſect, affirmed were neceſſary to be known in order to eſtabliſh a right or proper method of cure.

ABDOMEN, in anatomy, is that part of the trunk of the body, which lies between the thorax and the bottom of the pelvis. The word is derived from *abdere*, to hide.

It is divided or ſeparated from the cavity of the thorax by the diaphragm, and terminated below by the muſcles of the arms.

The *abdomen* is a kind of a parabolic cavity, lined by a particular kind of a thin ſoft membrane, called the peritonæum. It contains the ſtomach, inteſtines, meſentery, meſocolon, omentum, liver, gall, bladder, ſpleen, pancreas, glands of the meſentery, vaſa lactea, receptaculum chyli, kidneys, renal glands, ureters, bladder, and the internal parts of generation in both ſexes.

The human body is generally divided into three regions or ventors, the head, thorax, and the abdomen.

The *abdomen* is defended by five pair of muſcles, which not only ſecure the viſcera, but by their alternate relaxations and contractions in reſpiration, promote the action of digeſtion, and the extruſion of the fæces and urine. By their contraction the cavity of the abdomen is ſtraightened, and the deſcent of the contents of the viſcera through the inteſtines is promoted. They are the proper antagoniſts to the ſphincters of the anus, and bladder, and forcibly expel the excrements of thoſe parts, as alſo the fœtus in parturition.

The *abdomen* is ſubject to inflammations, abſceſſes, ſcirrhi, indurations, inflations, ſpaſms, &c. ſo that many operations are performed on it, ſuch as, perforations, ſutures, ſections, &c.

It is liable to four different ſorts of wounds:

1. Such as affect the integuments, are not dangerous, and are to be treated as wounds are in common.

2. Such as affect the muſcles without penetrating the peritonæum, requires a probe to ſearch them, and injected liquids to cleanſe, and cure the wound.

3. Such as enter the cavity of the abdomen without injuring the contents. It muſt be treated as in the laſt caſe, but inſtead of keeping the wound open, as in that ſituation, it muſt be carefully kept cloſed up; and a ſparing regimen is particularly required, and the body gently purged during the time of healing.

4. The contents of the cavity entered; this caſe is of the utmoſt conſequence, as the greater danger reſults from it. The knowledge of which is gained, by the patient's exceſſive pain whilſt up, or ſuſpended in a horizontal poſture: this circumſtance is the pathognomic ſign of the diſeaſe; to remove which, in caſe of its continuing obſtinate, the place muſt be laid open, and the rupture reduced in the uſual way.

The muſcles which defend the abdomen are called, obliqui deſcendentes & aſcendentes, the rectus tranſverſalis and pyramidales.

Concerning the hydropieal tumors of the abdomen, valuable information may be had in the *Medical Eſſays of Edinburgh*, *Vol. V. Art.* 59. *and Buchan's Domeſtic Medicine.* See Syſtems of Anatomy and Surgery.

ABDOMINALES, in the Linnæan ſyſtem of ichthyology, an order of fiſh, having the ventral fins placed behind the pectoral, in the abdomen; comprehending 17 genera, and 127 ſpecies. See Syſtem of Ichthyology.

ABDUCENS Labiorum, in anatomy, a name given to a muſcle, called by Albinus, *levator anguli oris*; by Spigelius, *ſecundus ad latera*; and the *caninus*, or *elevator labiorum communis*, of others

ABDUCTION, a form of reaſoning among logicians, which conſiſts in drawing concluſions from certain and undeniable propoſitions.

Abduction, in ſurgery, a ſpecies of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, in anatomy, commonly called Abducent, a name uſually applied to ſeveral of the muſcles, on account of their ſerving to withdraw, open, or pull back the parts to which they are fixed.

The word is compounded of *ab*, from, and *ducere*, to draw. Their antagoniſts are adductores.

The buſineſs of the abductory muſcles is to remove and extend the limbs, fingers, toes, eyes, &c. of the human body. See Syſtem of ANATOMY.

ABEL-TREE, an obſolete name for a ſpecies of the poplar tree. See POPULUS.

ABELIANS, ABELOITES, or ABELONIANS, in church hiſtory, a ſect of heretics, mentioned by St. Auguſtin, which aroſe in the dioceſe of Hippo, in Africa, and is ſuppoſed to have begun in the reign of Arcadius and ended in that of Theodoſius. Their marriages were regulated after the example of Abel, who they pretended was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence, and to keep up the ſect when a man and woman entered into this ſociety; they adapted a boy and a girl who were to inherit their goods, and to many upon the ſame terms of continence, but to fulfil all things in the manner of their predeceſſors.

ABELICEA, SANTALUS ADULTERINA, or PSEUDOSANTALUM, a tall ſpecies of pine, growing only in Crete.

ABELMOLUCH, or ABELMULICH, a ſpecies of the palm, or ricinus tree.

ABELMOSCH, or ABELMUSCH, muſk ſeed, brought from the Weſt Indies, formerly imported from Egypt.

ABENEL GAUBY, a fixed ſtar of the third magnitude, in the ſouth ſcale of Libra, or the ſixth Conſtellation.

ABEREMURDER, ABEREMURDRUM, is, in law, *probatum murdrum*, or murder that need no proof, and could only be atoned for with the blood of the guilty; it is part of the code of Alfred the Great.

ABERRATION, in aſtronomy, a ſmall apparent motion of the fixed ſtars, diſcovered by the late Doctor Bradley. The diſcovery was made by accident in the year 1725, when Mr. Molyneux and Dr. Bradley, began to obſerve the bright ſtar in the head of Draco, marked γ by Bayer, as it paſſed near the zenith, with an inſtrument made by Mr. Graham, in order to diſcover the parallax of the earth's annual orbit; and after repeated obſervations they found this ſtar about the beginning of March 1726, to be 20″ more ſoutherly than at the firſt obſervation. It now ſeemed to be arrived at its utmoſt limits ſouthward, becauſe in ſeveral trials made about this time, no ſenſible difference was obſerved in its ſituation. By the 14th of April 1726, it appeared to be turning back, and on the 1ſt of June it paſſed at the ſame diſtance from the zenith, as it had done in December, when it was firſt obſerved. In September following, it appeared 39″ more to the N. than it was in March, juſt the contrary way to what it ought to appear by the annual parallax of the ſtars. This unexpected phænomenon perplexed the obſervers very much, and Mr. Molyneux died before the true cauſe of it was diſcovered. After this, Dr. Bradley, with another inſtrument more exact, obſerved the ſame appearances in many other ſtars; and by the great regularity that appeared in a ſeries of obſervations, made in all parts of the year, the doctor was fully ſatisfied with regard to the general laws of the phænomena, and therefore endeavoured to find out the cauſe of them. He was already convinced that the apparent motion of the ſtars, was not owing to a nutation of the earth's axis.

The next thing that offered itſelf, was an alteration in the direction of the plumb line, with which the inſtrument was conſtantly rectified, but this upon trial proved inſufficient. Then he had recourſe to what refraction might do, but here alſo nothing ſatisfactory occurred. At laſt, this acute aſtronomer found that the phænomena in queſtion proceeded from the progreſſive motion of light, and the earth's annual motion in its orbit: for he perceived, that if light was propagated in time, the apparent place of a fixed object would not be the ſame when the eye is at reſt, as when it is moving in any other direction than that of the line paſſing through the eye and object, and that when the eye is moving in different directions the apparent place of the object would be different. See *Philoſ. Tranſ.* N°. 406.

ABERRATION, in medicine, ſignifies a deviation from the uſual courſe of the natural ſyſtem.

ABERRATION, in optics, is uſed to denote that error, or deviation of the rays of light, when inflected by a lens or ſpeculum, whereby they are hindered from meeting or uniting in the ſame point.

There are two ſpecies of the aberrations of rays of light, diſtinguiſhed by their different cauſes; one ariſing from the figure of the glaſs or ſpeculum, the other from the unequal refrangibility of the rays of light. This laſt ſpecies is ſometimes called the Newtonian ſyſtem of optics. See Syſtem of OPTICS.

ABERRATION, *Crown of*, is a luminous circle ſurrounding the real diſk of the ſun, depending on the aberration of the ſolar rays, whereby his apparent diameter is enlarged.

ABESAMON, dirt, rubbiſh, or dung.

ABESSI, implies the remaining matter of the aliment, after the chyle is ſeparated from it, i. e. excrement, uſually ſtiled, rebis.

ABESTA, the name of one of the ſacred books of the Perſian magi, which they aſcribe to their great founder Zoroaſter. The abeſta is a commentary on two others of their religious books called Zend and Pazend, the three together including the grand ſyſtem of the Ignicold, or worſhippers of holy and celeſtial fire.

ABESTON. See ASBESTOS.

ABESUM, unſlacked calx, or quick lime.

ABETTOR, a law phraſe, implying one who encourages another to perform a criminal action; and lays, in all caſes, liable to puniſhment, except in high treaſon againſt the ſtate; as thoſe guilty in that particular are wholly principals, incapable of abettors or acceſſaries. See ACCESSARY and the ANALYSIS *of law*.

ABEVACUATION, uſed as a medical term, to ſignify a partial evacuation of the peccant humors, either by art or nature.

ABEYANCE, ABBAYANCE, or ABEIANCE, in law, the expectancy of an eſtate, e. g. if lands are leaſed to one perſon as tenant for life, with reverſion to another for years, the remainder for years is in abeyance till the deceaſe of the leſſee.

ABHEL, in botany, the evergreen called ſavin, well known in phyſical preparations.

ABIANS, the ancient people of Scythia, who dwelt in wooden houſes that moved upon wheels, ſo as to facilitate a journeying onward, being mindful only of their flocks, on whoſe produce they ſubſiſted. Homer makes honourable mention of them, as a people of great integrity; alſo humane and courageous.

ABIB, in the ancient chronology of the Jews, the firſt month of the eccleſiaſtical year; ſince called Niſan; and is reckoned the ſeventh month of the civil year. It began at the vernal equinox; and according to the courſe of the moon, by which their months were regulated, anſwered to the latter part of our March, and the beginning of April.

ABIB, in Hebrew, ſignifies an ear of corn; alluding to the firſt harveſt commencing in that month throughout Paleſtine.

ABIDING *by Proofs*, in law, the caſe added to the pleadings; whereby council illuſtrates the matters in evidence, ſo as to convince the court that the ſtatement of the caſe, as to facts, carries a verdict in favour of his client.

ABIES, the fir-tree, a genus of ever-greens; the characters of which are, there are male and female on the ſame tree; the males have empalements of four leaves without petals, many ſtamina, and naked ſummits. The females are collected in a ſcaly cone, each ſcale covering two flowers, having neither petals or ſtamina, with one pointel, and are each ſucceeded by a winged nut. The diſtinguiſhing character of this genus, is the leaves ariſing ſingly from their baſe, whereas the pines have two or more ariſing from the ſame point.

By the Linnæan ſyſtem, firs and pines are united, ſo as to be claſſed generally as deals, yet differ materially as to ſubſtance and quality; the learned botaniſt placing them among the manœcia monadelphia.

The fir tree grows in many parts of Europe, particularly Germany, Norway, Denmark and Sweden, as well as in Aſia and America, as a natural production: in the latter of which places the celebrated ſpruce beer is brewed from a preparation made from this tree. The tops and leaves of the fir tree, are recommended to be taken in diet drinks for the ſcurvy.

Roſin, tar, common and Burgundy pitch, Straſburgh turpentine, Canada balſam, &c. are productions of this tree.

All ſorts of fir are propagated by ſeeds; which may be done in manner following, viz. Soak the cones in warm water for about twelve hours, after which the ſeveral cells will open, and the ſeeds will fall out; for theſe ſeeds ſhould never be taken out of the cones, till the time of ſowing them, which is in March. The ground ſhould be carefully fallowed and harrowed ſeveral times, to deſtroy the weeds, then level the earth with a ſpade, at the diſtance of about ſix feet ſquare, in ſmall ſpots, in which, ten or twelve ſeeds are to be ſown, covered with ſome of the ſame mould, broken fine, but not ſifted. A defence muſt be placed over them, ſo as to defend them from the birds; a net or a furze buſh will be the beſt ſafeguard, until they are well up; and when this covering is taken off, a little looſe earth is to be drawn about the ſtems of the plants, and a row of ſmall furze, placed on the ſouth ſide, to defend them from the heat of the ſun at noon. About eight plants come to perfection out of twelve, which may be left ſtanding until the ſecond year; and then are to be tranſplanted into nurſery beds. On the fourth year ſhould be removed to the plantation allotted them, and are to be planted at 20 feet diſtance, for when they are cloſer planted, the under branches ſoon drop their leaves, and totally decay: in removing the plants, great care ſhould be taken not to injure their roots, and as much earth raiſed with them as is poſſible.

The unſkilful diſpoſition of theſe trees, has brought them into diſrepute with many perſons, but, if properly placed, they may be made ornamental to gentlemen's ſeats.

In pruning off the under branches, to the deſigned height, not more than one row ſhould be lopt off each year, as too many cut off at once may kill or dwarf the tree into a ſtate of wry bendings. The month of September is the time for pruning; and March, or the beginning of April, for ſowing and tranſplanting.

The common fir requires a ſtrong loamy ſoil, in low grounds. The American ſpruce firs, picea, or ſilver yew leaved firs, a dry ſituation, but a very deep ſoil and muſt be ſheltered from the north winds in the winter ſeaſon.

They will riſe in a beautiful pyramidal figure, if kept free from weeds, and fenced from cattle: and will amply ſatisfy the gardner for his trouble. But if at ſeven years old, any are found to be ſtunted in growth, it will be well to dig them up carefully, and exchange places with others that flouriſh; but then ſome rich ordure, or manure, is to be added in this plantation.

ABIGA *Herba*, the ground pine or chamæpitys.

ABIGEAT, or Abigeatus, the ſame as *abactus*, the crime of ſtealing cattle by droves; in the ancient laws of England, puniſhed by baniſhment, condemnation to the mines or gallies for life, and ſometimes with death itſelf.

Abigeat, among phyſicians, to procure abortion by art.

ABIGEUS, in the civil law, one guilty of the crime of drove ſtealing.

ABILITY, in law, denotes a power of doing certain actions in the acquiſition or transferring of property: generally, capacity.

AB-INTESTATE, in the civil law, is applied to a perſon who inherits the right of one who died inteſtate, or without making a will.

ABISHERING, an ancient law term, denoting a liberty or freedom from all amerciaments; alſo a right to the forfeiture of all others within his fee; uſually applied to perſons to whom charters or other inſtruments of record were granted. Several citizens in England partake of thoſe franchiſes.

ABIT, or Aboit, ceruſs.

ABJURATION, in law, is uſed for renouncing, diſclaiming, and denying the pretender to have any manner of right to the throne of Great Britain or Ireland, and that upon oath, which is required to be taken upon divers pains and penalties by many ſtatutes, particularly 1 W. & M. 13 W. III. 1 Anne, and 1 G. I. But as the form has been altered ſomewhat by 6 G. III. chap. 53, the following is the exact form of the oath:

"I L. M. do truly and ſincerely acknowledge and profeſs, teſtify and declare in my conſcience, before God and the world, that our Sovereign Lord King George, is lawful and rightful king of this realm, and all other his majeſty's dominions thereunto belonging. And I do ſolemnly and ſincerely declare, that I do believe in my conſcience, that not any of the deſcendants of the perſon who pretended to be Prince of Wales, during the life of the late king James II. and ſince his deceaſe pretended to be, and took upon himſelf the ſtile and title of king of England, by the name of James III. or of Scotland, by the name of James VIII. or the ſtyle and title of king of Great Britan, hath any right or title whatſoever to the crown of this realm, or any other the dominions thereunto belonging. And I do renounce, refuſe and abjure any allegience or obedience to any of them. And I do ſwear, that I will bear faith and true allegiance, to his majeſty king George, and him will defend, to the utmoſt of my power againſt all traiterous conſpiracies and attempts, whatſoever, which ſhall be made againſt his perſon, crown and dignity; and I will do my beſt endeavour, to diſcloſe, make known to his majeſty and his ſucceſſors, all treaſons and traiterous conſpiracies, which I ſhall know to be againſt him or any of them. And I do faithfully promiſe, to the utmoſt of my power, to ſupport, maintain and defend the ſucceſſion of the crown, againſt the deſcendants of the ſaid James, and againſt all other perſons whatſoever, which ſucceſſion by an act, intitled 'An act for the further limitation of the crown, and the better ſecuring the rights and liberties of the ſubject,' is and ſtands limitted to the princeſs Sophia, electoreſs and ducheſs dowager of Hanover, and the heirs of her body, being proteſtants. And all theſe things I do plainly and ſincerely acknowledge and ſwear, according to theſe expreſs words by me ſpoken, and according to the plain and common ſenſe and underſtanding of the ſame words, without any equivocation, mental evaſion, or ſecret reſervation whatſoever. And I do make this recognition, acknowledgment, abjuration, renunciation, and promiſe, heartily, willingly, and truly, upon the true faith of a Chriſtian. So help me God."

The word is purely Latin, *abjuratio*; and compounded of *ab*, from, or contrary; and *jurare*, to ſwear.

Abjuration, in our ancient cuſtoms, implied an oath taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the kingdom for ever; he was then at liberty for forty days to prepare himſelf.

Abjuration *of Hereſy*, the ſolemn recantation of any doctrine accounted wicked, falſe, or dangerous.

ABLACTATION, from *ablactatio*, the weaning a child from the breaſt: as nature has taken care to provide for an aliment ſuitable to the ſtomachs of new born infants, ſo it has pointed out directions when to change it, for a diet is more ſolid and difficult of digeſtion. For the method of weaning. See Weaning.

Ablactation, in ancient agriculture, or gardening, implies a method of inarching, grafting, or engrafting by approach. See Grafting *and* Inoculation.

Ablactation, ſignifies alſo any thing extracted from its original ſtate, and ſupported by ſome new ſource, ſo as to make its nature partake of another means to preſerve life, than that it originally poſſeſſed: this is only to be applied to the botanical ſyſtem.

ABLAQUEATION, a phraſe of antiquity in gardening, which ſignifies the operation of laying the roots of fruit trees bare, to expoſe them to the ſun, wind and rain, in order to promote their fecundity. The time of performing this ſuppoſed ſervice to the trees of baring, uſed to be in the latter end of autumn, but now it is very properly laid aſide, as many excellent fruit trees were killed by it.

ABLATIVE, is the ſixth caſe in the Latin grammar, and peculiar to that language. It is oppoſed to the *dative*, which expreſſes the action of giving; the *ablative* expreſſing that of taking away: e. g. *ablatum eſt à me*, it was taken from me. It is ſometimes called the comparative caſe, as being much uſed in comparing things together; thus, *dulcior melle*, ſweeter than honey. See Syſtem of Grammar.

Ablative *Abſolute*, in grammar, is a detached phraſe, independent of the reſt of a diſcourſe; and is much the ſame with the Engliſh parentheſis; e. g. *Juvante Deo*, (with God's aſſiſtance). It is called *abſolute*, becauſe governed by no other word.

ABLECTI, in Roman antiquity, a ſelect body of ſoldiers picked or ſelected out from among thoſe called *extraordinarii*.

ABLEGMINA, in Roman antiquity, thoſe choice parts of the entrails of victims, which were offered in ſacrifice to the gods; called proficiæ, porriciæ, profecta & proſegmina. The ablegmina were ſprinkled with flour, and burnt on the altar, the prieſts pouring wine on them.

ABLET, or Ablen, in ichthyology, a name given to the common bleak, a ſmall freſh water fiſh, called by the Romans alburnus. It is a ſpecies of Cyprinus, which Artedi calls the five inch Cyprinus, with twenty rays in the pianna ani. See thoſe names.

ABLUENTS, *Abluentia*, in medicine, the ſame with dilutents or diluters; and are ſuch as diſſolve, and conſiſt of aqueous infuſions and decoctions, to thin the blood, correct its ſpiſſitude and acrimony, and carry off the acrid ſalts and offending matter, by the emunctories of nature; but eſpecially in the ſtomach and inteſtines.

ABLUTION, from *abluo*, *quaſi ab lavo*, I waſh away; in a general ſenſe, implies the waſhing or purifying with water.

Ablution, in a religious application, ſignifies a ceremony in uſe among the ancients; and ſtill practiſed in ſeveral parts of the world: it conſiſted in waſhing the body, which was always done before ſacrificing, or even entering their houſes; which practice ſeems to be as old as any part of external worſhip, or ceremonial law.

Moſes enjoined them; the Heathens adopted them; and Mahomet gave commandment for their uſe to his followers: thus they have taken root among moſt nations; and have become a conſiderable part of almoſt all forms of religious worſhip that are eſtabliſhed throughout the world. The Egyptian magi had their diurnal and nocturnal ablutions. The Grecians their ſprinklings. The Romans their luſtrations and lavations. The Jews their waſhings. The ancient Chriſtians their bathings before communion: which the Roman catholics, in ſome meaſure, ſtill retain. The Syrians, Copths, &c. have their ſolemn waſhings on good Friday; the Turks their greater and leſſer abſitions, their ghaſt, and wodon, their aman, tharata, taharat or tabarut, guſul, abdeſt, and ramanis.

Ablution, in the Romiſh church, is now uſed by taking a ſip of wine and water, to waſh down the wafer, eaten in the communion ſervice, as the hoſt is ſuppoſed to be really tranſubſtantiated into the elements of the body and blood of Jeſus Chriſt, after the conſecration of the prieſt.

The ſame term is applied to the action of the prieſt's waſhing his hands in water, after the conſecration of the hoſt.

Ablution, among chemiſts and apothecaries, is the waſhing away of the ſuperabundant ſalts of any body, an operation often called edulcoration.

Ablution, among phyſicians, is uſed either by waſhing the external parts of the body by baths, or deterging the body by their diluting fluids, as water-gruel, whey, &c. Frequent ablutions, with warm water, are ſaid to diſpoſe the body to putrid diſeaſes, by relaxing its fibres, which is thought to be one reaſon why the plague is ſo frequent in the Turkiſh dominions; the Mahometan religion enjoining frequent ablutions.

ABOARD, the inſide of a ſhip: hence any perſon who enters a ſhip is ſaid to go aboard; but when an enemy enters in the time of battle, he is ſaid to board; a technical term that always implies hoſtility. To fall aboard of, is to ſtrike at, or encounter another ſhip, when one or both are in motion; or to be driven upon each other by the force of the wind or current.

Aboard *the main tack*, the order to draw a ſail, called the main tack, or ſail, which is done by drawing the lower corner of the main ſail down to the cheſtree.

ABOIT, ceruſs, or white lead.

ABOLISHING, the ſame with

ABOLITION, which implies the act of annulling, deſtroying, making void, or reducing to nothing, in a general ſenſe: but,

Abolition, *in law*, ſignifies the repealing of any act or ſtatute, and prohibiting ſome ceremony or cuſtom. It alſo implies the leave of his majeſty or his judge, to a criminal accuſer, to forbear any further proſecution. Vide 25 Hen. VIII. c. 21.

Abolition, in the ancient practice of civilians and lawyers, implied, a deſiſting from, or annulling a legal proſecution; thereby to remit the puniſhment due to the crime. Alſo the cancelling or diſcharging a public debt.

ABOLLA, a military garment worn by the Greek and Roman ſoldiers; it was lined with ſome of the ſame ſtuff, to encreaſe its warmth in the winter ſeaſon.

Some affirm that it took its name from the Latin word *bulla*, on the ſuppoſition that the garment was ornamented with bullæ; others aſſert that it derived its name from the Greek *αμβολη*, of *αναβολη*, *amictus*, cloathing.

Critics and antiquaries are greatly divided as to its form, uſe, kinds, &c. of this garment. Papias makes it a ſpecies of the toga, or gown; but Nonius, and others, a ſpecies of the pallium, or cloak.

The abolla ſeems rather to have been oppoſed to the toga, which was a garment of peace, as the abolla was of war, for ſo Varro and Martial report of them. There ſeem to have been different kind of abollas, fitted to different occaſions; for even kings appear to have uſed them. Caligula was affronted at king Ptolomy, for appearing at the ſhews in a purple abolla, and by the eclat thereof, turned the eyes of the ſpectators from the emperor upon himſelf.

ABOMASUS, Abomasum, or Abomasius, in comparative anatomy, names uſed for the fourth ſtomach of ruminating beaſts, or ſuch as chew the cud: theſe have four cells or ſtomachs, 1, the venter; 2, the reticulum; 3, the omaſus; and 4, the abomaſus, or maw. And in the latter of calves and lambs, the runnet is uſed for curdling milk.

ABOMINATION, a term uſed in Scripture with regard to the Hebrews, who, being ſhepherds, are ſaid to have been an abomination to the Egyptians, becauſe they ſacrificed the ſacred animals of that people, as oxen, goats, ſheep, &c. which were unlawful to be ſlain in that country. Again, the abomination of deſolation, ſpoken of by the prophet Daniel, is ſuppoſed to imply the ſtatue of Jupiter Olympus, which Antiochus Epiphanes cauſed to be placed in the temple of Jeruſalem. The abomination of deſolation, mentioned by the Evangeliſts, ſignifies the enſigns of the Romans, during the laſt ſiege of Jeruſalem, by Titus, on whom their gods were decyphered, and placed on the holy temple, as trophies of victory and honour.

ABORIGINES, or Aborigenes, in geography, a name given to the original, or firſt inhabitants, of any country; but more particulary the ancient inhabitants of Latium, when Æneas and his Trojans came into Italy; ſince called Romania, or Campagna di Roma.

In this ſenſe the Aborigenes are diſtinguiſhed from the Janigenæ, who, according to the falſe Beroſus, inhabited the country before them from the Siculi, whom they expelled; from the Grecians, whom they deſcended from; from the Latins, whoſe name they aſſumed, after their union with Æneas and the Trojans; laſtly, from the Auſonii, Volſci, Œnotrii, &c. neighbouring nations in other parts of the country. St. Jerome ſays, they were ſo called from being *abſque origine*; the primitive planters of the country after the flood. Dion. Halicamuſſus, accounts for the name as original founders of the race of inhabitants of that country: others ſay they were originally Arcadians, who claimed to be earth-born, and not deſcended from any people. Aurel. Victor ſuggeſts another opinion, namely, Aborigines, q. d. Aberrigines, from *ab*, from, and *errare*, to wander, as having been a wandering people. Pauſanias rather thinks they were thus called *απο ορεων*, from mountains; which opinion ſeems to be confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of this people, ſays:

> IS GENUS INDOCILE AC DISPERSUM MONTIBUS ALTIS,
> COMPOSUIT, LEGESQUE DEDIT. ———

ABORTION, from *ab*, and *orior*, to be born; in midwifry or medicine, implies an untimely or premature birth of a fœtus, otherwiſe called a miſcarriage: but if this happens before the ſecond month of pregnancy, it is called a falſe conception. Abortions are ſeldom dangerous in the firſt five months; but a frequent habit of miſcarriage debilitates the ſyſtem, ſhatters the conſtitution, and lays the foundation of chronic diſeaſes of the moſt obſtinate and dangerous nature.

In the advanced months, the prognoſis will be more or leſs favorable, according to the patient's former ſtate of health.

The proximate cauſe of abortion is the ſame with that of real travail, namely, a contracting effort of the uterus, and abdominal muſcles, aſſiſted by the other expulſive powers. The remote cauſes cannot be explained with preciſion, as many circumſtances with regard to the nature of impregnation and connection of the fœtus, with the placenta and uterus, are ſubjects involved in many difficulties; ſo that the general maxims which follow, are the heads that require particular attention.

1. Whatever interrupts the regular circulation, between the uterus and placenta.

2. Every thing that excites the ſpaſmodic contraction of the uterus, or other aſſiſting powers.

3. All accidents, or occaſions, that deprive the fœtus of life.

Theſe matters properly conſidered, will lead to a further inveſtigation of particulars, which ſhall be amply demonſtrated in its proper place.

With regard to the treatment of abortions, it is impoſſible to ſet down any general preſcription, as it muſt be varied agreeably to the particular circumſtances of the caſe; nor is it poſſible to point out particular indications, or propoſe any regular plan to be purſued for this purpoſe.

Abortion is often preceded by no apparent ſymptom, till the rupture of the membranes and evacuation of the waters, announce the approaching expulſion of the fœtus. Either to remove threatening ſymptoms, or to prevent miſcarriage, when there is reaſon to apprehend it, often baffles the moſt ſkilful practitioner; becauſe it generally happens, there is a ceſſation of growth in the ovum; or, in other words, an extinction of life in the fœtus, ſometime previous to any appearance of abortion.

Women who have once aborted, are liable to a recurrence from a like cauſe, at the ſame particular period; therefore, upon the firſt appearance of it, a woman ought to confine herſelf to her bed, until the reſult of the ſymptom was ſufficiently explained. Opiates, mixed with reſtringents, are reckoned excellent againſt abortion. Boerhaave's recipe is, ℞. bloodſtone, powdered, Armenian bole, dragon's blood, of each 1 drachm; ſyrup of myrrh, an oz. ſolid laudanum, 3 grains; plaintain water, 6 oz. well mixed together: half an oz. to be taken every quarter of an hour. For the further treatment of abortions, ſee Syſtem of MIDWIFRY.

The practice of procuring abortions, was prohibited in both ancient Greece and Rome; but no other penalty annexed than exile; for it was conſidered in thoſe Pagan countries, no more than the plucking of unripe fruit; therefore philoſophy exempted it from being a capital offence.

Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, who attended to their ſhape and beauty, deſtroyed the fœtus in her womb. The primitive father, Athenagoras Tertullian, Minutius Felix, and Auguſtin, declaimed loudly againſt the practice, as virtual murder; and ſeveral councils have juſtly condemned it: yet it is affirmed by many, that the modern church of Rome allows diſpenſations for that ſin. The rates of which Egane has given in his Religious Ceremonies.

Artificial abortion is chiefly in the hands of midwives and nurſes, rarely in that of phyſicians, who in ſome countries are not admitted to the profeſſion without abjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſus abortivus*; though elſewhere he gives the formal proceſs whereby he himſelf procured a young woman a miſcarriage. The Cyclopædia has introduced an unneceſſary method to procure an abortion, which curious recipe we omit, as we think, with a great deal of propriety, leſſons of murder are in no wiſe compatible with univerſal ſcience.

ABORTION, is alſo uſed for a fœtus, which dying in the womb, continues there beyond the uſual time of geſtation.

ABORTION, among gardeners, ſignifies ſuch fruits as are produced too early, and never arrive at maturity.

ABORTIVE, in a general ſenſe, a term uſed for any thing which comes before its due time; or a deſign which miſcarries.

ABORTIVE, is more particularly uſed for any thing relating to an abortion, to which it is uſually applied.

ABOUT, the ſituation of a ſhip immediately after ſhe has tacked or changed her courſe, by going about and ſtanding on the other tack.

ABOUT-SHIP, the order to the ſhip's crew to prepare for tacking; to change the ſhip's courſe.

ABRA, a ſilver coin ſtruck in Poland, worth about a ſhilling, Britiſh money, current in ſeveral parts of Germany, Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRAHAMIANS, or ABRAHAMITES, a ſect of heretics, who renewed the error of the Paulicians. They took their name from that of their leader Abraham, a native of Antioch; by the Arabs called Ibrahim, whence alſo the name Ibrahimiah given to this ſect. They aroſe about the cloſe of the 8th century, and were ſuppreſſed by the vigilance of Cyriacus, patriarch of Antioch.

ABRAHAMITES, in church hiſtory, is uſed for a party of monks, who ſuffered death for the worſhip of images under Theophilus.

ABRAMIS, in ichthyology, a name given by Bellonius and others, to the cyprinus latus, or bream.

ABRASA, ulcers, attended with abraſion of part of the ſubſtance, or ulcers, where the ſkin is ſo tender and lax, as to be ſubject to abraſion.

ABRASAX, or ABRAXAS, the ſupreme god of the Baſilidian heretics. It is a myſtical word, compoſed of the Greek numerals, α, (1) β, (2) ϱ, (100) α, (1) ξ, (60) α, (1) σ, (200) = CCCLXV. or 365.

ABRASION, in medicine, the corroding of any part by acrid humours or medicine. To remedy which, emollient and obtunding medicines are recommended. It alſo implies to ſhave off.

ABRAUM, in natural hiſtory, a name given by ſome writers to a ſpecies of red clay, uſed in England by cabinet makers and other tradeſmen, to colour mahogany of a reddiſh colour.

ABRAX, an antique ſtone, with the word abraxas engraved on it; they are of various ſizes, and moſt of them as old as the third century.

ABREAST, a ſea term, ſignifies, ſide by ſide, or oppoſite to;

a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea, where, on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in right or curved lines. When the line is formed abreaſt, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle, with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the center, and the ſecond and third in command in the centers of their reſpective ſquadrons.

Abreast, within the ſhip, implies on a line with the beam, or by the ſide of any object aboard. See Abaft.

ABRIC, ſulphur.

ABRIDGING, in literature, the ſhortening, epitomizing, or contracting any book, matter, or thing.

Abridging, in algebra, is the reducing a compound equation to a more ſimple form; to prevent the mind's being diſtracted, with attending to known quantities, concerning which nothing further is required: and to keep the attention entire for the reſt, mathematicians uſed to abridge their equations by expreſſing all the known quantities of the ſame term, by a ſingle letter. See Algebra.

ABRIDGMENT, a ſummary or contraction of a diſcourſe, wherein the leſs material things being more briefly inſiſted on, the whole is brought to a leſſer compaſs.

Abridgment, in a literary ſenſe, is the ſame with epitomè, or abſtract of a large work, the perfection of which conſiſts in taking only what is material and ſubſtantial, and rejecting all ſuperfluities.

Abridgment, in law, the ſhortening a count or declaration. Thus in aſſize, a man is ſaid to abridge his plaint, and a woman her demand in action of dower, if any land is put therein, which is not in the tenure of the defendant; for, on a plea of non tenure in abatement of the writ, the plaintiff may leave out the lands, and pray that the tenant may anſwer to the remainder. The reaſon is, that theſe writs run in general, and therefore ſhall be good for the reſt. Act paſſed for this practice, 21 Hen. VIII. c. 3.

ABRINUNCIATION, or Abrenunciation, the act of renouncing. See Renunciation.

ABRODIETICAL, nice, or delicate diet.

ABROCHMENT, or Abbrochment, *Abrocamentum*, anciently denoted the engroſſing or buying up commodities by wholeſale, before they came to the public market, in order to ſell them off dear by retail, commonly called foreſtalling.

ABROGATION, from the Latin word *abrogo*, I repeal, ſignifies annulling, or making void; literally, repealing a law. Abrogation is ſynonymous with abolition and revocation.

ABROKANI, or Mallemolli, the name of a kind of muſlin, or clear white fine cotton cloth, brought from the Eaſt Indies, about 20 yards in length, and one in breadth.

ABROKUS, in botany, the name of a ſpecies of the bromus, or avena ſterilis, or wild goat; called by the Latins *orobus*, or *madida*; the Greeks βροχα. Virgil uſes the word for peaſe; Plautus, for all eſculent things that were boiled. Hence the baſtard peaſe and oats were called abrocha non madida, i. e. not fit for boiling or eating.

ABROLKOS, the name of certain ſhelves or banks of ſand, about 20 leagues from the coaſt of Brazil.

ABRONO, in botany, implies an herb, called heartpeaſe.

ABROTANUM, in botany, a ſynonime of ſeveral plants, commonly ſignifies ſouthern-wood. See Syſtem of Botany.

ABRUGI, in botany, the ſame as Abrono.

ABRUS, in the materia medica, the name of a ſeed produced by one of the phraſeole, or kidney beans, and uſually termed angola ſeed.

ABSCEDENTIA, in ſurgery, a term applied to decayed parts of the body, which, in a morbid ſtate, are ſeparated from the ſound, or loſe that union which was preſerved in a natural ſtate.

ABSCESS, in ſurgery, from *abſcedo*, to depart, a cavity containing pus, or gathering of matter in a part, ſo called, becauſe the parts which were joined are now ſeparated; one part recedes from another, to make way for the collected matter.

Abscess, is ſynonymous with apoſtem, apoſtema, impoſthume, and impoſthumation, which generally imply a tumor or inflammation.

An abſceſs, according to Mr. Bell's definition, is, an inflammatory tumor, containing a collection of purulent matter, confined in a fleſhy membrane, and may be frequently diſcuſſed before the abſceſs is formed (i. e. when the inflammation appears) by the application of proper medicines. But when it increaſes, and is attended with great pain, heat, and pulſation; when the fever perſiſts obſtinately, and theſe ſymptoms continue for three days, notwithſtanding all endeavours for a reſolution, that intention is to be entirely laid aſide; becauſe, if ſuch applications, as are proper to reſolve a humor, are continued, when reſolution is no longer poſſible, the moſt fluid parts of the obſtructing humours will be diſſipated, and the more groſs and inactive particles dried and hardened, ſo as to prevent ſuppuration, or at leaſt to render it difficult; in conſequence of which, a troubleſome induration of the part will remain, or, if glandulous, a ſchirrus will be formed. Very different methods, therefore, ſhould be uſed, and the humour brought to maturation with the utmoſt expedition. The proper medicines for promoting this intention are ſuch as increaſe the motion in the part, and have the tendency to excite a gentle fever; as fomentations and ſtimulating medicines. Such compoſitions alſo as confine the heat exerted in the part affected, by preventing an exceſſive perſpiration, are alſo proper. The ſimple arometic gums, and the emolient relaxing and moiſtening medicines, are therefore proper for maturating the pus. This method muſt be purſued till the abſceſs has acquired a ſufficient degree of ripeneſs, which may be known by the ſoftneſs of the part, and the fluctuation of matter in the tumor when preſſed, its whiteneſs and remiſſion of pain, heat, redneſs, tenſion, pulſation and fever; the pointed aſpect of the tumor, and a ſenſation of weight, ſucceeding the pain, are alſo ſigns that the pus is ſufficiently formed and fit for evacuation. When theſe ſigns indicate the maturity of the tumor, the knife is to be introduced into its ſofteſt, whiteſt, and moſt prominent part, till the pus flowing out, evinces that a ſufficient penetration is made; then let the knife be raiſed equally upwards, ſo as to make an inciſion ſufficiently large, or forcing its point through the oppoſite part of the abſceſs; let the intermediate integuments be divided, taking care to avoid the nerves and large veſſels. The inciſion being made and the pus evacuated, let the abſceſs be cured by cleanſing, ſuppurating, digeſtive, and deterſive medicines, which muſt be varied according to the ſtate of the part. If the patient be afraid of an inciſion, the abſceſs muſt be opened by a cauſtic: in order to which, the tumor muſt be covered with a plaiſter, in the middle of which is left an orifice of ſuch a ſize as may be judged moſt convenient, and in which a proper potential cautery muſt be applied to the ſkin; if the cauſtic be ſolid, it muſt be wetted before it is applied; the whole is then to be covered with another plaiſter, with compreſſes, and a proper bandage. In about five or ſix hours, or according to the ſtrength of the cauſtic, the eſchar will be formed, when the dreſſings muſt be taken off, and the eſchar divided from one end to the other with a biſtoury; in doing of which, care muſt be taken to go down as low as the pus. After the operation, the wound is dreſſed with digeſtives, and the eſchar will ſeparate in a few days with a plentiful ſuppuration. The management afterwards is the ſame as if opened by inciſion. See Syſtem of Surgery.

Abscess, in farriery, is a purulent tumor, incident to ſeveral animals, as horſes, ſheep, poultry, &c. See Syſtem of Farr ery.

ABSCISS, or Absis, in aſtronomy. See Apsis.

ABSCISSE, in conics, often called abſciſſa, implies a part of the diameter or tranſverſe axis of a conic ſection, intercepted between the vertex, or ſome other fixed point, and a ſemiordinate. See Conic Sections.

In the parabola, the abſciſſe is a third proportional to the parameter and the ordinate. In the ellipſis, the ſquare of the ordinate is equal to the rectangle under the parameter and abſciſſa, leſſened by another rectangle under the ſaid abſciſſa, and fourth proportional to the axis, the parameter and the abſciſſa. In the hyperbola, the ſquares of the ordinates are as the rectangles of the abſciſſa by another line, compounded of the abſciſſa and the tranſverſe axis. However, it is to be remarked, that the two propoſitions relating to the ellipſis and hyperbola, the origin of the abſciſſes, or abſciſſas, the point from whence they are reckoned, is ſuppoſed to be the vertex of the curve, or, which is the ſame, the point where the axis meets it: for, if reckoned from the center, the foregoing propoſitions will be erroneous, a principal matter which mathematicians ſhould guard againſt.

In mechanical curves there are no abſciſſes, unleſs the curved lines may be ſo called, as in the common cycloid, the arches of the generating circle, taken from the vertex of the figure, when the generating circle is in ſuch a ſituation as to have the abſciſſe coincide with the diameter.

ABSCISSION, from *abſciſſio*, in rhetoric, a figure of ſpeech, whereby the ſpeaker ſtops ſhort in the middle of his diſcourſe: ſo that an auditor is left to form his own conſtruction, or make what inference he pleaſes: e. g. "one of her ſex, age, and beauty, to be ſeen at ſuch an hour, with a man of his character! I ſhall ſay no more."

Abscission is a ſpecies of ellipſis or ſuppreſſion. It is held a deterioration.

Abscission, in ſurgery, is ſometimes uſed for amputation, but more properly for cutting off ſome part of the body, when become anywiſe hurtful: thus we ſay, the abſciſſion of the præpice, &c. In this ſenſe, it is the ſame with αποκοπη. Cowper uſes the word as ſynonimous with amputation. The Cyclopædia diſagrees with him. Bell's Syſtem upon Cheſſelden's plan agrees with Cowper. The Encyclopædia, publiſhed in Scotland, takes no notice of the word. In Phil. Tranſ. No. 283, Mr. Shipton ſpeaks of an abſciſſion of part of the inteſtines without danger.

Abscission, in the moſt unlimited ſenſe, when applied to ſurgical operations, ſignifies the dividing any corrupted and uſeleſs part of the body from that which is ſound, by means of ſome ſharp inſtrument.

ABSCONSA, a dark lanthern, uſed by the monks as a ceremonial, at the time of burying a deceaſed member.

ABSENCE, being from the uſual place of reſidence.

ABSENT, in law, implies in a general ſenſe, a perſon gone away from his habitation, with an intent to evade or avoid ſome conſequence appertaining to the eſtabliſhed laws of the realm.

ABSINTHITES, **Absinthiac**, or **Absinthiated**, a thing impregnated with wormwood, or abſinthium. In Act. Med. tom. 3. M. Bartholin mentions a woman whoſe milk became as bitter as gall, by the too frequent uſe of wormwood. Ray, Fehr, Paulli, and Dr. Bowle, have given treatiſes on it. Wormwood, in the opinion of the late celebrated Dr. Hunter, is a bitter as much wanting to Engliſh palates as tobacco: the latter of which he held in abhorrence, although he uſed ſnuff himſelf!

ABSINTHIUM, or **Wormwood**. See Artemisia.

Wormwood is greatly commended by many eminent phyſicians for its medicinal virtues, as a ſtrengthener of the ſtomach, and to remove obſtructions of the liver and ſpleen, creating an appetite, and deſtroying worms.

ABSOLUTE, in a general ſenſe, denotes ſomething which is unconnected with, or independent on any other thing.

Absolute is alſo applied to things which are free from limitation or condition: as abſolute, unreſtrained, power, decree, promiſe, &c. Hence, the covenant with Noah was abſolute, and without conditions; the Goſpel covenant was abſolute alſo, conditional, by faith and obedience, to avoid the penalty of God's wrath. In various notions of religion, the conditions are abſolute; thus, the Antinomians aſſert, that the goſpel covenant is abſolute, and that Chriſt has purchaſed our ſalvation, without any conditions to be performed on our part; but charity and the true light of God's word are not to be found among ſuch people, for the love of God and love of the world never abide together.

Absolute ſtands for independence, and relative for dependence; conſequently the Deity only is abſolute, and all things that are created muſt be dependent.

Absolute alſo denotes a thing's being free from conditions or limitations; in which ſenſe, the word is ſynonymous with unconditional. We ſay, an abſolute decree, abſolute promiſe, abſolute obedience.

Absolute *Government*, that wherein the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

Absolute *Gravity*, in philoſophy, is the whole force by which a body, ſhell, or ſhot, is impelled towards the centre.

Absolute *Number*, in algebra, is the known quantity which poſſeſſes entirely one ſide of the equation. Thus in the equation $xx+10x=64$, the number 64 poſſeſſing entirely one ſide of the equation, is called the abſolute number, and is equal to the ſquare of the unknown root x, added to $10x$, or to 10 times x.

Absolute *Equation*, in aſtronomy, implies the aggregate, or ſum of the optic and eccentric equations.

The optic equation ariſes from the apparent inequality of a planet's motion, in not being equally diſtant from the earth at all times, and would ſubſiſt even if the planet's real motion was uniform.

The eccentric equation ariſes from a planet's revolution round the ſun in an elliptical orbit, and being placed in one of the foci, deſcribes equal aræs in equal times: but, as the motion cannot be equal in all parts of the orbit, it occaſions the equation.

ABSOLUTELY, in a general ſenſe, ſtands oppoſed to relatively, i. e. when the terms of a propoſition are without relation to each other.

Absolutely, is alſo uſed for poſitively, or, unconditionally. Thus, the church of Rome aſſumes a poſitive or abſolute claim to forgive ſins, upon a full and open confeſſion. The church of England, in a milder ſenſe, receives this tenet declaratively; or, in other words, agreeably to the doctrine of the primitive church, which aſſumed no other authority than that delivered in the holy Scriptures.

Absolutely, in grammar, ſignifies a word, or phraſe, without government. Thus in the phraſe, 'We ſhould pray without ceaſing.' The word pray is taken abſolutely, as it governs nothing.

Absolutely, in geometry, ſignifies entirely, or completely. As a globe is abſolutely or entirely round, in contradiſtinction to that which is but partly ſo, as a cycloid, ſpheroid, &c.

ABSOLUTION, *abſolutio*, in civil law, is a ſentence whereby the party accuſed, is declared innocent of the crime laid to his or her charge.

The Roman law, thus defines it: after the cauſe had been pleaded by both parties, the prætor pronounced the word *dixerunt*, q. d. the parties have ſaid every thing they think neceſſary, and three billets, or ballots, were immediately given to each judge, one marked with A. for *abſolvo*, another with C. for *condemno*, and a third with N. L. for *non liquet*, and accordingly as there was a majority of billets, or ballots, the criminal was abſolved, condemned, or reſpited. See the Article A, a Roman abbreviation.

Absolution, in the canon law, is a juridical act, by which the prieſt declares the ſins of ſuch as are penitent remitted. In the church of Rome, the council of Trent, ſeſſ. xiv. cap. 3. declare the form or eſſence of the ſacrament to lie in the words of abſolution. I abſolve thee of thy ſins.

The formula of abſolution, in the Romiſh church, is abſolute; in the Greek church it is deprecatory, and in the churches of the reformed, declarative.

Absolution, in the latter caſe, is underſtood in the practice of the eccleſiaſtical courts in England, whereby a perſon who ſtands excommunicated is releaſed, or freed from that puniſhment, when error is found in the pleadings and proceedings of the court. Vide Stat. 23 Eliz.

ABSOLUTISM, the dogma of God's acting abſolutely in the affair of ſalvation. This doctrine is maintained by the calviniſts, for which bigotted tenet the Lutherans refuſe all union with them.

ABSORBENTS, generally imply ſuch things as have the faculty of abſorbing, or ſoaking up others. Ariſtotle ſays, a pot full of aſhes will abſorb as much water as if it was empty and filled with that liquid; but this received maxim, as well as many others of that celebrated philoſopher, is found to be falſe.

Absorbents, in medicine, are ſuch remedies as have the power of drying up redundant humours, whether applied externally or internally. In the Pharmacopæias there are ſeveral forms of abſorbents: ſuch as the teſtacious powders, boles, chalk, calcined bones, hartſhorn, crabs-eyes and claws, burnt ivory, terra ſagillata, and even iron itſelf. Alſo divers woods, as ſaſſafras, maſtic, ſanders, guaiacum, and divers roots, as ſarſaparilla, china, &c. Theſe powerful abſorbents, are chiefly given in diſorders ariſing from too great an abundance of acids in the ſtomach. It is a neceſſary precaution to drink diluting liquors along with abſorbents, alſo to take gentle purges, as well during the uſe of them, as when they are left off.

Absorbents, ſays Juncker, conſume the humours without fuſing them, and have ſometimes the effect of ſtrengtheners, ſometimes of purgatives, and oftener of calmers, to allay fermentations. They are of uſe for tempering acrimonies, and after emollients and attenuants, for healing tumors; ſome hold them neceſſary for preventing the ill effects of bitters: they are good in cardialgias, or heats of the ſtomach and hiccoughs; they are alſo given in hectics, and other chronical caſes; but, nevertheleſs, ſhould be uſed with great caution and reſerve. For, on being too laviſhly adminiſtered, congeſtions in the viſcera are frequently the conſequences. In the itch, bilious fevers, dyſenteries, hypochondrical and hyſteric caſes, they are extremely pernicious, and often fatal.

Many preſcribe them as ſalutary in removing infantile acute diſeaſes; but, it is certain, they are hurtful, in loading the tender viſcera of children, and creating obſtructions in the capillaries.

As to the ſeveral ſorts of abſorbents, generally in uſe, ſee the Syſtem of Pharmacy. And for their ſeveral applications, ſee the Syſtems of Medicine and Surgery.

The immoderate uſe of certain abſorbents has been attended with fatal conſequences. Vide Phil. Tranſ. N°. 459. ſect. 2.

Absorbent *Veſſels*, promiſcuouſly imply, the lacteal veſſels, lymphatics, and inhalent arteries, all of which imbibe the nutritious and other matters brought near them.

The abſorbent veſſels are ſometimes called reſorbent veſſels, and ſometimes abſorbent pores. Theſe are found in all parts of the body, eſpecially where the membranes lie open to cavities, as in the mouth, œſophagus, ſtomach, inteſtines, &c. A modern author computes many millions in every inch ſquare of the ſtomach; hence may be inferred, that the external application of mercurials to the ſtomach, enter the habit of the body inſtantaneouſly.

Mortimer aſſerts, that the pores of the human body imbibe the fluid matter, floating in the ambient air.

In the Medical Commentaries of the late Dr. Wm. Hunter, and in Dr. Garney's Obſervations on them, Medic. Muſ. vol. ii. p. 229, and alſo Dr. Wilkinſon, ibid. p. 117, ſome curious experiments and remarks, will be found well worth the attention of the learned in medical knowledge.

It is ſaid, that the more particular uſe of theſe veſſels, is to work upon the lacteals, which open into the ſides of the inteſtine tube to imbibe the chyle in its deſcent from the ſtomach, and convey it into the meſenteric veins: for their deſcription, ſee the Syſtem of Anatomy.

Many naturaliſts, particularly De la Hire, Malpighi, Leewenhoeck, and the immortal Linnæus, with ſeveral others, affirm the like abſorbents in plants; the fibrous or hairy roots of which are as a kind of *vaſa abſorbentia*, which attract and imbibe the nutritious juices from the earth. See the Syſtem of Botany for further illuſtration.

ABSORBING, the act of imbibing, or ſucking up any body, matter, or thing. Thus, black bodies, according to Sir Iſaac Newton, abſorb all the rays of light they receive. In this received opinion, M. Bouguer differs, as he aſſerts that the effect is to be attributed to the action of ſome power diffuſed over the black ſurface, and not to the impact of light on the ſolid parts of bodies. This he proves by ſeveral experiments. Vide his Traite d'Opique, Paris, 1787. A new edition.

It is ſaid, luxuriant branches abſorb or waſte the nutritious juices, which ſhould feed the principal ſtock plant of fruit, or other trees. P. Miller.

ABSORPTION, in the animal œconomy, ſignifies the act of imbibing; and, according to Dr. Monro, Med. Eſſ. Edin. vol. iii.

p. 132, the effect encreaſes, or diminiſhes, agreeably to the ſtrength or weakneſs of the animal body of a living creature.

Aqua vitæ, or any other ſtray fluid, applied to the ſurface of the ſkin, particularly the ſtomach, arm-pits, flanks, or hams, inſtantly draws in the ſpirit with the liquid through a ſet of pores appropriated for this action: which, beſide the property of capillary tubes, poſſeſs, likewiſe, a contractile power from irritation.

ABSORPTION *of the Earth*, a phraſe uſed by Kircher, and others, for the ſinking of large tracts of land, by means of ſubterranean commotions, uſually termed earthquakes.

Pliny relates, that in his time, the mountain Cymbotus, on the verge of which ſtood the populous town of Eurites, were wholly abſorbed into the earth, ſo that not a trace of either remained.

The city of Tantalis, in Magnaſia, the mountain Sypelus, the towns of Galanis and Garnatus, in Phœnicia, are recorded by the ſame author to have been abſorbed in like manner.

The vaſt promontary called Phlegium, in Ethiopia, after a violent earthquake in the night time, was inviſible the next morning. Kircher's Mand. Subter. p. 77.

The city of Liſbon, of a late date, has ſhewn an awful ſpectacle of this ſpecies of abſorption.

Added to theſe accounts, modern authors aſſert, that the mountain Picus, in one of the Molucca iſles, was ſo lofty, that it appeared at great diſtances as an immenſe column reared erect in the air, and ſerved as a land-mark to ſailors; an earthquake in this iſland deſtroyed it: at one inſtant the whole mountain was abſorbed into the bowels of the earth, and no mark of its place remained. A like accident, but of a more terrible kind, happened in China in the year 1556, when a whole province of the mountainous parts of that kingdom was in one moment abſorbed into the earth, and all the towns buried, the whole number of the inhabitants ſinking with it, and an immenſe lake of water remaining in its place to this time. Of much later date is the deſtruction of a city, in the confines of Swiſſerland: but this, though generally ſaid to have been ſwallowed up into the earth, was not properly an abſorption, for the whole city was buried by the fall of a mountain upon it.

The burning mountains, Veſuvius and Strongylus, both once very high, have in length of time loſt half their height, the upper part having been undermined by the burning, and having fallen into and been abſorbed by the underpart. And in the year 1646, during the terrible earthquake in the kingdom of Chili, ſeveral mountains in the Andes diſappeared, and were one after another wholly abſorbed in the earth.

Theſe, and a thouſand other accidents of the like kind, prove the truth of abſorptions in general; ſome of them leaving level ground in the place of the things abſorbed, ſome immenſe chaſms and cracks, and ſome lakes of freſh or ſalt water; and it may be that many immenſe lakes were formed in ages of which we have no hiſtory, by the like abſorptions.

Pliny gives many accounts of the reſtoring of places thus abſorbed; but later obſervations do not give an equal credit to thoſe parts of this hiſtory.

There are many inſtances, however, of iſlands being produced, though we cannot affirm them to have appeared in the place of any which have been abſorbed.

In the year 1638, an iſland was raiſed near St. Michael's, in the Atlantic ocean, by ſubterraneous fires, which threw up ſtones and other ſubterranean productions, in ſuch quantities, that they formed an iſland of five miles in length. The mountain raiſed in one night, in the ſea, near Puzzoli, is another inſtance of the ſudden production of theſe mountains: this appeared after one night's violent ſubterranean conflict, and ſtill keeps its place, and is known by the name of Mons Sanctus.

ABSTEMII, in church hiſtory, a name given to ſuch perſons as could not partake of the cup of the euchariſt, on account of their natural averſion to wine; Calviniſts allow theſe to communicate in the ſpecies of bread only, touching the cup with their lips; which on the other hand is, by the Lutherans, deemed a prophanation.

ABSTEMIOUS, is properly underſtood of a perſon who refrains abſolutely from all uſe of wine.

The hiſtory of Mr. Wood, in the Medic. Tranſ. vol. II. p. 261, art. 18, is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body, by a ſtrict courſe of abſtemiouſneſs.

The Roman ladies, in the firſt ages of the republic, were all enjoined to be abſtemious; and that it might appear by their breath, whether or no they kept up the injunction, it was one of the laws of the Roman civility, that they ſhould kiſs their friends and relations whenever they accuſed them.

ABSTENTUS, among Civilians, is underſtood of an heir withheld by his tutor from taking on him an inheritance. Among eccleſiaſtical writers, the word is alſo uſed for a perſon excommunicated.

ABSTERGENTS, or **ABSTERSIVE MEDICINES**, more uſually called among phyſicians, detergents, are cleanſing medicines of a ſaponaceous nature, capable of diſſolving concretions formed of earth and oil, which water ſimply, as an abluent, cannot effect.

ABSTINENCE, in a general ſenſe, implies the act or habit of refraining from ſomething which we have a propenſity to, or find a pleaſure in. The word is derived from *abſtinere*, formed of *abs*, from, and *tenere*, to hold.

The Jewiſh law ordained that the prieſts ſhould abſtain from the uſe of wine, during all the time of their being employed in the ſervice of the temple. The ſame abſtinence was enjoined the Nazarites, during the time of their Nazariteſhip, or ſeparation. The Jews were commanded to abſtain from ſeveral ſorts of animals, viz. all ſuch as have not the hoof parted, and do not chew the cud. The fat of all ſorts of animals that were ſacrificed, was forbidden to be eaten, and the blood of every animal in general, was prohibited under pain of death. Neither did they eat the ſinew, which is upon the hollow of the thigh, though it be otherwiſe pure, becauſe the angel who wreſtled with Jacob at Mahaniam, touched the hollow of his thigh, which occaſioned the ſinew to ſhrink. They abſtained likewiſe from thoſe animals which had been taken by a devouring and impure beaſt, ſuch as a dog, a wolf, a boar, &c. and from ſuch as died of themſelves. Fiſh that have neither fins nor ſcales were to be abſtained from as impure.

Some are of opinion that this diſtinction of animals, into clean and unclean, was intended to denote the moral purity or impurity which the Hebrews were to endeavour after, or avoid. A hog, for inſtance, ſignifies gluttony; a hare, laſciviouſneſs; and ſo of others: again, a ſheep denotes gentleneſs; a pigeon, ſimplicity; and the like. But many commentators are of opinion, that ſeveral animals were declared unclean, and therefore to be abſtained from, only becauſe of ſome qualities in them naturally hurtful or pernicious to health.

Among the primitive Chriſtians, ſome denied themſelves the uſe of ſuch meats as were prohibited by the law; others looked upon this abſtinence with contempt.

St. Paul has given his opinion in this matter: 'One believeth that he may eat all things; another who is weak eateth herbs. Let not him that eateth deſpiſe him that eateth not. And let not him that eateth not, judge him that eateth.' Rom. xiv. 1, 2, 3, and 1 Cor. viii. 7 and 10. The council of Jeruſalem, which was held by the apoſtles, enjoined the Chriſtian converts to abſtain from meats ſtrangled, from blood, from fornication, and from idolatry.

Abſtinence, as preſcribed by the goſpel, is intended to mortify and reſtrain the paſſions, to humble our vicious natures, and by that means raiſe our minds to a due ſenſe of prayer and devotion.

But there is another ſort of abſtinence, which may be called ritaul, and conſiſts in abſtaining from particular meats at certain times and ſeaſons.

The Jews were obliged to abſtain from their wives at certain ſeaſons. The ſame is enjoined in the apoſtolical conſtitutions, on all faſts and meagre days; the church of England recommends certain days of faſting and abſtinence. Abſtinence from fleſh, has been enjoined by ſtatute ever ſince the Reformation, particularly on Fridays and Saturdays, and on the vigils, and all commonly called fiſh-days. Vide 2 and 3 Edw. VI. Cap. 19.

The like injunctions were renewed under Queen Elizabeth, but at the ſame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats, but in favor of the conſumption of ſea fiſh, and to multiply the number of fiſhermen and mariners, as well as ſpare the flocks of ſheep. Vide 5 Eliz. chap. 15. The great faſt, ſays St. Auguſtin, is to abſtain from ſin.

The ancient Athletæ lived in perpetual abſtinence from all kind of ſenſible pleaſure, to render their bodies more robuſt and hardy.

Several writers are of opinion, that before the flood, mankind abſtained from wine and fleſh, becauſe the Scriptures expreſly mention, that Noah, immediately after the deluge, began to plant the vine, and that God permitted him to make uſe of animal food; whereas he had given to Adam nothing more than the fruits and plants of the earth. This opinion, however, is not univerſal; many learned interpreters maintain the contrary, and believe that mankind before the deluge did not deny themſelves the pleaſures of either wine, or animal food.

The Phœnicians and Aſſyrians, who were neighbours to the Jews, had their ſacred faſts. The Egyptians, according to Herodotus, ſacrificed a cow to Iſis, after they had prepared themſelves by faſting: he alſo attributes the ſame cuſtom to the women of Cyrene. Among the Athenians, the Eleuſinian feaſts, as well as the Thermophores, were attended with rigorous faſtings, eſpecially among the women, who paſſed a whole day ſitting on the ground in a mourning habit, and without taking the leaſt ſuſtenance. The Romans had alſo ſettled faſts in honor of Jupiter. Hiſtorians alſo mention thoſe of Julius Cæſar, Auguſtus, Veſpaſian, Marcus Aurelius, &c. The Pythagoreans, at leaſt thoſe among them who profeſſed the greateſt perfection, and gloried in having attained to the higheſt degree of their maſter's theory, never eat either fleſh or fiſh: their abſtaining from whatever had life, was a conſequence of the metempſychoſis; though it is not eaſy to diſcover the cauſe from whence Pythagoras imbibed that averſion he always had to beans, mallows, wine, &c. He might, indeed, abſtain from eggs, becauſe chickens were produced from them; but upon what foundation could he build his argument, that the bean was a ſacred plant? His opinion that the gods patronized it, could flow only from ſuperſtition: and his belief that the mallow had any qualities repugnant to health, could only be the effect of ignorance, or at leaſt the want of experience.

In the brute creation we ſee extraordinary inſtances of long abſtinence, many of the ſpecies paſs four, five, or ſix months, every year, without either food or water. The ſerpent, land tortoiſe, dormouſe, &c. are obſerved to retire regularly, at certain ſeaſons, to their reſpective cells, and conceal themſelves from ſight; ſome hide themſelves in the caverns of rocks, or ruins; ſome dig holes in the earth; while others retire to the woods, and lay themſelves up in the clefts of trees.

Several ſpecies of birds, and almoſt the whole tribe of inſects, are capable of ſubſiſting the whole winter, not only without food, but even without reſpiration. This particular furniſhes us with an admirable inſtance of the wiſdom of the Creator: the proper food of theſe creatures, particularly thoſe of the inſect tribe, being then wanting, proviſion is made for them to live without it. When the fields are diveſted of their flowery furniture, and the trees and plants are ſtripped of their fruits, what would become of creatures ſubſiſting only by the produce of the ſpring and ſummer? And when the air is grown rigid and chilled with froſt, what could ſupport theſe tender ſpecies which are impatient of cold? Therefore to prevent the total deſtruction and extirpation of ſo many ſpecies of animals, the author of nature has wiſely provided, that creatures thus bereaved of their food, ſhould be alſo impatient of cold, in order to lead them to ſome receſs, where they may find ſhelter from danger; while the natural texture and vicidity of their blood, diſpoſes it, by a farther degree of cold, to become almoſt ſtagnant in their veſſels; ſo that the circulation being hardly carried on, and the animal function in a great meaſure ſuſpended, there is no ſenſible waſte or conſumption of parts, but they remain in a drowſy neutral ſtate between life and death, till the warm ſun at once recalls them to life, and produces the food neceſſary to their exiſtence by thawing the congealed juices both of theſe animals and vegetables. Hence it is no wonder that land tortoiſes, dormice, &c. are found as fat and fleſhy after ſome months abſtinence as before. Sir George Ent, tells us, Phil. Tranſ. No. 194, that he weighed his tortoiſe ſeveral years ſucceſſively, at its going into the earth in October, and at its coming out again, in March; and found that of 4℔ 4 oz. it never loſt more than an ounce.

We have alſo inſtances of men paſſing ſeveral months in abſtinence, like other creatures. The records of the tower mention a Scotchman impriſoned for felony, and carefully watched in that fortreſs for ſix weeks, during which time he took not the leaſt ſuſtenance, and for this peculiarity received his pardon.

It is to be added, that, in moſt inſtances of extraordinary human abſtinence, related by naturaliſts, there were ſaid to have been apparent marks of a texture of blood and humours much like that of the animals abovementioned; though it is no improbable opinion, that the air itſelf may furniſh ſomething for nutrition. It is certain there are ſubſtances of all kinds, animals, vegetables, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration; and that an animal body may be nouriſhed thereby, is evident in the inſtance of vipers; which if taken, when firſt brought forth, and kept from every thing but air, will grow very conſiderably in a few days. So the eggs of lizards are obſerved to increaſe in bulk, after they are produced, though there be nothing to furniſh the increment but air alone; in like manner, as the eggs or ſpawn of fiſhes grow, and are nouriſhed with the water.

ABSTINENCE, in phyſic, is a term of very extenſive ſignification; for it implies, a privation of all ſucculent aliments. Though abſtinence is not ſufficient for the cure of diſeaſes, yet it greatly aſſiſts the operation of medicines, and is a preventative againſt a multitude of dangerous diſorders. Several writers relate extraordinary cures performed by it, and in protracting the term of human life. The noble Venetian, Conaro, after every method had been tried in vain, and his life was deſpaired of, when he was no more than forty years of age, recovered his former health, and lived to be near an hundred years old; by the ſole effect of abſtinence, as he himſelf tells us in a book he publiſhed on that ſubject. It is indeed ſurprizing to what a great age the primitive Chriſtians of the Eaſt, who retired from perſecution into the deſerts of Arabia and Egypt, lived, healthful and cheerful, on a very little food. Caſſian aſſures us, that the common allowance for twenty-four hours was only twelve ounces of bread and mere water. He adds, that, with this ſparing diet, St. Anthony lived an hundred and five years; James, the hermit, one hundred and four; Arſenius, tutor to the Emperor Arcadius, an hundred and twenty; St. Epiphanius, an hundred and fifteen; Simeon, the Stylite, an hundred and twelve; and Romauld, an hundred and twenty. Nor need we have recourſe to the Eaſtern chriſtians, for examples, ſince the hiſtory of our own country furniſhes us with ſome, even ſuperior to thoſe already recited. Buchan relates that one Laurence preſerved his life to an hundred and forty years, by temperance and labour: and Spotſwood mentions one Kentigem, afterwards called St. Monga, or Mungo, who lived to the age of an hundred and eighty five, by the ſame means.

Dr. Cheyne imputes moſt of the chronical diſeaſes, the infirmities of old age, and the ſhort lives of Engliſhmen, to repletion; and may be either prevented or cured by abſtinence.

ABSTINENCE is alſo uſed ſometimes to ſignify a ſuppreſſion. Thus in Cœlis Aurelianus, *abſtinentia ſudoris*, ſignifies a ſuppreſſion of ſweat. Sometimes in this author it means a compreſſion; as *ſpiritus ab abſtinentiam clauſus*, means the wind ſhut up in the inteſtines by compreſſion, thereby cauſing the Iliac paſſion.

ABSTINENTS, or ABSTINENTES, a ſet of heretics, that appeared in France and Spain, about the end of the third century. They are ſuppoſed to have borrowed part of their opinions from the Gnoſtics and Manicheans, becauſe they oppoſed marriage, condemning the uſe of fleſh meat, and placed the Holy Ghoſt in the claſs of created beings. We have, however, no certain account of their peculiar tenets. In eccleſiaſtical hiſtory, ſome authors repreſent the Abſtinentes, as the ſame with thoſe otherwiſe called Continentes, and that they particularly enjoined abſtinence from the uſe of marriage. Some make them the ſame with the Hierarcites; others with the Encratites.

ABSTRACT, *Abſtractum*, in a general ſenſe, any thing ſeparated from ſomething elſe, which is of like parts, powers, or principles.

ABSTRACT *Idea*, in metaphyſics, is a partial idea of a complex object, limited to one or more of the component parts, or properties; laying aſide, or abſtracting from the reſt. Thus in viewing an object with the eye, or recollecting it in the mind, we can eaſily abſtract from ſome of its parts or properties, and attach ourſelves to others: e. g. We can attend to beautiful hues of fruits or flowers, without paying any regard to their figure, ſhape, taſte, ſmell, or conſiſtence.

ABSTRACT *Terms*, in logic, are ſuch as denote thoſe objects which exiſt in imagination only. Thus beauty and uglineſs are abſtract terms. There are ſome objects that pleaſe and appear beautiful; others affect us in a very different manner, which we call ugly; and yet there are no ſuch real ſubſtances in nature, as beauty or uglineſs; they ſubſiſt only in our imagination.

ABSTRACT is alſo extended to divers other things, in reſpect of their purity, ſimplicity, ſubtilty, &c.

ABSTRACT *Numbers*, are aſſemblages of units, conſidered in themſelves, and not applied to denote any collections of particular and determined things. Thus, 5 is an abſtract number, if conſidered ſimply by itſelf: but, if we ſay 5 pounds, 5 miles, &c. then the 5 becomes a concrete number.

ABSTRACT *Mathematics*, otherwiſe called *pure mathematics*, are thoſe branches which treat of magnitude or quantity, conſidered abſolutely, without any reſtriction to a particular part. Thus, geometry, algebra, and arithmetic, are abſtract mathematics. In this ſenſe, abſtract mathematics ſtand oppoſed to mixed mathematics; wherein, ſimple and abſtract properties, and the relations of quantities, primitively conſidered in pure mathematics, are applied to ſenſible objects, and by that means become intermixed with phyſical conſiderations; ſuch are, *Navigation*, *Hydroſtatics*, *Optics*, *&c.*

ABSTRACT, in literature, a compendious view of any large work, being ſynonymous with *abridgment*, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few critical thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But, rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect. An *abridger*, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: to abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning, muſt be preſerved; nothing eſſential, either in argument or illuſtration, ought to be omitted.

Theſe obſervations relate ſolely to ſuch abridgments as are deſigned for the public; but when a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: but as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe, after giving a few directions, we ſhall exhibit an example or two, to ſhew with what eaſe it may be done.

Read the book carefully; endeavour to learn the principal view of the author; attend to the arguments employed: when you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of paper or a common-place book; put down what the author wants to prove, ſubjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr. Hume's deſign is to prove, That miracles which have not been the immediate objects of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, his argument (for there happens to be but one) is,

"That experience, which in ſome things is variable, in others uniform, is our *only* guide in reaſoning concerning matters of fact. A variable experience gives riſe to probability only; an uniform experience amounts to a proof. Our belief of any fact from the teſtimony of eye-witneſſes is derived from no other principle than our experience in the veracity of human teſtimony. If the fact atteſted be miraculous, here ariſes a conteſt of two oppoſite experiences, or proof againſt proof. Now, a miracle is a violation of the laws of nature; and as a firm and unalterable experience has eſtabliſhed theſe laws, the proof againſt a miracle, from the very nature of the fact, is as complete as any argument from experience can poſſibly be imagined; and if ſo, it is an undeniable conſequence, that it cannot be ſurmounted by any proof whatever derived from human teſtimony."

In Dr. Campbell's Diſſertation on Miracles, the author's principal aim is to ſhew the fallacy of Mr. Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument.

"The evidence ariſing from human teſtimony is not ſolely derived from experience: on the contrary, teſtimony hath a natural influence on belief antecedent to experience. The early and unlimited aſſent given to teſtimony by children gradually contracts as they advance in life: it is, therefore, more conſonant to truth, to ſay, that our diffidence in teſtimony is the reſult of experience, than that our faith in it has this foundation. Beſides, the uniformity of experience, in favour of any fact, is not a proof againſt its being reverſed in a particular inſtance. The evidence ariſing from the ſingle teſtimony of a man of known veracity will go farther to eſtabliſh a belief of its being actually reverſed: if his teſtimony be confirmed by a few others of the ſame character, we cannot withhold our aſſent to the truth of it. Now, though the operations of nature are governed by uniform laws, and though we have not the teſtimony of our ſenſes in favour of any violation of them; ſtill, if in particular inſtances we have the teſtimony of thouſands of our fellow-creatures, and thoſe too men of ſtrict integrity, ſwayed by no motives of ambition or intereſt, and governed by the principles of common ſenſe, that they were actually eye-witneſſes of theſe violations, the conſtitution of our nature obliges us to believe them."

Theſe two examples contain the ſubſtance of about 400 pages. Abridgments have many advantages; it engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the books again, by glancing a few lines, we are not only in poſſeſſion of the chief arguments, but recal in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down, verbatim, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all univerſities.

ABSTRACTI, *abſtracted*, in eccleſiaſtical hiſtory, a ſect of Lutherans, who followed biſhop Heſhuſius of Berlin, in Pruſſia, who aſſerted againſt Beza "That Chriſt was to be adored, not only in the concrete, as the ſon of God, but that his fleſh, in the abſtract, was an object of adoration." Wigandus prevailed ſo far againſt Heſhuſius, as to get him depoſed; afterwards, the abſtracti gained the aſcendant, and Wigandus was ſilenced. Micræl. Hiſt. Eccl. l. 3. ſ. 2. &c. Budd. Iſag. Hiſt. Theol. l. 2. c. 7.

ABSTRACTION, in general, the act of abſtracting, or the ſtate of being abſtracted.

Abstraction, in metaphyſics, the operation of the mind when occupied by abſtract ideas. A large oak fixes our attention, and abſtracts us from the ſhrubs that ſurround it. In the ſame manner, a beautiful woman in a crowd, abſtracts our thoughts, and engroſſes our attention ſolely to herſelf. Theſe are examples of real abſtraction: when theſe, or any others of a ſimilar kind, are recalled to the mind after the objects themſelves are removed from our ſight, they form what is called abſtract ideas, or the mind is ſaid to be employed in abſtract ideas. But the power of abſtraction is not confined to objects that are ſeparable in reality as well as mentally: the ſize, the figure, the colour of a tree are inſeparably connected, and cannot exiſt independent of each other: and yet we can mentally confine our obſervations to any one of theſe properties, neglecting or abſtracting from the reſt.

It is the faculty or power of abſtracting, that makes the great difference between man, and the brute creation; they ſeem to reaſon about particular objects and ideas, but there appear in them no traces of abſtraction, or forming general ideas.

Dr. Price, in his Review of the Principal Queſtions and Difficulties in Morals, p. 43. Dr. Cudworth, in his Eternal and Immutable Morality, book 4. Dr. Campbell, in his Philoſophy of Rhetoric, vol. 2, p. 105, as well as Mr. Locke, and Dr. Berkley, have ſeverally given a very accurate deſcription of *abſtraction*, both generally and particularly. We might add two celebrated writers on the theory of moral philoſophy, namely, Lord Bolingbroke, and Hume, who have defined this extenſive word for generalizing: but, as their works are tainted with dangerous tenets, it would be better that their labours were forgotten; therefore, we wiſh to guard every claſs of readers, againſt ſuch pernicious compoſitions, as the metaphyſical productions of theſe authors are.

Doctors Reid, Beattie, and Oſwald, have wrote in this wide field of philoſophy, and have been well received by the public; but, in our opinion, Paley's Moral and Political Philoſophy, notwithſtanding it is not wholly freed from error, is ſuperior to any of thoſe modern founders of morality.

We ſhall only add, that abſtracting, on the common ſyſtem, is no more than generalizing: it is making one thing ſtand for a hundred, by omitting the conſideration of the differences between them: it is taking ſeveral differents, i. e. different combinations, ſetting aſide the peculiarities in each, and conſidering only what is found alike in all. Thus it is that I ſay, I love my friend, love my miſtreſs, love myſelf, my bottle, my book, my eaſe, &c.

ABSTRACTITIOUS, or Abstractive, is applied, by modern chemiſts, to a ſpirit drawn from vegetables, without fermentation: in which ſenſe, abſtractitious ſpirits are ſynonimous with natural ſpirits, and ſtand oppoſed to fermentative, or artificial ones. Such ſpirits are chiefly procured from plants, which abound in volatile ſalt. The abſtractitious ſpirit of ſcurvy graſs, is preferred by fermentation. All the native ſpirits of aromatic plants, are called abſtractitious.

ABSTRUSE, a term denoting ſomething that is difficult, dark, obſcure, and not eaſy to be underſtood. Thus, metaphyſics is an abſtruſe ſcience; as is the new doctrine of infinite ſeries, which very few thoroughly underſtand.

The word is derived from the Latin, *abſtruſus*, formed of, *abs*, from, and *trudo*, I thruſt.

ABSURD, an epithet given to any action, ſentiment, or thing, which contradicts, or runs counter to a manifeſt truth, or to the received opinions of mankind. Thus, it would be abſurd to affirm, that 4 times 5, are 19; or that 19s. is a pound ſterling.

Reductio ad ABSURDUM, or arguing *ex abſurdo*, in the ſciences of logic and mathematics, implies a method of proving the truth of a propoſition, by ſhewing it would be abſurd to deny it. Euclid, in his Elements of Geometry, Sir Iſacc Newton, in his Theory of the Solar Syſtem, and Dr. Watts, in his Logic, have had recourſe to this method of reaſoning.

When the term, *abſurd*, is applied to actions, it has the ſame import as *ridiculous*.

ABSURDITY, that error by which any thing may be denominated abſurd.

The doctrine of the modern ſect of Unitarians, is a great abſurdity, becauſe it is contrary to the Holy Scriptures, and the Chriſtian faith.

The doctrine of a vacuum is alſo an abſurdity, becauſe it is contrary to Ariſtotle; and that of a plenum, as being contrary to Sir Iſaac Newton.

> —— *Nihil tam abſurdè dici poteſt,*
> *quod non dictatur à philoſopho.* Cicero.

Hence it may be inferred, that of all ideal ſyſtems, that of philoſophy is moſt apt to err; the reaſon ſeems to be, that of all men, thoſe called philoſophers are the leaſt diſpoſed to give proofs that are capable of experiment; and, for the moſt part, content themſelves with an abſtruſe mode of reaſoning, neglecting to explain the terms they make uſe of; i. e. the preciſe idea each is made to repreſent; and, indeed, may well be compared to a man's undertaking to number, without knowing the value of the numeral figures.

ABSUS, the Egyptian lotus.

ABSYNTHIUM, or Absinthum. See Artemisia.

ABSYNTHUS, in natural hiſtory, the name of a ſtone, of a black colour, variegated with ſpots of red; and, when heated, retains its warmth for ſeven days.

ABTHANES, a title of honor, anciently conferred on the inhabitants of Scotland, who were ennobled, generally called, thanes, derived from the Saxon word, chancvy, or, king's miniſters, with this diſtinction, that the higher ranks were called, abthanes, and the lower ſubthanes, or underthanes.

ABUCCO, Abocco, or Abocchi, a weight uſed in the kingdom of Pegu, equal to 12½ teccalis : 2 abuccos = 1 agire : 2 agire = ½ hiza ; = 100 teccalis; i. e. 2℔. 5 oz. heavy, or 3℔. 9 oz. light weight of Venice.

ABUKESO, the Turkiſh name of the aſlani, or 115th part of an aſper.

ABUNA, which in the Abbyſine or Abyſſinian tongue, implies *our father*, a name given to the archbiſhop or metropolitan of Abyſſinia.

This patriarch, or pontiff, had formerly ſuch extenſive authority that the king himſelf was not acknowledged as duly eſtabliſhed on his throne, until he was firſt conſecrated by the hands of the *abuna*. But at preſent his power is conſiderably abridged.

The *abuna* is repreſented as a perfect ignoramus, and the prieſts he ordains are more illiterate than himſelf, and perſons of diſſolute lives. He is dependent on the patriarch of Alexandria, who conſtitutes and appoints ſuch perſon to be metropolitan of Abyſſinia as he thinks proper. And for this reaſon it is, that the Abyſſine prieſts mention in their prayers the patriarch of Alexandria before their own metropolitan, who, after his election, is accountable for his conduct, and the due adminiſtration of his office to that patriarch.

ABUNDANCE, Abundantia, in heathen mythology, an ideal deity who preſided over plenty, or the general produce of harveſt. In a modern acceptation of the word, it implies, to abound in ſuperfluous plenty, or more than is neceſſary.

ABUNDANT *Number*, in arithmetic, a number, whoſe aliquot parts, added together, exceed it : e. g. 12 is an abundant number, as its aliquot parts 1, 2, 3, 4, and 6, make 16 inſtead of 12.

Abundant *Number* is oppoſed to a deficient or defective number, both of which vary from a perfect number : e. g. 10, is a deficient number; its quota parts 1, 2, and 5, are but 8, inſtead of 10. But 6 is a perfect number, as its aliquot parts or ſubdiviſions 1, 2, and 3, make 6 exactly.

Abundant *Notion*, in logic, implies a thing which may be known by various marks or characters, their redundancy not being neceſſary, as fewer names would ſuffice. See Syſtem of Logic.

ABUSE, in a general ſenſe, the perverting ſomething from its true deſign, purpoſe, or intention. It is compounded of *ab*, from, and *uſus*, uſe. In grammar, the words abuſe, abuſive, or abuſively, imply the uſing words in ſo prepoſterous a manner that they convey no clear or diſtinct idea.

Words being the medium through which perſons communicate their diſcoveries, reaſonings, and knowledge to each other, he who uſes them improperly, though he does not corrupt the fountain of knowledge, which are in the things themſelves; yet he endeavours to deſtroy the effect by which they are diſtributed to mankind, and may therefore be conſidered as an enemy to the improvement of human learning.

A permutation of benefices, without the conſent of the biſhop, is deemed *abuſive*, and conſequently is null and void to all intents and purpoſes.

ABUTILON, in botany, the trivial name of ſeveral ſpecies of the *ſida*, as claſſed in Monadelphia. See Syſtem of Botany.

ABUTTALS, or Abbutals, in law, denote the mears, bounds, buttings, boundings, or boundaries of a piece of land; by which it is to be underſtood the ſeveral parts or particulars that lay around it, by a deſcriptive title alluding to the four cardinal points; hence, it is to be inferred, that all freehold, copyhold, or leaſehold premiſes, whether houſes or lands, ſhould have a full deſcription of the parcels, or particulars, either by a map or circumjacent abuttals, expreſſed in words at full length in the body of the deed. This matter properly attended to would, of courſe, prevent many chancery ſuits to aſcertain original boundaries, &c.

ABYSS, in a general ſenſe, denotes ſomething very deep, profound, and, as it were, bottomleſs. The word is originally Greek, *αϐυσσος*, compounded of the primitive *α*, and *βυσσος*, q. d. without a bottom.

Abyss, in a particular ſenſe, denotes that immenſe cave in the earth, into which it is ſuppoſed the Almighty, on the third day of the creation, collected all the waters, which before covered the ground, to ſerve as a reſervoir for the ſupply of his creatures.

The ideas of Dr. Woodward, quoted in almoſt every Dictionary that has been publiſhed of late years, betrays ſo whimſical a turn, that a ſerious reader muſt feel himſelf much hurt, upon the peruſal of ſuch imperfect reaſoning, all of which turns upon the fallacious hypotheſis, that man can ſcan the unſearchable wiſdom of God! Does not this way of defining the creation carry a palpable abſurdity on the face of it? We therefore explode every ſpecies of legendary information, which could ſerve no other intention than that of leading our readers into error, which we ſhall always carefully avoid.

Camerarius, Kempfer, Ray, Cockburn, Whitehurſt, Burnet, Whiſton, Bourguet, Scheuchzer, and many others, have given their thoughts freely on this ſubject; but as they are all but bare notions of men, and founded upon no certain ſtandard to obtain proofs by, we omit their ſeveral definitions, as inſufficient and unſatisfactory.

Abyss, in the Septuagint verſion of the Old Teſtament, implies a great deep; as in the old tranſlations, the word has been rendered, "and darkneſs was on the face of the abyſs," i. e. the *great deep* which the tranſlators of the Engliſh bible have rendered *deep* only.

Abyss is alſo uſed to denote hell, in which ſenſe the word is ſynonymous with *Barathrum*, *Erubus*, and *Tartarus*; in the Engliſh bible, the bottomleſs pit. *Cruden's Concordance.*

The unclean ſpirits expelled by Chriſt begged, according to the vulgate of the New Teſtament, and they beſought him, that he would not command them to go out into the *deep*, (*Abyſs.*) Luke viii. 31. vide Rev. ch. 9. v. 1. abyſs, or bottomleſs pit.

Abyss, in antiquity, is uſed to ſignify the Temple of Proſerpine, under ground, wherein was found an immenſe quantity of gold, ſilver, and precious ſtones.

Abyss, in heraldry, the centre of the eſchutcheon. In which ſenſe, a thing is ſaid to be bore in abyſs, *en abyſſme*, when placed in the middle of the ſhield, clear from any other bearing : he bears azure, a *fleur-de-lis*, in abyſs.

Abyss, among alchemiſts, is uſed by ſome for the immediate receptacle of the ſeminal matter, and by others for the firſt matter itſelf.

Abyss, in a metaphorical ſenſe, is applied to any thing that is inſcrutable, or incomprehenſible; thus, the judgment of God is called, a great *abyſs*.

Abyss, in hydography, the ſame as *gulph*.

ABYSSINIAN *Church*, that eſtabliſhed in the empire of Abyſſinia; it makes only a branch of the cophts or jacobites, a ſect of heretics, who reject the council of Chalcedon. From this doctrine they are alſo called Eutychians, and ſtand oppoſed to the Melchites.

The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and ſuperſtition. They practice circumciſion. They keep Saturday, the ſeventh day, and Sunday, the firſt day of the week, as Sabbaths; thereby attending to the Jewiſh, as well as Chriſtian Sabbath. They eat no meats prohibited by the law of Moſes, and in many reſpects attend to the cuſtoms enjoined by the Moſaical law. Like the Roman Catholics they pray for their dead, and invoke ſaints and angels, and pay extraordinary veneration to the Virgin Mary. Images in painting are allowed in their churches, ſome of which are highly extolled, but they abhor all thoſe in relievo, except the croſs.

The books called Apocryphal they hold as canonical, and admit legendary conſtitutions and canons of the apoſtles as genuine.

Alvarez and Pagit have given their liturgy, and Ludolf their calendar. As to their doctrine of the ſoul of man, it ſeems more rational than that advanced by Dr. Prieſtly, and a few other ſceptical writers : as the Abyſſinians ſay, that man's ſoul was not created, but proceeds from the earthly father, Adam, throughout all the generations of the world; alledging, that God finiſhed the work of creation on the ſixth day; and as he breathed into man the breath of life, conſequently man was capable of producing his own ſpecies, with both parts, ſoul and body, to the laſt of the world.

ACACALIS, in the materia medica, the name given by ſome authors to the ſiliqua ſylveſtris.

ACACALOTL, in ornithology, a name given to the Braſilian web-footed crow, called by many authors the corvus aquaticus, or water raven. It is about the ſize of the common raven; its beak bent like a bow, and of a blue colour; its head is ſmall; it is of a mixed brown, and red colour on the breaſt and belly, and of a finely variegated hue on the back, made up of a ſhining purple, black and green; its wings are of a fine green, which looks very bright and gloſſy in the ſun. Many authors call it the pelicanus-carbo, or corvorant. See Syſtem of Ornithology.

ACACIA, or binding bean, of the ſpecies of mimoſa, in the Linnæan ſyſtem. There are ſeveral ſpecies of this genus, but the ſort beſt known by the name of the Egyptian thorn is very common in England, and becomes in time a tree of a tolerable ſize. The flowers which grow in bunches, conſiſt each of one leaf, ſlightly divided at the extremity into five parts; the filaments are hairy and longer than the ſtyle; the flower is ſucceeded by a pod, containing ſeveral oblong ſeeds. The branches of moſt of the ſpecies of acacia are armed with ſtrong ſharp thorns. This is the plant which produces the gum-arabic.

Of the flowers of this ſpecies the Chineſe make the curious faſt yellow, which ſtains ſilk or paper, and produces an elegant and pleaſing effect, as it gives a true colour of the higheſt finiſhed ſhade of that dye.

To mention the mode of the Chineſe preparation of this dye ſtuff would amount to no more than the loſs of time in the reading, notwithſtanding the ſeveral Dictionaries lately publiſhed have dwelt upon this unintereſting proceſs.

Mr. Geoffroy attributes the origin of bezoar to the ſeeds of this plant; which, being brouſed by certain animals, and vellicating the ſtomach by their great ſourneſs and aſtringency cauſe a condenſation of the juices, till at length they become coated over with a ſtony matter, which we call *bezoar*.

There are a great many varieties of acacia, all of which may be propagated in hot beds.

Acacia *Germanica*, an inſpiſſated juice made of wild ſloes, hardly ripe. The true acacia is ſaid to be very ſcarce in the ſhops, where the German acacia is uſed in its ſtead, both being powerful aſtringents, and conſequently good in hæmorrhages and all kinds of fluxes.

Acacia, in the materia medica of the ancients, a gum made from the Egyptian acacia tree, and thought to be the ſame with our gum arabic.

The name acacia, or *ακακια*, in antiquity, implies a roll, or bag, repreſented on the medals of the Greek and Roman Emperors; ſome think it is only a handkerchief which they uſed as a ſignal; others take it for a volume, or roll of memorandums, or petitions; and finally, others will have it to be a purple bag filled with earth to remind the prince of his mortality.

Acacia *Zeylancia* ſignifies logwood.

Acacia *Indiana* ſignifies tamarind.

Acacia *Baſtard*, or *Robinia*, in botany, a genus of the diadelphia decandria claſs: for its characters. See Syſtem of Botany.

Acacia, in medicine, an inſpiſſated juice of a ſhrub of the thorn kind, uſed as an aſtringent: it is prepared by inſpiſſating to a due conſiſtence the juice diſcharged from the unripe pods of a large prickly tree of this name. It is an ingredient in the theriaca andromachi.

ACACIANS, a religious ſect; or, as ſome authors aſſert, ſeveral ſects of heretics, who maintained that the ſon was only ſimilar, and not of the ſame ſubſtance with the father: or, that he was not only a diſtinct, but a diſſimilar ſubſtance. Some of theſe ſects had their denomination from Acacias, biſhop of Cæſarea, who lived in the 4th century.

Some writers ſay, that the principal leader of theſe heretics was one Acacias, patriarch of Conſtantinople, in the 5th century.

ACADEMICIAN, or Academist, a member of an academy.

ACADEMICS, or Academists, a denomination given to the cultivators of a ſpecies of philoſophy originally derived from Socrates, and afterwards illuſtrated and enforced by Plato, who taught in a grove near Athens, conſecrated to the memory of Academus, an Athenian hero; from which circumſtance this philoſophy received the name of *academical*. Before the days of Plato philoſophy had, in a great meaſure, fallen into contempt. The contradictory ſyſtems and hypotheſes which had ſucceſſively been introduced into the world were become ſo numerous, that, from a view of this inconſiſtency and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehenſion. Abſolute and univerſal ſcepticiſm were the natural conſequences of this concluſion. In order to remedy this abuſe of philoſophy and of the human faculties, Plato made uſe of the principles of the academical philoſophy; and, in his Phædo, reaſons in the following manner: "If we are unable to diſcover truth, ſays he, it muſt be owing to two circumſtances: either there is no truth in the nature of things, or the mind, from a defect in its powers, is not able to comprehend it. Upon the latter ſuppoſition, all the uncertainty and fluctuation in the opinions and judgments of mankind admit of an eaſy ſolution: let us therefore be modeſt, and aſcribe our errors to the real weakneſs of our own minds, and not to the nature of things themſelves. Truth is often difficult of acceſs: in order to come at it we muſt proceed with caution and diffidence, carefully examining every ſtep; and, after all our labour, we ſhall frequently find our greateſt efforts diſappointed, and be obliged to confeſs our ignorance and weakneſs."

Several of our modern philoſophers have plunged themſelves into an abſurd and ridiculous kind of ſcepticiſm. They pretend to diſcredit ſubjects that are plain, ſimple, and eaſily comprehended; but give peremptory and deciſive judgments upon things that evidently exceed the limits of our capacity. Of theſe, Berkley and Hume are the moſt conſiderable. Berkley denied the exiſtence of every thing, excepting his own ideas. Mr. Hume has gone a ſtep further, and queſtioned even the exiſtence of ideas; but at the ſame time has not heſitated to give determined opinions with regard to eternity, providence, and a future ſtate, miraculous interpoſitions of the Deity, &c. ſubjects far above the reach of our faculties. In his Eſſay on the academical or ſceptical philoſophy he has confounded two very oppoſite ſpecies of philoſophy. After the days of Plato, indeed, the principles of the firſt academy were groſsly corrupted by Arceſilas, Carneades, &c. This might lead Mr. Hume into the notion that the *academical* and *ſceptical* philoſophy were ſynonimous terms. But no principles can be of a more oppoſite nature than thoſe which are inculcated by the old academy of Socrates and Plato, and the ſceptical notions which were propagated by Arceſilas, Carneades, and the other diſciples of the ſucceeding academies.

ACADEMY, in antiquity, a garden, villa, or grove, ſituated within a mile of Athens, where Plato and his followers held their philoſophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnaſium: he lived in the time of Theſeus; and, after his death, it retained his name, and was conſecrated to his memory. Cimon embelliſhed it with fountains, trees, and walks; but Sylla, during the ſiege of Athens, employed theſe very trees in making battering engines againſt the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he alſo named an *academy*, where he compoſed his *academical queſtions*, and his book *De natura Deorum*.

Academy, among the moderns, is moſt commonly uſed to ſignify a ſociety of learned men, eſtabliſhed for the improvement of any art or ſcience, and generally under the protection of a prince.

The firſt academy we read of was eſtabliſhed by Charlemagne, at the inſtigation of Alcuin. It was compoſed of the chief wits of the court, the emperor himſelf being a member. In their academical conferences, every perſon was to give an account of what ancient authors he had read; and each even aſſumed the name of ſome ancient author who pleaſed him moſt, or ſome celebrated perſon of antiquity. Alcuin, from whoſe letters we learn theſe particulars, took that of Flaccus, the ſurname of Horace: a young lord, named Augilbert, took that of Homer: Adelard, biſhop of Corbie, was called Auguſtin: Riculſe, biſhop of Mentz, was Dametas; and the king himſelf, David. This ſhews the miſtake of ſome modern writers, who relate, that it was in conformity with the genius of the learned men of thoſe times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus. In giving an account of the principal academies in Europe, we ſhall arrange them in order:

I. *Medical* Academies, as that of the Naturæ Curioſi in Germany; that founded at Palermo in 1645; another at Venice in 1701; another at Geneva in 1715, in the houſe of M. Le Clerc. The college of phyſicians at London and Edinburgh are alſo, by ſome, ranked in the number of *Academies*.

The academy of Naturæ Curioſi, called alſo the Leopoldine Academy, was founded in 1652 by Jo. Laur. Bauſchius, a phyſician; who, in imitation of the Engliſh, publiſhed an invitation to all phyſicians to communicate their extraordinary caſes; and, meeting with ſucceſs, was elected preſident. Their works were at firſt publiſhed ſeparately; but in 1670 a new ſcheme was laid for publiſhing a volume of obſervations every year. The firſt volume appeared in 1684, under the title of Ephemerides, and the work has been continued with ſome interruptions and variations of the title, &c. In 1687, the Emperor Leopold took the ſociety under his protection, granting the members ſeveral privileges, particularly that their preſidents ſhould be counts palatine of the holy Roman empire.

II. *Chirurgical* Academies, inſtituted ſome years ago, by public authority, at Paris: the members of which were not only to publiſh their own and correſpondents obſervations and improvements, but to give an account of all that was publiſhed on ſurgery, and to compoſe a complete hiſtory of the art, by their extracts from all the authors ancient and modern who had written on it. A queſtion in ſurgery is annually propoſed by the academy, and a gold medal of 200 livres value given to him who furniſhes the moſt ſatisfactory anſwer.

Academy *of Surgery at Vienna*, was inſtituted ſome years ago by the preſent emperor, under the direction of the celebrated Brambilla. The emperor, with his uſual liberality, has provided a large and ſplendid edifice in Vienna, which affords habitation both for the teachers, the ſtudents, pregnant women, patients for clinical lectures, and ſervants. He has alſo purchaſed for the uſe of this academy a medical library; ſets of chirurgical inſtruments; an apparatus for experiments in natural philoſophy; a collection of natural hiſtory; a number of anatomical and pathological preparations.

Among other parts of this inſtitution three prize-medals, each of the value of 40 florins, are annually beſtowed on thoſe ſtudents who return the beſt anſwer to queſtions propoſed the year before. Theſe prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius the protochriurgus at Vienna.

III. *Eccleſiaſtical* Academies; as that at Bologna in Italy, inſtituted in 1687, employed in the examination of the doctrine, diſcipline, and hiſtory, of each age of the church.

IV. *Coſmographical* Academy, at Venice, called the Argonauts. This was inſtituted at the ſolicitation of F. Coronelli, for the improvement of geographical knowledge. Its deſign was to publiſh exact maps, both celeſtial and terreſtrial, as well particular as general, together with geographical, hiſtorical, and aſtronomical deſcriptions. Each member, in order to defray the expence of ſuch a publication, was to ſubſcribe a proportional ſum, for which they were to receive copies of each each piece publiſhed.

V. Academies *of Sciences*. Theſe comprehend ſuch as are erected for improving natural and mathematical knowledge. They are otherwiſe called philoſophical and phyſical academies. The firſt of theſe was inſtituted at Naples, about the year 1560, in the houſe of Baptiſta Porta. It was called the Academy *Secretorum Naturæ*.

The Academy of Roſſano, in the kingdom of Naples, was originally an academy of Belles Letters, founded in 1540, and transformed into an academy of ſciences in 1695, at the ſolicitation of the learned abbot Don Giacinto Gimma; who being made preſident, under the title of promoter general, gave them a new ſet of regulations. He divided the academiſts into the following claſſes: grammarians, rhetoricians, poets, hiſtorians, philoſophers, phyſicians, mathematicians, lawyers, and divines, with a claſs apart for cardinals and perſons of quality. To be admitted a member, a man muſt have ſome degrees in the faculty. The member are not allowed to take the title of academiſts in the beginning of their books, without a written permiſſion from their preſident, which is not granted till the work has been examined by the cenſors of the academy; and the permiſſion is the greateſt honour the academy can confer, as they adopt the work, and are anſwerable for it againſt all criticiſms that may be made upon it. To this law the preſident or promoter himſelf is ſubject; and no academiſt is allowed to publiſh any thing againſt the writings of another without leave from the ſociety.

F. Merſenne is ſaid to have given the firſt idea of a philoſophical academy in France, towards the beginning of the 17th century, by the conferences of naturaliſts and mathematicians occaſionally held at his lodgings. F. Merſenne propoſed certain problems to examine, or experiments to be made. Theſe private aſſemblies were ſucceeded by more public ones. The French example animated ſeveral Engliſh men of diſtinction and learning to erect a kind of philoſophical academy at Oxford, towards the cloſe of Oliver Cromwell's adminiſtration; which, after the reſtoration, was erected into a royal ſociety.

Lewis XIV. in 1666, aſſiſted by the counſels of M. Colbert, founded an academy of ſciences at Paris, with a ſufficient revenue to defray the charge of experiments, and ſalaries to the members.

Royal Academy *of Sciences.* After the peace of the Pyrenees, Lewis XIV. being deſirous of eſtabliſhing the arts, ſciences, and literature, upon a ſolid foundation, directed M. Colbert to form a ſociety of men of known abilities and experience in the different branches, who ſhould meet together under the king's protection, and communicate their reſpective diſcoveries.

In a ſhort time, the claſſes of hiſtory, Belles Lettres, &c. were united to the French academy, which was originally inſtituted for the improvement and refining the French language; ſo that the royal academy containined only two claſſes, viz. that of natural philoſophy and mathematics.

In 1696 the king, by a proclamation, gave this academy a new form, and put it upon a more reſpectable footing. It was to conſiſt of four kinds of members viz. *honorary*, *penſionary*, *aſſociates*, and *elves*.

Notwithſtanding the advantages which the members of this academy enjoy over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under ſome imputations, particularly that of plagiariſm, or borrowing their neighbours inventions; but with what juſtice we do not ſay.

The French have alſo conſiderable academies in moſt of their great cities: as, at Montpelier, a royal academy of ſciences on the ſame plan as that at Paris; at Thoulouſe is an academy under the denomination of Lanterniſts; others at Niſmes, Arles, Lyons, Dijon, Bourdeaux, &c.

The Royal Academy of Sciences at Berlin was founded in 1700 by Frederic II. king of Pruſſia, on the model of that of England; beſides natural knowledge, it likewiſe comprehends the Belles Lettres. In 1710 it was ordained that the preſident ſhould be one of the counſellors of ſtate, and nominated by the king. The members were divided into four claſſes; the firſt for proſecuting phyſics, medicine, and chemiſtry; the ſecond for mathematics, aſtronomy, and mechanics; the third for the German language and the hiſtory of the country; and the fourth for oriental learning.

Frederic III. the late king of Pruſſia, gave new vigour to this academy, by inviting to Berlin ſuch foreigners as were moſt diſtinguiſhed for their merit in literature, and encouraged his ſubjects to proſecute the ſtudy and cultivation of the ſciences by giving ample reward; he gave a new regulation to the academy, and took upon himſelf the title of its protector.

The academiſts hold two public aſſemblies annually; one in January, on the late king's birth-day; and the other in May, on the day of his acceſſion to the throne. At the latter of theſe is given, as a prize, a gold medal of 50 ducats value: the ſubject for this prize is ſucceſſively, natural philoſophy, mathematics, metaphyſics, and erudition.

The Imperial Academy of Sciences at Peterſburgh was projected by Peter the Great. That great monarch having, during his travels, obſerved the advantage of public ſocieties for the encouragement and promotion of literature, formed the deſign of founding an academy of ſciences at Peterſburgh. By the advice of Wolf and Leibnitz, whom he conſulted on this occaſion, the ſociety was regulated, and ſeveral learned foreigners were invited to become members. Peter himſelf drew the plan, February 1724.

The preſent empreſs Catharine III. with her uſual zeal for promoting the diffuſion of knowledge, has taken this uſeful ſociety under her more immediate protection. She has altered the court of directors greatly to the advantage of the whole body; has corrected many abuſes, and infuſed a new ſpirit into their reſearches. By her majeſty's particular recommendation, the moſt ingenious profeſſors have viſited the various provinces of her vaſt dominions; and as the fund of the academy was not ſufficient to ſupply the whole expence of theſe ſeveral expeditions, the empreſs beſtowed the ſum of 2000l. which ſhe has renewed as occaſion required.

The purpoſe and intent of theſe travels will appear from the inſtructions given by the academy to the ſeveral perſons who were engaged in them. They were ordered to purſue their inquiries upon the different ſorts of earths and waters; upon the beſt methods of cultivating the barren and deſert ſpots; upon the local diſorders incident to men and animals, and the moſt efficacious means of relieving them; upon the breeding of cattle, and particularly of ſheep; on the rearing of bees and ſilk-worms; on the different places and objects for fiſhing and hunting; on minerals; on the arts and trades; and on forming a Flora Ruſſica, or collection of indigenous plants: they were particularly inſtructed to rectify the longitude and latitude of the principal towns; to make aſtronomical, geographical, and meteorological obſervations; to trace the courſe of the rivers; to take the moſt exact charts; and to be very diſtinct and accurate in remarking and deſcribing the manners and cuſtoms of the different people, their dreſſes, languages, antiquities, traditions, hiſtory, religion; and, in a word, to gain every information which might tend to illuſtrate the real ſtate of the whole Ruſſian empire.

In conſequence of theſe expeditions, perhaps no country can boaſt, within the ſpace of ſo few years, ſuch a number of excellent publications on its internal ſtate, on its natural productions, on its topography, geography, and hiſtory; on the manners, cuſtoms, and languages of the different people, as have iſſued from the preſs of this academy.

Their works abound with ingenious and elaborate diſquiſitions upon various parts of ſcience and natural hiſtory, and which reflect the greateſt honour upon their authors; and it may not be an exaggeration to aſſert, that no ſociety in Europe has more diſtinguiſhed itſelf for the excellence of its publications, and particularly in more abſtruſe parts of the pure and mixed mathematics.

They have an extenſive library conſiſting of 36000 curious books and manuſcripts, and a muſeum, in which the various branches of natural hiſtory, &c. are diſtributed in different apartments: it is extremely rich in native productions, having been conſiderably augmented with a variety of ſpecimens collected by Pallas, Gmelin, Guldenſtaedt, and other learned profeſſors, during their late expeditions through the Ruſſian empire. The ſtuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the higheſt curioſity and value. The ſociety has this modeſt motto, *Paulatim*.

The Academy of Sciences at Bologna, called the Inſtitute of Bologna, was founded by count Marſigli in 1712, for the cultivation of phyſics, mathematics, medicine, chemiſtry, and natural hiſtory.

The Academy of Sciences at Stockholm, or Royal Swediſh Academy, owes its inſtitution to ſix perſons of diſtinguiſhed learning, amongſt whom was the celebrated Linnæus: they originally met on the 2d of June 1739, formed a private ſociety, in which ſome diſſertations were read; and in the latter end of the ſame year their firſt publication made its appearance. As the meetings continued and the members increaſed, the ſociety attracted the notice of the king, and was, on the 31ſt of March 1741, incorporated under the name of the Royal Swediſh Academy.

The king is ſometimes preſent at the ordinary meetings, and particularly at the annual aſſembly in April for the election of members. Any perſon who ſends a treatiſe which is thought worthy of being printed, receives the tranſactions for that quarter gratis, and a ſilver medal, which is not eſteemed for its value, being worth only three ſhillings, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are put forth ſeparately under the title of *Oeconomica acta*. Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are alſo diſtributed by the academy. The fund for theſe prizes is ſupplied from private donations.

The Royal Academy of Sciences of Copenhagen owes its inſtitution to the zeal of ſix literati, whom Chriſtian VI. in 1742, ordered to arrange his cabinet of medals. Theſe perſons occaſionally meeting for that purpoſe, extended their deſigns; aſſociated with them others who were eminent in ſeveral branches of ſcience; and forming a kind of literary ſociety, employed themſelves in ſearching into, and explaining, the hiſtory and antiquities of their country.

In 1743 his Daniſh majeſty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former purſuits natural hiſtory, phyſics, and mathematics.

The American Academy of Sciences was eſtabliſhed in 1780 by the council and houſe of repreſentatives in the province of Maſſachuſet's Bay, for promoting the knowledge of the antiquities of America, and of the natural hiſtory of the country; for determining the uſes to which its various natural productions might be applied; for encouraging medicinal diſcoveries, mathematical diſquiſitions, philoſophical inquiries and experiments, aſtronomical, meteorological, and geographical obſervations, and improvements in agriculture, manufactures, and commerce,; and, in ſhort, for cultivating every art and ſcience which may tend to advance the intereſt, honour, dignity, and happineſs, of a free and independent people. The members of this academy are never to be more than 200, nor leſs than 40.

The Royal Academy of Arts in London was inſtituted for the encouragement of deſigning, painting, ſculpture, &c. &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artiſts of the firſt rank in their ſeveral profeſſions. It furniſhes, in winter, living models of different characters to draw after; and, in ſummer, models of the ſame kind to paint after. Nine of the beſt academicians are annually elected out of the 40, whoſe buſineſs is to attend by rotation, to ſet figures, to examine the performance of the ſtudents, and to give them neceſſary inſtructions. There are likewiſe four profeſſors, namely, of painting; architecture; anatomy; and perſpective; who annually read public lectures on the ſubjects of their ſeveral departments; beſide a preſident, a council, and other officers. The admiſſion to this academy is free to all ſtudents properly qualified to reap advantage from the ſtudies cultivated in it; and there is an annual exhibition of paintings, ſculptures, and deſigns, open to all artiſts of diſtinguiſhed merit.

The Academy of Painting and Sculpture at Paris took its riſe from the diſputes that happened between the painters and ſculptors in that capital. The academy conſiſts of a protector; a vice-protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treaſurer; four profeſſors, one of which is profeſſor of anatomy, and another of geometry; ſeveral adjuncts and counſellors, an hiſtoriographer, a ſecretary, and two uſhers.

The Academy of Painting holds a public aſſembly every day for two hours in the afternoon, to which the painters reſort either to deſign or to paint, and where the ſculptors model after a naked perſon. There are 12 profeſſors, each of whom keeps the ſchool for a month; and there are 12 adjuncts to ſupply them in caſe of need. The profeſſor upon duty places the naked man as he thinks proper, and ſets him in two different attitudes every week. This is what they call ſetting the model. In one week of the month he ſets two models together, which is called ſetting the group. The paintings and models made after this model, are called Academics, or Academy-figures. They have likewiſe a woman who ſtands for a model in the public ſchool. Every three months, three prizes for deſign are diſtributed among the elves or diſciples; two others for painting, and two for ſculpture, every year.

There is alſo an Academy of Painting, Sculpture, &c. at Rome, eſtabliſhed by Lewis XIV. wherein thoſe who have gained the annual prize at Paris are intitled to be three years entertained at the king's expence, for their further improvement.

The Academy of Architecture, eſtabliſhed by M. Colbert in 1671, conſiſting of a company of ſkilful architects, under the direction of the ſuperintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the reſt.

VI. Academies of Law; as that famous one at Beryta, and that of the Sitientes at Bologna.

VII. Academies of Hiſtory; as the Royal Academy of Portugueſe Hiſtory at Liſbon. This academy was inſtituted by king John V. in 1720. It conſiſts of a director, four cenſors, a ſecretary, and 50 members; to each of whom is aſſigned ſome part of the eccleſiaſtical or civil hiſtory of the nation, which he is to treat either in Latin or Portugueſe. The civil hiſtory compriſes the tranſactions of the kingdom from the government of the Romans down to the preſent time.

VIII. Academies of Antiquities; as that at Cortona in Italy, and at Upſal in Sweden. The firſt is deſigned for the ſtudy of Hetrurian antiquities; the other for illuſtrating the Northern languages, and the antiquities of Sweden. One of their laws is to give audience to poets only one day in the year; another is to fix their ſeſſions, and impoſe a tax of a diſſertation on each member in his turn.

The Academy of Medals and Inſcriptions at Paris was formed by M. Colbert, under the patronage of Lewis XIV. in 1663, for the ſtudy and explanation of ancient monuments, and perpetuating great and memorable events, eſpecially thoſe of the French monarchy, by coins, relievos, inſcriptions, &c.

One of the firſt undertakings of this academy was to compoſe, by means of medals, a connected hiſtory of the principal events of Lewis XIV's reign: but in this deſign they met with great difficulties, and of conſequence it was interrupted for many years; but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

IX. **Academies** *of Belles Lettres* are thoſe wherein eloquence and poetry are chiefly cultivated. Theſe are very numerous in Italy, and not uncommon in France.

The Academy of Umidi at Florence has contributed greatly to the progreſs of the ſciences by the excellent Italian tranſlations given, by ſome of its members, of the ancient Greek and Latin hiſtorians. Their chief attention is to the Italian poetry, at the ſame time that they have applied themſelves to the poliſhing of their language, which produced the Academy la Cruſca.

In 1690 the Academy of Arcadi was eſtabliſhed at Rome, for reviving the ſtudy of Poetry and of the Belles Lettres. Beſides moſt of the politer wits of both ſexes in Italy, this academy comprehends many princes, cardinals, and other eccleſiaſtics; and, to avoid diſputes about pre-eminence, all appear maſked after the manner of the Arcadian ſhepherds. Within ten years from its firſt eſtabliſhment, the number of academiſts amounted to ſix hundred. They hold aſſemblies ſeven times a year in a mead or grove, or in the gardens of ſome nobleman of diſtinction. Six of theſe meetings are employed in the recitation of poems and verſes of the Arcadi reſiding at Rome; who read their own compoſitions; except ladies and cardinals, who are allowed to employ others. All the members of this body, at their admiſſion, aſſume new paſtoral names, in imitation of the ſhepherds of Arcadia. The academy has ſeveral colonies of Arcadi in different cities of Italy, who are all regulated after the ſame manner.

X. Academies of Languages; called by ſome, grammatical academies: as,

The Academy della Cruſca at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but ſcarce heard of before the year 1584, when it became noted for a diſpute between Taſſo and ſeveral of its members. Many authors confound this with the Florentine academy.

The French Academy, which had its riſe from a meeting of men of letters in the houſe of M. Conrart, in 1629. In 1635 it was erected into an academy, by Cardinal Richlieu, for refining and aſcertaining the French language. Noblemen or perſons of diſtinction are not admitted on any other introduction than as men of letters. They have been ſeverely ſatyrized, and their ſtyle has been ridiculed as enervating inſtead of refining the French language. They are alſo charged with having ſurfeited the world by flattery, and having exhauſted all the topics of panegyric in praiſe of their founder; it being a duty incumbent on every member, at his admiſſion, to make a ſpeech in praiſe of the king.

The Royal Spaniſh Academy at Madrid held its firſt meeting in July 1713, in the palace of its founder, the duke d'Eſcalona. It conſiſted at firſt of eight academiſts, including the duke; to which number 14 others were afterwards added, the founder being choſen preſident or director. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with chooſing carefully ſuch words and phraſes as have been uſed by the beſt Spaniſh writers, and to compoſe a Dictionary of their language.

XI. Academies of Politics; as that at Paris, conſiſting of ſix perſons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little ſervice, as the kings of France were unwilling to truſt any but their miniſters with the inſpection of foreign affairs.

Academy is alſo a term for ſchools and other ſeminaries of learning among the Jews, where their rabbins and doctors inſtructed their youth in the Hebrew language.

The Romans had a kind of military academies, eſtabliſhed in all the cities of Italy, under the name of Campi Martis. The youth were admitted to be trained for war at the public expence. The Greeks, beſide academies of this kind, had military profeſſors called Tactici, who taught all the higher offices of war, &c. &c.

Academy is often uſed with us to denote a kind of collegiate ſeminary, where youth are inſtructed in arts and ſciences. There is one at Portſmouth for teaching navigation, drawing, &c. another at Woolwich, for fortification, gunnery, &c. Beſides theſe, there are numerous academies, eſpecially in London, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The non-conformiſt miniſters, &c. are bred up in private academies; as not approving the common univerſity education. The principal of their academies are thoſe in London, Daventry, and Warrington.

Academy *Figure*, a drawing of a naked man or woman, taken from the life; which is uſually done on paper with red or black chalk, and ſometimes with pencils or crayons.

ACÆNA, *αχαινα*, in antiquity, a Grecian meaſure of length, equal to 10 feet Britiſh.

Acæna, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; the characters of which are theſe: the calyx is a perianthium, conſiſting of four leaves, which are ovate, concave, equal, and perſiſtent; there is no corolla: the ſtamina conſiſts of four equal middle ſized filaments oppoſite to the calyx; the antheræ are quadrangular, twin erect: the piſtillum has an inverſely-ovate hiſped germ: the ſtylus is ſmall, and inflected on one ſide; and the ſtigma is a ſmall thickiſh coloured membrane, divided into many ſegments: the pericarpium is an inverſely ovated dry one celled berry, covered with prickles, bent backwards: the ſeed is ſingle. There is but one ſpecies, a native of Mexico.

ACAIBA, in botany, the ſame as,

ACAJOU, the name of a genus of plants, called by botaniſts, anacardium, or Weſt Indian caſhew-nut trees, the characters of which are; the empalement is of one leaf, erect and cut into five ſegments: the flower is alſo of one leaf, having a ſhort tube, and cut into five parts at the top; the ten ſtamina are as long as the petals, and crowned with ſmall ſummits: in the center is a round germen, ſupporting an awl, ſhaped ſtyle, crowned with an acute ſtigma; the germen becomes a large oval fleſhy fruit, having a large kidney ſhaped nut growing to its apex. See Acardium. Lin. Gen. Plant. 467.

The juice of this fruit, when duly fermented, intoxicates like wine. It is ſaid to ſtop a diarrhœa, and cure a diabetes. Authors aſſert, that the Indians uſe it as a provocative to venery: they are ſaid to extract oil from the ſhells, which is uſed by painters, to give their colour a laſting black, and alſo to keep wood from decay.

ACALEPHE, a nettle, whoſe ſummit grows red and ſeedy.

Acalephe, a fiſh whoſe fleſh is remarkably tender. Gellius.

Acalephe, a ſea-fowl, ſomewhat like a mallard. Nicander.

ACALEPTIC, in ancient proſody, a complete verſe.

ACALYPHA, in botany, a genus of plants of the monœcia adelphia claſs, and are of four ſpecies. Lin. Syſ.

As the acalypha, or three-ſeeded mercury, is ſeldom preſerved, even in botanic gardens, having neither uſe or beauty to form any part of its characteriſtic, we omit its deſcriptive characters.

ACALCUM, tin.

ACAMATOS, among practitioners in phyſic, implies that diſpoſition of a limb which is equally diſtant from flexion and extenſion.

ACANACEOUS *Plants*, the ſame as acanthaceous, i. e. ſuch as are armed with thorns or prickles.

ACANAPHORA, the ſame as centuary.

ACANGIS, *Adventurers*, the Turkiſh huſſars, or light troops, who are employed as ſcouts on the frontiers of an enemy's country.

ACANOR, a chemical furnace of a particular conſtruction.

ACANTHA, a technical term amongſt botaniſts, to ſignify the thorns of plants: formed of the Greek words, ακη, point, and ανθος, flower. The term is alſo applied to the prickles, or thorns of fiſh.

Acantha, in anatomy, is applied to the poſterior protuberances of the vertebræ of the back, forming what we call the ſpina dorſi, or back bone.

ACANTHABOLUS, in ſurgery, an inſtrument for pulling thorns, or the like, out of the ſkin.

A tweezer is ſometimes called an acanthabolus. The word is compounded of ακανθα, a thorn, and βαλλω, to caſt away. Sometimes it is called velſella, for its figure, &c. See Instruments in Surgery, in the plate under that name; agreeably to the Modern Syſtem of Surgery.

ACANTHALZUCA, the ſame as echinopus, or globe thiſtle.

ACANTHE, the ſame as artichoke.

Acanthe *Arabica*, an oriental plant, uſed in medicine, ſeldom enumerated in botany.

ACANTHIAS, in ichthyology, a name given by ſome authors to the fiſh, whoſe ſkin is uſed by caſe-makers; under the general, but ſimple, denomination of *fiſh-ſkin*. It is claſſed as the galens.

ACANTHICE, maſtich, among ancient naturaliſts, a kind of gum, producing from the herb helxine.

ACANTHINE, Acanthinus, denotes a thing, relating to, or reſembling the herb acanthus: as, acanthina veſtimenta, acanthine garments, of which we have two different explications.

Embroidery, is ſaid to be invented to imitate the Egyptian acanthus; ſilken ſtuffs alſo go by this name.

Plin. Hiſt. Nat. lib. 14. *c.* 12 *Hard. Not.*

ACANTHINAM *Lignum*, brazil wood.

ACANTHION, a plant of the thiſtle kind, whoſe down makes a ſort of ſtuff not unlike ſilk.

ACANTHIS, in ornithology, a ſpecies of the goldfinch.

ACANTHOPTERYGII, in ichthyology, one of the claſſes, containing 17 genera of fiſhes, whoſe fins are bony and prickly at the extremities. The name is derived from the Greek words, ακανθα, a thorn, and πτερυγιον, a fin. See Syſtem of Ichthyology.

ACANTHUS, in botany, the branca urſini, bear's-foot, brank urſine, or bear's-breech; a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and ranked in the 40th natural order perſonatæ. See Syſtem of Botany.

Acanthus, in architecture, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders. See Syſtem of Architecture.

ACANUS, a ſpecies of the carduus or thiſtle.

ACAPATLI, the botanical name of the plant, which produces the long pepper.

ACAPNON, marjoram, called by the Greeks, ἄκαπνον, or dry wood.

ACARA, a ſmall freſh water fiſh, caught in the Brazils.

ACARAAYA, a ſea fiſh, common to the Brazilians.

ACARAMUCU, a ſmall fiſh.

ACARAPEBA, a ſmall Brazilian fiſh.

ACARAPITAMA, a beautiful Brazilian fiſh, reſembling a mullet.

ACARAPUCU, a freſh water Brazilian fiſh.

ACARAUNA, a ſmall American fiſh, called by our ſailors, the Old Wife. See Syſtem of Ichthyology.

ACARI, or Acarus, the tick or mite, a genus of inſects belonging to the order of aptera, or ſuch as have no wings. The acarus has eight legs, two eyes, one on each ſide of the head; and two jointed tentacula. The female is oviparous.

The ſiro or cheeſe-mite, is a very minute ſpecie. To the naked eye theſe mites appear like moving particles of duſt; but the microſcope diſcovers them to be perfect animals, having as regular a figure, and performing all the functions of life, as perfectly as creatures that exceed them in bulk. The principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body; and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quick-ſighted; and when they have been once touched with a pin you will eaſily perceive how cunningly they avoid a ſecond touch. Their legs are each furniſhed at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there iſſue a few exceeding long hairs. Other parts of the body are alſo covered with thin and long hairs. The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous, as the louſe and ſpider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute; and, in their growing to their full ſize, they caſt their ſkins ſeveral times. Theſe little creatures may be kept alive many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen in coitu, conjoined tail to tail; and this is performed by an incredibly ſwift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhows, that 90 millions of them are not ſo large as a common pigeon's egg. They are very voracious animals, and have often been ſeen to eat one another. Their manner of eating is by thruſting alternately one jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding they ſeem to chew the cud. There are ſeveral varieties of this ſpecies found in different ſubſtances beſides cheeſe; as in malt-duſt, flour, oatmeal, &c. Thoſe in malt duſt and oatmeal are much nimbler than the cheeſemites, and have longer hairs. There are alſo a ſort of wandering mites, which range wherever there is any thing they can feed on: they are often ſeen in the form of a white duſt, and are not ſuſpected to be living creatures. The mite is called by authors, ſimply, *acarus*. It is an animal very tenacious of life, and will live months without food. Mr. Lewenhoek had one lived 11 weeks in a ſituation he had fixed it for examining by his microſcope.

Linnæus enumerates 35 ſpecies, of which ſome are inhabitants of the earth, ſome of waters; ſome live on trees, others among ſtones, and others on the bodies of different animals, and even under their ſkin.

ACARNA, in botany, the name of the artichoak.

ACARNAN, in ichthyology, a ſmall ſea fiſh, common in the Mediterranean, ſuppoſed to be of the ſame ſpecies with the rubellio, or erythrinus.

ACARON, the wild myrtle.

ACARTUM, red lead.

ACARUS, the ſame as acari.

ACATALECTIC, a term in ancient poetry for ſuch verſes as have all their feet or ſyllables.

ACATALEPSY, in philoſophy, ſignifies the impoſſibility of comprehending ſomething. The diſtinguiſhing tenet of the pyrrhoniſts was their aſſerting an abſolute acatalepſy in regard to every thing.

ACATALUS, a juniper berry.

ACATASTATOS, inconſiſtent, a term in medicine applied to irregular fevers, whoſe paroxiſms are uncertain, and which are indicated by frequent changes in the urine. It is likewiſe applied to thoſe ſhivering fits in fevers, which have no conſtant return, and to turbid urine that depoſits no regular ſediment.

ACATERY, anciently an officer in the king's houſhold, deſigned as a check between the clerks of the kitchen and the clerks of the houſhold or purveyors.

ACATHARSIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, in divinity, the name of a ſolemn hymn, anciently ſung in the Greek church, on Saturday, of the 5th week of Lent, in honor of the Virgin Mary, for having thrice delivered Conſtantinople from the hands of barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace uſed for military purpoſes. The acatium was a ſpecies of thoſe veſſels called naves actuariæ, i. e. ſuch as were wrought with oars. It was ſometimes made uſe of in battle. Strabo deſcribes it as a privateer or pirate ſloop.

ACAULIS, in botany, a term applied to ſuch flowers as have no viſible ſtalk, but appear to reſt upon the ground.

ACAULOSE, in botany, implies ſuch plants as have no caulis or ſtem; ſuch as the carline-thiſtle, &c.

ACBAB, in ornithology, a bird found in the Philippine iſlands, which deſtroys the early ſprout of the rice, ſo that the inhabitants are continually guarding againſt ſo injurious an enemy of this autumnal increaſe.

ACBAR, an ancient Arabian idol, deſtroyed at the time of Mahomet's propagation of his religion in Arabia.

ACCADEMIA, in muſic, implies a concert.

ACCALIA, in Roman antiquity, ſolemn feaſts held in honor of Acca Laurentia, Romulus's nurſe; they were otherwiſe called, Laurentalia.

ACCAPITARE, in ancient law, the act of becoming the vaſſal of a lord.

ACCAPITUM ſignifies a ſum paid as a fine by the tenant on his homage as a copyholder.

ACCAZDIR, tin.

ACCEDAS *ad curiam*, in law, a writ which lies for him who fears falſe impriſonment, or falſe judgment, in an inferior court.

Accedas *ad vicecomitem*, a writ directed to the coroner commanding him to deliver a writ to the ſheriff, who hath ſuppreſſed a pone delivered to him.

ACCELERATED, in a general ſenſe, ſignifies a thing continually increaſing, or growing longer in ſubſtance.

ACCELERATION, in mechanics, the increaſe of velocity in a moving body. Accelerated motion is that which continually receives freſh acceſſions of velocity. Acceleration ſtands immediately oppoſed to retardation, which denotes a diminution of velocity.

Acceleration is chiefly uſed in phyſics, in reſpect of falling bodies, i. e. of heavy bodies tending towards the centre of the earth by the force of gravity.

Various were the ſyſtems and opinions which philoſophers produced to account for this acceleration. But the immediate cauſe of acceleration is now ſufficiently obvious; the principle of gravitation, which determines the body to deſcend determining it to be accelerated by a neceſſary conſequence.

Suppoſe a body let fall from on high: the primary cauſe of its beginning to deſcend is doubtleſs the power of gravity: but when once the deſcent is commenced, that ſtate becomes in ſome meaſure natural to the body; ſo that if left to itſelf, it would perſevere in it for ever, even though the firſt cauſe ſhould ceaſe: as we ſee in a ſtone caſt with the hand, which continues to move after it is left by the cauſe that gave it motion.

The motion of a body aſcending, or impelled upwards, is diminiſhed, or retarded from the ſame principle of gravity, acting in a contrary direction, in the ſame manner as a falling body is accelerated. A body thus projecting upwards riſes till it has loſt all its motion; which it does in the ſame time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the ſame body thrown up will riſe to the ſame height from which falling it would have acquired the velocity wherewith it was thrown up: and hence the heights which bodies thrown up with different velocities do aſcend to, are to one another as the ſquares of thoſe velocities.

Acceleration *of Bodies on inclined Planes*. The ſame general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion ſlower; but the inclination being every where equal, the retardation ariſing therefrom will proceed equally in all parts, at the beginning and the ending of the motion.

Acceleration *of the Motion of Pendulums*; the motion of pendulous bodies is celerated in their deſcent; but in a leſs ratio than that of bodies falling pependicularly. See Mechanics and Pendulum.

Acceleration *of the Motion of Projectiles*. See Projectiles.

Acceleration is alſo applied in the ancient aſtronomy, in reſpect of the fixed ſtars. This acceleration was the difference between the revolution of the *primum mobile* and the ſolar revolution; which was computed at three minutes and 56 ſeconds.

Acceleration *of the Moon*, a term uſed to expreſs the increaſe of the moon's mean motion from the ſun, compared with the diurnal motion of the earth. See Syſtem of Astronomy.

Accelerator, in anatomy, the name of two muſcles of the penis, which ſerve for ejecting the urine or ſemen. See Anatomy, *Table of the Muſcles*.

ACCENDENTES, a lower order of miniſters in the Romiſh church, whoſe office it is to light and trim the candles.

ACCENDONES, in Romiſh hiſtory, ſeconds to the Gladiators, who fought in the amphitheatres for the diverſion of the audience.

ACCENSI, in the Roman armies, ſupernumerary ſoldiers, who were held in readineſs to ſupply the places of thoſe who were ſlain in battle. Livy mentions them as undiſciplined troops. Salmaſius ſays, they were recruited, or enliſted out of the 5th claſs of the Roman citizens.

ACCENSIIS alſo imply, in the Roman law, tipſtaves, who ſummoued partiet to appear and anſwer before the judges.

ACCENSION, in philoſophy, the act of ſetting a body on fire. Thus the accenſion of gun-powder by the fire, ſtruck with the flint and ſteel of the gun lock, between the hammer and the trigger.

ACCENT, in a general ſenſe, ſignifies, a particular tone, ſtreſs, or ſtrong articulation of the voice.

Accent, in grammar, applied to ſpeaking, or reading, implies an inflection of the voice, which gives each ſyllable of a word its due pitch, whether high, low, or grave.

The word is derived from the Latin, *accentus*; and is compounded of *ad*, to, and *cano*, to ſing. *Accentus*, *quaſi adcantus*, or *juxta cantum*. In this ſenſe, *accent* is ſynonymous with the Greek, *τονος*; the Latin, *tenor*, and the Hebrew, טעם, *guſtus*, in Engliſh, *taſte*.

For the uſe of it, its marks, particulars and characters, ſee Syſtem of Grammar.

Accent, in muſic, is a certain modulation, or warbling of the ſounds, either by the voice or inſtruments, to expreſs a paſſion. Every bar, or meaſure, is divided into accented and unaccented parts; the accented are the principal, being thoſe chiefly intended to move and affect the hearer: the more full and void of diſcords the harmony is, the leſs offence to the ear will be given.

ACCENTOR denotes one of the three ſingers or players, that performs the predominant part in a trio.

ACCEPTANCE, in a general ſenſe, the act of receiving or admitting of a thing.

Acceptance, in common law, ſignifies a perſon's agreeing to offers made in bargaining, by which the bargain is concluded.

Acceptance, in civil law, implies the concurrence of the donee, which renders the act complete; it being previouſly underſtood, that the choice made by the donor is to remain irrevokeable.

Acceptance, in commerce, ſignifies the name at length, or initials of a name, ſubſcribed to a bill of exchange, by which the writer makes himſelf debtor to the drawer, payable to the indorſer or holder of the bill, for the ſum contained in the body of the writing, at a certain time therein limited. For the governing law of mercantile tranſactions relative to bills of exchange, ſee the Syſtem of Commercial Law.

ACCEPTATION, in grammar, the meaning of a word, to be underſtood, agreeably to the intention of its author.

ACCEPTER, or Acceptor, the ſubſcriber to a bill of exchange.

ACCEPTILATION, in civil law, ſignifies a diſcharge given to the debtor by the creditor, without the payment of any value.

ACCESS, in a general ſenſe, denotes the approach of one towards another.

Access, in medicine, implies the beginning of a fit of a periodical diſeaſe.

Access, in the court of the Roman Pontiff, implies the receding of the cardinal electors from their firſt ſuffrages, when the numbers are equal for the two candidates, upon an election of a Pope, ſo that they give their votes for one of the competitors, in order to augment his number and cloſe the election.

Access, in common law, a power granted to poſſeſs a benefice after the death of an incumbent; or, otherwiſe, if the party to whom the acceſs is granted ſhould be a minor, the benefice may be given to another in the interim; but when he hath attained a competent age he may enter into poſſeſſion of his benefice without any new grant or preſentation.

ACCESSIBLE, any thing that may be approached, or acceſs had to it.

ACCESSION, generally implies the joining of ſomething new to a thing exiſting previous to ſuch union.

Accession, in politics and law, ſignifies the ſucceſſion of a prince to the throne of a deceaſed monarch.

Accession, in the law of nations, implies, the ſovereign's agreeing with the political treaty of two or more potentates, or ſtates, already entered into between them.

Accession, in law, is a method of acquiring property, by which, in things that have a cloſe connection or dependence upon one another, the property of the principal thing draws after it the property of the acceſſory: thus, the owner of a cow becomes likewiſe the owner of the calf. It ſometimes likewiſe ſignifies conſent or acquieſcence.

ACCESSORY, or Accessary, ſomething that accedes, or is added to another more conſiderable thing; in which ſenſe the word ſtands oppoſed to principal.

Accessory, or Accessary, in common law, is chiefly uſed for a perſon guilty of a felonious offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of acceſſories: before the fact, and after it. The firſt is he who commands, or procures another to commit felony, and is not preſent himſelf; for if he be preſent, he is a principal. The ſecond is he who receives, or aſſiſts, any man that has done murder, or felony, whereof he has knowledge. A man may alſo be acceſſory to an acceſſor, by aiding, receiving, &c. an acceſſory in felony.

An acceſſory in felony ſhall have judgment of life and member, as well as the principal who did the felony; but not till the principal be firſt attainted, convicted, or outlawed thereon. Where the principal is pardoned without attainder, the acceſſory cannot be arraigned: it being a maxim in law, *Ubi non eſt principalis, non poteſt eſſe acceſſorius:* but if the principal be pardoned, or have his clergy after attainder, the acceſſory ſhall be arraigned; 4 and 5 W. et M. cap 4. And by ſtat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony, or ſtands mute, or challenges above 20 of the jury, it ſhall be lawful to proceed againſt the acceſſory in the ſame manner as if the principal had been attainted; and notwithſtanding ſuch principal ſhall be admitted to his clergy, pardoned, or delivered before attainder. In ſome claſſes alſo, if the principal cannot be taken, then the acceſſory may be proſecuted for a miſdemeanor, and puniſhed by fine, impriſonment, &c. In the loweſt and higheſt offences there are no acceſſories, but all are principals: as in riots, forcible entries, and other treſpaſſes, which are the loweſt offences. So alſo in the higheſt offence, which is high treaſon, there are no acceſſories.

Acceſſories, in petty treaſon, murder, and in felonies of ſeveral kinds, are not to have their clergy. There can be no acceſſory before the fact in manſlaughter; becauſe that is ſudden and unprepenſed.

ACCESSORY *Nerves*, in anatomy, nerves, which ariſing from the medulla in the vertebræ of the neck, aſcend, and enter the ſkull, and paſs out of it again with the par vagum, wrapped up in the ſame common integument, and after quitting them, are diſtributed into the muſcles of the neck and ſhoulders. See Syſtem of ANATOMY.

ACCESSORY, among painters, an epithet given to ſuch parts of an hiſtory-piece as ſerve chiefly for ornament, and might have been wholly left out: ſuch as vaſes, armour, &c.

ACCIDENCE, the firſt rudiments of the Roman language, or Latin tongue,

ACCIDENT, in a general ſenſe, denotes any ſudden misfortune.

ACCIDENT, in grammar, implies a property attached to a word, without entering into its eſſential definition; for every word, notwithſtanding its ſignification, will be either primitive, derivative, ſimple, or compound, which are the accidents of words. A word is ſaid to be primitive, when it is taken from no other word in the language in which it is uſed: thus heaven, king, good, are primitive words. It is ſaid to be derivative, when it is taken from ſome other word: thus heavenly, kingdom, goodneſs, &c. are derivatives. A ſimple word is eaſily diſtinguiſhed from a compound: thus juſt, juſtice, are ſimple words: unjuſt, injuſtice, are compound: res is a ſimple word, as well as publica; but reſpublica is a compound. Beſides theſe accidents, which are common to all ſorts of words, each particular ſpecies has its accidents: thus the accidents of the noun ſubſtantive are the gender, declenſion, and number; and the adjective has another accident, namely the compariſon. See Syſtem of GRAMMAR,

ACCIDENT, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the eſſence of the armour; ſuch as abatement, difference, and tincture.

ACCIDENTAL, in a general ſenſe, implies all things that happen by accident.

ACCIDENTAL, in philoſophy, the effect of ſomething that flows by accident, not either guided by laws, or ſubject to the thing to which it is joined; conſequently, it is freed from return, unleſs by caſual intervening.

In this ſenſe accident is oppoſed to conſtant and principal, e. g. The ſun's place is with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer, and the cold in winter; whereas winds, ſnows, and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

ACCIDENTAL *Point*, in perſpective, is that point in the horizontal line where the projections of two lines parallel to each other meet the reſpective plane.

ACCIDENTAL *Colours* are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly at a particular colour are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects.

M. d'Arcy has contrived a machine for determining the duration of the effects of light.

ACCIPENSER, in ichthyology, the genus of fiſhes belonging to the claſs of amphibia, and order of nantes of Linnæus. See Syſtem of ICHTHYOLOGY.

ACCIPITER, the name of Linnæus's firſt order of birds. See Syſtem of ORNITHOLOGY.

ACCIPITER, a name given by the Romans to the hawk, and which, from its being carnivorous, they conſidered as a bird of bad omen:

> *Odimus Accipitrem, quia ſemper vivit in Armis.* OVID.

The hawk was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nilus; it was called by them, the image of the ſun; and on that account we find the ſun repreſented under the ſhape of an hawk.

ACCIPITRINA, in botany, the ſophia chirurgorum, or hawk-weed.

ACCLAMATION, a confuſed noiſe or ſhout of joy, by which the public expreſs their applauſe, eſteem, or approbation.

ACCLAMATION, in a more proper ſenſe, denotes words uttered with extraordinary vehemence. Acclamation uſually accompanied with applauſe, with which it is ſometimes confounded: though ought to be diſtinguiſhed; as acclamation given by the voice, applauſe by the hands; acclamation is alſo beſtowed on perſons abſent, applauſe only on thoſe preſent.

Acclamations are of various kinds; eccleſiaſtical, military, nuptial, ſenatorial, ſynodical, ſcholaſtic, theatrical, harmonical, &c. We meet with loud acclamations, muſical, and rythmical acclamations; acclamations of joy, reſpect, and even of reproach.

Acclamations were not unknown on the theatres in the earlieſt ages of the Roman commonwealth; but they were then no more than confuſed ſhouts. Afterwards they became a ſort of regular concerts. That mentioned by Phædrus, *lætare incolumis Roma ſalvo principe*, was made for Auguſtus. Nero was paſſionately fond of muſic, and took eſpecial care to improve and perfect the muſic of acclamations. Charmed with the harmony which the Alexandrians, who came to the games celebrated at Naples, had ſung his praiſes, he brought ſeveral over to inſtruct a number of youth, choſen from among the knights and people, in the different kinds of acclamations practiſed at Alexandria. Theſe continued in uſe as long as the reign of Theodoric. But the people did not always make a chorus; ſometimes there were two, who anſwered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca gave the ſignal by clapping, 5000 ſoldiers called Auguſtals, began to chaunt his praiſe, which the ſpectators were obliged to repeat. The whole was conducted by a muſicmaſter called Meſochorus or Pauſurious. The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magiſtrates who preſided at the games. Perſons of diſtinguiſhed merit alſo ſometimes received them, of which Quintilian gives us inſtances in Cato and Virgil. The moſt uſual forms were, *Feliciter, Longiorem vitam, Annos felices.* The actors themſelves, and thoſe who gained the prizes in the games of the circus, were not excluded the honour of acclamations.

To theatrical acclamations may be added thoſe of the ſoldiery and the people in time of triumph. The victorious ſoldiery accompanied their general to the capitol; and, among the verſes they ſung in his praiſe, frequently repeated, *Io Triumphe*, which the people anſwered in the ſame ſtrain.

The acclamations of the ſenate were ſomewhat more ſerious than the popular ones; but aroſe from the ſame principle, viz. a deſire of pleaſing the prince or his favourites; and aimed likewiſe at the ſame end, either to expreſs the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new proteſtations of fidelity. Theſe acclamations were uſually given after a report made by ſome ſenator, to which the reſt all expreſſed their conſent by crying omnes, omnes: or elſe, æquum eſt, juſtum eſt. Sometimes they began with acclamations, and ſometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the ſenate, were conducted; ſomething of which practice is ſtill retained at modern elections of kings and emperors, where *vivat rex, vive le roy*, and *long live the king*, are cuſtomary forms.

The Turks practiſe ſomething like this on the ſight of their emperors and grand vizirs to this day.

The acclamations in Greece which authors, poets, philoſophers, orators, &c. received, who recited their works in public, were held in great parade, in the moſt ſolemn places, as the capitol, temples, the Athenæum, and the houſes of great men. Invitations were ſent every where, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp poſſible. Men of fortune who pretended to wit, kept applauders in their ſervice, and lent them to their friends. Others endeavoured to gain them by preſents and treats. There were particular acclamations for the philoſophers, for orators, hiſtorians, and poets.

The acclamation which the ſpectators honoured the victories of the athletæ were a natural conſequence of the impetuous motions which attended the gymnaſtic games. The cries and acclamations of the people ſometimes expreſſing their compaſſion and joy, ſometimes their horror and diſguſt, are ſtrongly painted by different poets and orators.

Acclamations made alſo a part of the ceremony of marriage. They were uſed for the omen's ſake; being the Læta Omina, ſometimes ſpoken of before marriage in Roman writers.

Acclamations, at firſt practiſed in the theatre, and paſſing thence to the ſenate, &c. were in proceſs of time received into the acts of councils, and the ordinary aſſemblies of the church. The people expreſſed their approbation of the preacher variouſly; the more uſual forms were, Orthodox! Third Apoſtle, &c. Theſe acclamations being ſometimes carried to exceſs, and often miſplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in ſome uſe as low as the time of St. Bernard.

ACCLIVUS, in anatomy, a muſcle, otherwiſe called obliquus aſcendens.

Acclivity, the riſe or ſlope of a hill, uſuall yoppoſed to the declivity or deſcent of a hill. In fortification it ſignifies the talus of the rampart.

ACCOLA generally implies a perſon reſident near a certain place: which, among the Romans, was in contradiſtinction to the incola, or reſidents in a certain place.

ACCOLADE, a ceremony anciently uſed in the conferring of knighthood.

When William the Conqueror conferred the honour of knighthood on his ſon Henry, it was given with the naked fiſt; but was afterwards changed into a blow, with the flat part of the ſword on the ſhoulder of the knight.

ACCOLEE, ſometimes ſynonymous with Accolade, and uſed in various ſenſes in heraldry: ſometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, and, laſtly, to kews, battons, maces, ſwords, &c. placed ſaltierwiſe behind the ſhield.

Accommodation, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

A prophecy of Scripture is ſaid to be fulfilled various ways; properly, as when a thing foretold comes to paſs; and improperly, or by way of accommodation, when an event happens to any place or people, like to what fell out ſome time before to another. Thus, the words of Iſaiah, ſpoken to thoſe of his own time, are ſaid to be fulfilled in thoſe who lived in our Saviour's; and are accommodated to them: "Ye hypocrites, well did Iſaiah's prophecy of you, &c." which ſame words St. Paul afterwards accommodates to the Jews of his time.

The primitive church accommodated multitudes of Jewiſh, and even heathen ceremonies and practices, to Chriſtian purpoſes; but the Jews had before done the ſame by the Gentiles: ſome will even have circumciſion, the tabernacle, brazen ſerpent, &c. to have been originally of Egyptian uſe, and only accommodated by Moſes to the purpoſes of Judaiſm.

ACCOMPANIMENT, ſomething attending or added as a circumſtance to another either by way of ornament, or for the ſake of ſymmetry.

Accompaniment, in muſic, denotes the inſtruments which accompany a voice, in order to ſuſtain it, as well as to make the muſic more full. The accompaniment is uſed in recitative, as well as in ſong; on the ſtage, as well as in the choir, &c.

Accompaniment, in painting, denotes ſuch objects as are added, by way of ornament, as dogs, guns, game, &c. in a hunting-piece.

Accompaniment, in heraldry, any thing added to a ſhield by way of ornament; as the belt, mantling, ſupporters, &c. It is alſo applied to ſeveral bearings about a principal one; as a ſatlier, bend, feſs, chevron, &c.

ACCOMPLICE, one concerned in any bad act; or is privy in the ſame deſign or crime with another, and is ſynonimous with acceſſary.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

Accomplishment is principally uſed in ſpeaking of events foretold by the Jewiſh prophets in the Old Teſtament, and fulfilled under the New. We ſay a literal accompliſhment, a ſpiritual accompliſhment, a ſingle accompliſhment, a double accompliſhment, a Jewiſh accompliſhment, a Chriſtian, or a heathen accompliſhment. The ſame prophecy is ſometimes accompliſhed in all, or in ſeveral of thoſe different ways. Thus, of ſome of the prophecies of the Old Teſtament, the Jews find a literal accompliſhment in their own hiſtory, about the time when the prophecy was given: the Chriſtians find another in Chriſt, or the earlieſt days of the church; the heathens another, in ſome of their emperors; the Mahometans another, in their legiſlator, &c. There are two principal ways of accompliſhing a prophecy; directly, and by accommodation.

Accomplishment is alſo uſed for any mental or perſonal endowment.

ACCORD, in painting, is the harmony that reigns among the lights and ſhades of a picture.

ACCOUNT, or Accompt, in a general ſenſe, implies a computation by numbers. It is alſo uſed collectively, for the ſeveral books or regiſters which merchants keep of their affairs or negotiations. See Syſtem of Book-Keeping.

Chamber accounts, in France, the ſame as our court exchequer.

Account, in chronology, we compute for a particular period. Thus we ſay the Julian account, the Gregorian account, &c. which in aſtronomical reckoning we call the new and old ſtyle.

ACCOUNTANT, or Accomptant, a perſon well verſed in accounts; whether employed by private perſons, or public companies.

ACCOUNTANTSHIP, the art of keeping and balancing accounts.

ACCOUNTANT-General, a new officer in the court of Chancery appointed by act of parliament to receive all monies lodged in court inſtead of the maſters, and convey the ſame to the bank of England for ſecurity.

ACCOUTREMENT, a term applied to the furniture of a ſoldier, knight, or gentleman.

ACCRETION, in phyſics, the increaſe or growth of an organical body, by the acceſſion of new parts.

Accretion, among civilians, the property acquired in a vague for unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two perſons, one of whom dies before the teſtator, the legacy devolves to the ſurvivor by right of accretion.

ACCROACHING, the ſame as Incroaching; to prohibit, which a law was made 25 Ed. III. cap. 2. It alſo comprehended the aſpiring of uſurpers to regal dignity, and had various interpretations relative to treaſonable conſtructions.

ACCROCHE, in heraldry, denotes a thing being hooked with another.

ACCRUE, in law, ſignifies ſomething that accedes to, or follows the property of another part or perſon. Thus money as principal incurs intereſt to accrue due on it, as the legal profit of the proprietor.

ACCUBATION, a poſture of the body, between ſitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. Accubation, or Accubitus, was the table-poſture of the Greeks and Romans; whence we find the words particularly uſed for the lying, or rather ſitting, down to meat. The Greeks introduced this poſture. The Romans, during the frugal ages of the republic, were ſtrangers to it: but as luxury got more univerſal, this poſture came to be adopted, at leaſt by the men; for as to women, it was reputed an indecency in them to lie down among the men. Children did not lie down, ſervants, ſoldiers, nor perſons of meaner condition; but took their meals ſitting, as a poſture leſs indulgent. The Roman manner of diſpoſing themſelves at table was this: a low round table was placed in the cœnaculum, or dining-room, and, about this, uſually three, ſometimes only two, beds or couches; according to the number, it was called biclinium, or triclinium. Theſe were covered with a ſort of bed-clothes, richer or plainer, according to the quality of the perſon, and furniſhed with quilts and pillows, that the gueſts might lie the more commodiouſly. There were uſually three perſons on each bed. In eating, they lay down on their left ſides, with their heads reſting on the pillows, or rather on their elbows.

ACCUBITOR, an ancient officer of the emperors of Conſtantinople, whoſe buſineſs was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the cubicularius and procubitor under him.

ACCUMULATION, in a general ſenſe, the act of heaping or amaſſing things together. Among lawyers, it is uſed in ſpeaking of the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances to the ſame proof.

Accumulation *of Degrees*, in an univerſity, is the taking ſeveral of them together, or at ſmaller intervals, than is allowed by the rules of the univerſity.

ACCURSED, ſomething that lies under a curſe, or ſentence of excommunication.

In the Jewiſh idiom, accurſed and crucified were ſynonymous. Among them, every one was accounted accurſed, who died on a tree. This ſerves to explain the difficult paſſage in Rom. ix. 3. where the apoſtle Paul wiſhes himſelf accurſed after the manner of Chriſt, i. e. crucified, if happily he might by ſuch a death ſave his countrymen.

ACCUSATION, the charging any perſon with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to, and *cauſari*, to plead.

Writers on politics treat of the benefit and the inconveniences of public accuſations. Various arguments are alleged, both for the encouragement and diſcouragement of accuſations againſt great men. Nothing, according to Machiavel, tends more to the preſervation of a ſtate, than frequent accuſations of perſons truſted with the adminiſtration of public affairs. This, accordingly, was ſtrictly obſerved by the Romans, in the inſtances of Camillus, accuſed of corruption by Manlius Capitolinus, &c. accuſations, however, in the judgment of the ſame author, are not more beneficial than calumnies are pernicious; which is alſo confirmed by the practice of the Romans. Manlius, not being able to make good his charge againſt Camillus, was caſt into priſon.

By the Roman law, there was no public accuſer for public crimes; every private perſon, whether intereſted in the crime or not, might accuſe, and proſecute the accuſed to puniſhment, or abſolution. Cato, the moſt innocent perſon of his age, had been accuſed 42 times, and as often abſolved. But the accuſation of private crimes was never received but from the mouths of thoſe who were immediately intereſted in them: but the huſband could accuſe his wife of adultery.

In the French law, none but the procureur general, or his deputies, can form an accuſation, except for high-treaſon and coining, where accuſation is open to every body. In other crimes, private perſons can only act the part of denouncers, and demand reparation for the offence, with damages.

In Britain, by Magna Charta, no man ſhall be impriſoned or condemned on any accuſation, without trial by his peers, or the law; none ſhall be vexed with any accuſation, but according to the law of the land; and no man may be moleſted by petition to the king, &c. unleſs it be by indictment or preſentment of lawful men, or by proceſs at common law. Promoters of ſuggeſtion are to find ſurety to purſue them; and if they do not make them good ſhall pay damages to the party accuſed, and alſo a fine to the king. No perſon is obliged to anſwer upon oath to a queſtion whereby he may accuſe himſelf of any crime.

ACCUSATIVE, in the Latin grammar, is the fourth caſe of nouns, and ſignifies the relation of the noun on which the action implied in the verb terminates; and hence, in ſuch languages as have caſes, theſe nouns have a particular termination, called *accuſative*: as, *Auguſtus vicit Antonium*, Auguſtus vanquiſhed Antony. Here Antonium is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, muſt have the accuſative termination. In Engliſh, we have nothing to diſtinguiſh this caſe from the *nominative*; but as we ordinarily place words in their natural order, it is eaſily diſcovered; the *nominative* conſtantly preceding, and the *accuſative* following the verb. Thus, when we ſay, the prince loves the princeſs, and the princeſs loves the prince: the prince is the *nominative* in the firſt, and the *accuſative* in the laſt; and the princeſs the *accuſative* in the firſt, and the *nominative* in the ſecond.

ACENTETUM, or ACANTETA, in natural hiſtory, a name given by the ancients to the pureſt and fineſt kind of rock-cryſtal: they uſed the cryſtal various ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in great eſtimation.

ACEPHALI, or ACEPHALITÆ, a term applied to ſeveral ſects who refuſed to follow ſome noted leader. Thus the perſons who refuſed to follow either John of Antioch, or St. Cyril, in a diſpute that happened in the council of Epheſus, were termed *acephali*, without a head or leader. Such biſhops, alſo, as were exempt from the juriſdiction and diſcipline of their patriarch, were ſtyled *acephali*.

ACEPHALOUS, or ACEPHALUS, in a general ſenſe; without a head.

ACEPHALUS, an obſolete term for the tænia, or tape-worm, which was long ſuppoſed to be acephalous. The firſt who gave it a head was Tulpius; and after him, Fehr: the former even makes it biceps, or two headed.

ACEPHALUS is alſo uſed in poetry, to expreſs a verſe defective in the beginning.

ACER, the MAPLE, or SYCAMORE TREE; a genus of the monœcia order, belonging to the polygamia claſs of plants; and ranking under the 23d natural order, Trihilatæ.

ACERATES, ſignifies an unmixed, or uncorrupted ſtate, whether of body or mind.

ACERB, a ſour rough aſtringency of taſte, ſuch as that of unripe fruit.

ACERIDES, plaſters made without wax.

ACERINA, in ichthyology, a name given by Pliny and other of the old naturaliſts, to the fiſh we at this time call the ruffe.

ACEROSUS, a term denoting the browneſt and coarſeſt ſort of bread.

ACERRA, in antiquity, an altar, erected among the Romans, near the bed of a perſon deceaſed, on which his friends daily offered incenſe till his burial. The real intention probably was to overcome any offenſive ſmell that might ariſe about the corpſe. The Chineſe have ſtill a cuſtom like this: they erect an altar to the deceaſed in a room hung with mourning; and place an image of the dead perſon on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

The acerra alſo ſignified a little pot, wherein were put the incenſe and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the ſame with what was otherwiſe called thuribulum, and pyxis.

We find mention of acerræ, in the ancient church. The Jews had alſo their acerræ, in our verſion rendered cenſers; and the Romaniſts ſtill retain them under the name of incenſe-pots. In Roman writers, we frequently meet with plena acerra, a full acerra: to underſtand which, it is to be obſerved, that people were obliged to offer incenſe in proportion to their eſtate and condition: the rich in larger quantities, the poor only a few grains; the former poured out acerras full on the altar, the latter took out two or three bits with their fingers.

ACESCENT, a word uſed to denote any thing which is turning ſour, or is ſlightly acid. It is only applied properly to the former of theſe two meanings. The ſecond may be expreſſed by either of the two words, acidulous or ſub-acid.

ACESTA, curable diſtempers.

ACESTIDES, the conductors of braſs founderies to confine the air, ſo as to cauſe it to aſcend rapidly in a narrow funnel, by which it increaſed the heat of the furnace.

ACESTIS, a fictitious ſort of chryſocolla, made of Cyprian verdigreaſe, nitre and urine.

ACETABULUM, in antiquity, a ſmall vaſe, or cup, uſed to ſerve up articles proper for ſervice at tables, much after the manner of our ſalts and vinegar cruets.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another, and thereby forming that ſpecies of articulation called Enarthroſis.

ACETABULUM, in botany, the name of a genus of the cryptogamia fungi, of Linnæus, the leaves of which reſemble a cup.

ACETARY, in the anatomy of plants, this term is applied to a pulpy ſubſtance in certain fruits, e. g. the pear, which is incloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACETIFICATION, in chemiſtry, the proceſs by which vinegar is made, which is done ſolely by expoſing vicious liquors in open veſſels, and may with propriety be called a ſpecies of fermentation, as the rarefaction of the ſaline particles is the chief point to be attended to.

ACETOSA, ſorrel; by Linnæus joined to the genus of dock, under the title of rumex.

ACETOSELLA, in botany, a ſpecies of oxalis.

ACETOUS, an epithet applied to ſuch ſubſtances as are ſour, or partake of the nature of vinegar.

ACETUM, vinegar, the vegetable acid of the chemiſts.

ACHAC, in ornithology, a bird very common in the Philippine iſlands.

ACHÆANS, a name given to the Grecians by ancient authors, alluding to the country they poſſeſſed.

ACHAIÆ PRESBYTERI, the preſbyters of Achaia, who are ſaid to have been preſent at the martyrdom of St. Andrew.

ACHALALACTLI, in ornithology, a ſpecies of king's fiſher, a bird remarkable for having a chain or ring of ſilver whiteneſs round its neck. It is common about the lakes and rivers of Mexico.

ACHANE, a Perſian corn meaſure, containing about 45 Attic medimni.

ACHAOVA, a medicinal plant, reſembling camomile. It is uſeful in many feveriſh diſorders.

ACHARISTON, a compoſition in medicine, of ſingular efficacy.

ACHAT, in law, implies a purchaſe or bargain: hence purveyors are called achators.

ACHATES, in mineralogy, the agate ſtone.

ACHE, or ACH, a painful ſenſation in the head, limbs, or any part of the body, occaſioned by chronic diſeaſes.

ACHEMENIS, an herb, with which Pliny relates had the property of exciting terror.

ACHERNER, in aſtronomy, a ſtar of the firſt magnitude, in the conſtellation Eridanus, whoſe longitude is 10° 31′ of Pices, and lat. 59° 18′ S. therefore inviſible in our latitude.

ACHEREST, a corn meaſure of about eight buſhels, anciently uſed in the northern counties of England.

ACHETA, in entomology, the ſame as cicada, of the order of hemiptera. See Syſtem of ENTOMOLOGY.

ACHIA, an Eaſt India pickle of the ſpecies of ſugar-cane.

ACHIAR, a general name for Eaſt Indian pickles imported into Europe.

ACHIÆNUS, in antiquity, implied a two years old deer.

ACHICOLUM, in antiquity, a medicated bath.

ACHILLEA, in medicine, the ſanguis draconis, or dragon's blood.

ACHILLÆA, YARROW, MILFOIL, NOSEBLEED, or SNEEZEWORT; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th Compoſitæ diſcoides. For its characters ſee Syſtem of BOTANY.

ACHILLEID, ACHILLEIS, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of his hero.

ACHILLES, a name given by ſchools to the principal argument alledged by each ſect of philoſophers in behalf of their ſyſtem. In this ſenſe we ſay, this is his Achilles, that is, his maſter-proof, alluding to the ſtrength and importance of Achilles among the Greeks.

Tendo ACHILLES, in anatomy, is a ſtrong tendonous cord, formed by the tendons of ſeveral muſcles, and inſerted into the os calcis. It has its name from the fatal wound Achilles is ſaid to have received in that part from Paris the ſon of Priam.

ACHIOTTE, or ACHIOTL, a Brazilian name for a red drug imported from America.

ACHIOTTE is uſed in dying, and in the preparation of chocolate. It is the ſame with the ſubſtance more uſually known by the name of *arnotto*; called by the Dutch *orleane*, and by the French *roucou*. In phyſic, it is a preſervative againſt retention of urine.

ACHIROPŒTOS, a name given by the ancient writers to certain miraculous pictures of Jeſus Chriſt and the Virgin Mary, ſuppoſed to have been made without hands. The moſt celebrated of theſe is the picture of Chriſt, preſerved in the church of St. John Lateran at Rome, ſaid to have been begun by St. Luke, but finiſhed by the miniſtry of angels.

ACHLYS, in medicine, a darkneſs or dimneſs of ſight, ariſing from a ſmall cicatricula on the pupil, occaſioned by a ſuperficial ulcer on the cornea.

ACHNE, in ancient authors, implied various things, ſuch as, froth; the white mucilage in the eyes of ſick perſons; white mucus in the fauces, thrown up by the lungs; chaff, huſks of fruit, &c.

ACHOR in medicine, a ſpecies of herpes.

ACHOR, in mythology, the god of flies, to whom, according to Pliny, the inhabitants of Cyrene ſacrfiiced, in order to obtain deliverance from thoſe inſects and the diſorders occaſioned by them.

ACHRAS, or Sapota Plum, a genus of the monogynia order, belonging to the hexandria claſs of plants, and ranking in the 43d natural order Dumoſæ.

There are four ſpecies, all natives of the Weſt Indies. The two principal ſorts are, 1ſt, the ſapota, with oblong leaves and ſmooth turbinated fruit. 2. The mamoſa, with ſpear-ſhaped leaves, and large oval fruit.

The firſt is common in the iſlands of Cuba and St. Domingo, but not in the Britiſh iſles. The ſecond is common in Jamaica, Barbadoes, and all the Weſt India iſlands, where it grows as a garden plant, to the height of 40 feet, having a ſtraight trunk, covered with aſh-coloured bark.

The ſtones of this fruit taken in emulſion are reckoned good againſt the gravel. No ſpecies of the achras can be preſerved in this country, except in the warmeſt ſtoves.

ACHRAT, in the Arabic, ſignifies life eternal, a term commonly made uſe of in the Turkiſh or Mahometan worſhip. This word is always oppoſed to *dinia*, the world, or preſent life. Alcoran, Ch. Houd.

Achrat, to the Perſian ſect of Ali, ſignifies, khaneh ferdai, i. e. the habitation of to-morrow; figuratively implying, that this life is but of one day's continuance; and eternity lies beyond it.

ACHROMATIC, ſignifies a want of colour. The word is Greek, compounded of *a*, privative, and *χϱομα*, colour.

ACHROMATIC Teleſcope, a teleſcope contrived to remedy the aberration in colours; for its principles and properties ſee Syſtem of Optics.

ACHTELING, a German liquid meaſure; 32 making a heemor; and 4 ſciltins make an achteling.

ACHTENDEELING, or Achteling, a corn meaſure uſed in the province of Holland.

ACHY, a ſpecies of caſſia that grows in Arabia.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia claſs of plants, aſſociating with the miſcellaneæ in the 54th natural order. There are eight ſpecies enumerated, and two more are added; however, the character of the genus does not agree in them all. They are all natives of India except the amaranthus, which is cultivated in botanical gardens. It grows to the height of three feet; flowers in July, and ſeeds in September.

ACHYRONIA, in botany, a name given by ſome authors to the aſpalathus of Linnæus.

ACHYROPHORUS, in botany, the ſame as the hypochæris.

ACIA, in Roman ſurgery, implied an eaſy manner of placing a roller over a wound.

ACICANTHERA, in botany, the trivial name of a ſpecies of rhexia.

ACICOCA, a Peruvian plant, which has the properties of the herb paraguay.

ACICULÆ, the ſmall pikes or prickles of fiſhes, the hedgehog, &c. &c.

ACIDITY, that quality which renders bodies acid.

ACIDOTON, in botany, the trivial name of a ſpecies of adelia.

ACIDS derive their name from the word *acere*, to be ſharp, and are always of a ſour ſalt taſte.

Acids, in chemiſtry, the name by which one of the general claſſes of ſalt are diſtinguiſhed. For the characteriſtic marks, ſee ſyſtem of Chemistry.

Acids derived from particular names, are regularly arranged to come under their proper heads alphabetically.

Acids, in medicine, imply ſuch liquids as have an acid quality, as ſpirits of vitriol, vinegar, &c. &c.

ACIDULÆ, cold mineral waters which contain a briſk ſpirit; in oppoſition to thoſe which are hot, called, thermæ.

ACIDULATED, a term applied to medicines which have an acid in their compoſition.

ACIDULOUS, denotes a thing that is ſlightly acid; it is ſynonimous with the word ſub-acid.

ACIDUM *Ætherium*, *Aluminoſum*, *Catholicum*, *Primigenium*, *Sulphureum*, ſeverally imply, ſpirit of vitriol.

Acidum *Aereum*, ſynonimous with fixed air.

Acidum *Pingue*, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalis, lime, &c. to give them their cauſtic properties: an effect which is found certainly to depend on the loſs of their fixed air.

ACINACES, in antiquity, a Perſian ſcimetar worn by chieftains, or principal captains of the military order.

ACINARIA, a botanic name for vaccinia paluſtria, or marſh whortle-berries.

ACINESIA, in medicine, the immobility of the whole of the body, or any part of it; as in the palſy, epilepſy, ſwooning, apoplexy, &c.

ACINI, in botany, ſmall grains or berries growing in bunches; as grapes, elder-berries, &c.

ACINODENDRON, or Acinodendrum, in botany, the trivial name of the thymus, in the claſs and order of didynamia gymnoſpermia.

ACINOS, ſtone, or wild baſil.

ACINUS, ſynonimous with Acini, but properly, only ſignifies the grape.

ACITLI, in ornithology, the lepus aqueus, or water hare.

ACKNOWLEDGMENT, in a general ſenſe, implies a confeſſion of ſomething had, done or received; but more particularly denotes the reward of ſome ſervice, or the grateful requital of a favour received.

Acknowledgment *Money*, a gift preſented to a new landlord, on the demiſe of the old one.

ACLIDES, in Roman antiquity, a kind of miſſive weapon, with a thong affixed to it, by which it might be drawn back after caſting it from the hand; moſt authors deſcribe it as a dart or javelin; but Scaliger ſays, it was globular, full of ſpikes, with a ſlender wood ſtem, to poiſe it by.

ACLOWA, in botany, a barbarous name of a ſpecies of colutea. The natives of Guinea uſe it to cure the itch, by rubbing it as we do unguents.

ACME, the top, or height of any thing. It is uſually applied to the maturity of an animal, juſt before it begins to decline. Phyſicians ſignify by it the height or worſt ſtage of a diſeaſe. It is alſo uſed to ſignify the prime or beſt part of a thing.

ACMELLA, or Achamella, in botany, the trivial name of a ſpecies of ſpilanthus.

ACNE, a ſmall pimple, or hard tubercle on the face.

ACNIDA, or Virginian Hemp, a genus of the dioecia order, and petandria claſs, in botany. As it is not applied to any uſe, the culture neceſſary to raiſe it is here unneceſſary; but in general terms, it may be growed as the European hemp.

ACNUA, amongſt the ancient Romans, ſignified a certain determinate meaſure of land, about a quarter of an acre Engliſh ſtatute meaſure.

ACNUM, in the language of the Alcoran, implies ſubſtance, or hypoſtaſis. The Turks and other Mahometans uſe it in prayer to ſignify a plurality in the Deity, yet they deny it to be a tenet of their church. D'Herbelot, Biblioth. Orient.

ACO, in ichthyology, a Mediterranean fiſh, called aquo, ſarachus, and ſarachinus.

ACOEMETÆ, or Acoemeti, in eccleſiaſtical hiſtory, ſignified the Alexandrian monks, a ſect ſet up by one Alexander at Conſtantinople, the beginning of the fifth century; they grounded their doctrine on the precept of St. Paul "to pray without ceaſing"; ſo that a conſtant ſucceſſion of prayer was kept up day and night by ſome of the members of the fraternity.

There are a kind of *acoemetæ* ſtill ſubſiſting in the Romiſh church; for ſo the religious of the holy ſacrament may properly be ſtiled, in that they keep up perpetual adoration; ſome or other of them praying before the ſacrament day and night.

ACOLCHICHI, in ornithology, a Mexican bird, called by Nieremberg, peterophœnicus Indiarum.

ACOLIN, a ſpecies of the partridge kind, a native of the Weſt India iſlands.

ACOLUTHISTS, Acolythists, or Acoluthi, an inferior order of clergy in the primitive church, among the Latins, and ranked next to the ſub-deacons. At their ordination, the archdeacon puts into their hands a candleſtick, with a taper, giving them to underſtand, they were to light candles for the church; as alſo an empty pitcher, to ſignify that they were to furniſh wine for the euchariſt. Some think they had another office, which was, to accompany and attend the biſhop, as alſo to bury the dead. The word comes from the Greek, *ακολȣθος*, a young ſervant. Heſychius.

Acoluthists, in philoſophy, ſignified a ſect of ſtoics, who never varied their principles, or turned aſide from the precepts of their doctrine.

ACOLYTHIA, in the Greek church, denotes the office of divine ſervice; or the prayers, ceremonies, hymns, &c. whereof the Greek ſervice is compoſed.

ACON, an inſtrument uſed in ancient exerciſes, like the diſcus.

Acon, a ſynonome of the knight's hoſpitallers.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great eſteem among the natives for its virtues in the ſmall-pox. They give an infuſion of it in wine. The leaves of this plant are opake, and as ſtiff as thoſe of the philyrea; they grow in pairs, and ſtand on ſhort foot-ſtalks; they are ſmall at each end, and broad in the middle; and the largeſt of them are about three inches in length, and an inch and quarter in breadth in the middle. Like thoſe of our bay, they are of a duſky colour on the upper ſide, and of a pale green underneath.

ACONE, in natural hiſtory, a whetſtone or hone, anciently called coticula by the Romans. It ſignifies alſo a mortar for levigation.

ACONITE, in botany, a plant famous among the ancients for having the quality of a poiſon and the properties of a remedy. Arrows dipt in its juice where they wound are ſaid to prove mortal. The Indians uſed aconite, corrected in cows urine, with good ſucceſs againſt fevers.

ACONITI, in antiquity, an appellation given to ſome of the athletæ, but differently interpreted. Mercurialis underſtands it of thoſe who only anointed their bodies with oil, but did not ſmear themſelves over with duſt, as was the uſual practice.

ACONITON, implies an unlined veſſel, or any thing that remains unfiniſhed within ſide.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD; a genus of the trigynia order, belonging to the polyandria claſs of plants. In the natural order, it aſſociates with the multiſiliquæ, 26. On account of the poiſonous qualities of monkſhood, no ſpecies of it ſhould be planted where children have acceſs, leſt they ſhould ſuffer by putting the leaves or flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occaſion great diſorder by being only rubbed upon very tender fleſh; and the farina of the flowers, when blown into the eyes, cauſes them to ſwell greatly. For the generic characters, ſee Syſtem of BOTANY.

ACONTIAS, in zoology, an obſolete name of the anguis jaculis, or dart-ſnake, belonging to the order of amphibia ſerpentes.

ACONTIUM, in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACOPA, in botany, the trifolium paludoſum, or buck bean.

ACOPA, in medicine, denotes a remedy againſt ſtrains of the body, loins, or limbs. It alſo implies ſoft cerates made uſe of for tumors.

ACOPIS, a foſſile ſalt, uſed by the ancients to anoint the limbs after fatigue.

ACOPIS, alſo ſignifies a valuable cryſtal.

ACOPOS, the laburnum, or baſe trefoil, ſome call the bean trefoil by this name.

ACOR, ſignifies acidity or ſourneſs.

ACORDINA, the Indian tutty.

ACORN, in natural hiſtory, the fruit of the oak-tree.

ACORN, in ſea language, a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſt-head. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail.

ACORUS, CALAMUS AROMATICUS, SWEET FLAG, or SWEET RUSH; a genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the ſecond natural order, Piperitæ. For the genuine characters, ſee Syſtem of BOTANY.

ACORUS, in the materia medica, a name ſometimes given to the great galangal.

ACORUS, or ACORI, in natural hiſtory, blue coral. The true ſort is very ſcarce; ſome, however, is fiſhed on the coaſts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandiſe which the Dutch trade for with the Camarones: that of the kingdom of Benin is alſo very much eſteemed. It grows in form of a tree on a rocky bottom.

ACOUSMATICI, ſometimes alſo called Acouſtici, in Grecian antiquity, ſuch of the diſciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, or the doctrine of ſounds. It is particularly applied to inſtruments uſed by thoſe who are dull of hearing.

ACOUSTIC *Duſt*, in anatomy, the ſame with meatus auditorius, or the external paſſage of the ear.

ACOUSTIC *Inſtrument*, or auricular tube, to aſſiſt the hearing.

ACOUSTIC *Veſſels*, in the ancient, theatres were a kind of veſſels made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of the theatres, which were not leſs than 400 feet in diameter.

ACOUSTIC *Diſciples*, among the ancient Pythagoreans, thoſe more commonly called Acouſmatici.

A NEW SYSTEM of ACOUSTICS, or PHONICS.

THIS ſcience comprehends the doctrine of ſounds, and is uſually divided into two parts; namely, diacouſtics, which explains thoſe ſounds that come directly from a ſonorous body to the ear; and catacouſtics, which treats of reflected ſounds; but ſuch diſtinction does not appear neceſſary, as the whole Syſtem may well be comprehended under one head, as will be clearly ſhewn from what follows:

DEFINITION I.

All ſounds are conveyed to us on the boſom of the air, whether they float upon it, or are propelled forward in it, otherwiſe there would be no ſound at all. Let the air be exhauſted from a receiver, and a bell ſhall emit no ſound when rung in the void; for, as the air continues to grow leſs denſe, the ſound dies away in proportion, ſo that at laſt its ſtrongeſt vibrations are almoſt totally ſilent.

Thus air is a vehicle for ſound. However, we muſt not, with ſome philoſophers, aſſert, that it is the only vehicle; that, if there were no air, we ſhould have no ſounds whatever: for it is found by trial, that ſounds are conveyed through water almoſt with the ſame facility with which they move through air. A bell rung in water returns a tone as diſtinct as if rung in the air. This was obſerved by Derham, who alſo remarked the tone came a quarter deeper. From hence, it would ſeem not to be very material in the propagation of ſounds, whether the fluid which conveys them be elaſtic or otherwiſe. Water, which, of all ſubſtances that we know, has the leaſt elaſticity, yet ſerves to carry them forward; and if we make allowance for the difference of its denſity, perhaps the ſounds move in it with a proportional rapidity to what they are found to do in the elaſtic fluid of air.

It is neceſſary to obſerve, that whether the fluid which conveys the note be elaſtic or non-elaſtic, whatever ſound we hear is produced by a ſtroke, which the ſounding body makes againſt the fluid, whether air or water. The fluid being ſtruck upon, carries the impreſſion forward to the ear, and there produces its ſenſation. Sound is nothing more than the impreſſion made by elaſtic body upon the air or water, and this impreſſion carried along by either fluid to the organ of hearing. Whether the ſound is diffuſed into the air, in circle beyond circle, like the waves of water when we diſturb the ſmoothneſs of its ſurface by dropping in a ſtone; or whether it travels along, like rays diffuſed from a centre, ſomewhat in the ſwift manner that electricity runs along a rod of iron, are queſtions which have divided the learned.

Sir Iſaac Newton has explained the progreſſion of ſound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of ſome inſects, we ſhall have a tolerable notion of the progreſſion of ſound upon this hypotheſis. The inſect, for inſtance, in its motion, firſt carries its contractions from the hinder part, in order to throw its fore-part to the proper diſtance, then it carries its contractions from the fore-part to the hinder to bring that forward. Something ſimilar to this is the motion of the air when ſtruck upon by a ſounding body.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of the *pulſes* of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. As to the velocity with which ſounds travel, Newton determines, by the moſt difficult calculation that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonſtrate, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth, in ſuch caſe, a pendulum, that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of the velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, which deſtroys entirely the force of his former demonſtration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute: a proportion which experience had eſtabliſhed nearly before.

Another theory advanced is, that every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface into all directions; ſo that the ſound firſt driven directly forward with a very ſwiſt motion, reſembling the velocity with which we know electricity flies from one end of a line to another.

Now, as to the pulſes, or cloſe ſhakes as the muſicians expreſs it, which a ſounding body is known to make, each pulſe is itſelf a diſtinct and perfect ſound, and the interval between every two pulſes is profoundly ſilent. Continuity of ſound from the ſame body is only a deception of the hearing; for as each diſtinct ſound ſucceeds at very ſmall intervals, the organ has no time to tranſmit its images with equal ſwiftneſs to the mind, and the interval is thus loſt to ſenſe: juſt as in ſeeing a flaming torch, if flared round in a circle, it appears as a ring of fire. In this manner a beaten drum, at ſome ſmall diſtance, preſents us with the idea of continuing ſound. When children run with their ſticks along a rail, a continuing ſound is thus repreſented, though it need ſcarce be obſerved that the ſtroke againſt each rail is perfectly diſtinct and inſulated.

All bodies whatſoever that are ſtruck, return more or leſs a ſound: but ſome, wanting elaſticity, give back no repetition of the ſound; the noiſe is at once begotten and dies: while other bodies, however, there are, which being more elaſtic and capable of vibration, give back a ſound, and repeat the ſame ſeveral times ſucceſſively. Theſe laſt are ſaid to have a tone; the others are not allowed to have any.

This tone of the elaſtic ſtring, or bell, is notwithſtanding nothing more than a ſimilar ſound of what the former bodies produced, but with the difference of being many times repeated while their notes is but ſingle. So that, if we would give the former bodies a tone, it will be neceſſary to make them repeat their ſound, by repeating our blows ſwiftly upon them. This will effectually give them a tone; and even an unmuſical inſtrument has often had a fine effect by its tone in our concerts.

We now then come to a critical queſtion, what is it that produces the difference of tone in two elaſtic ſounding bells or ſtrings? Or what makes one deep and the other ſhrill? This queſtion has always been hitherto anſwered by ſaying, that the depth or height of the note proceeded from the ſlowneſs or ſwiftneſs of the times of the vibrations. The ſloweſt vibrations, it has been ſaid, are qualified for producing the deepeſt tones, while the ſwifteſt vibrations produce the higheſt tones. In this caſe, an effect has been given for a cauſe. It is in fact the force with which the ſounding ſtring ſtrikes the air when ſtruck upon, that makes the true diſtinction in the tones of ſounds. It is this force, with greater or leſs impreſſions, reſembling the greater or leſs force of the blows upon a non-elaſtic body, which produces correſpondent affections of ſound. The greateſt forces produce the deepeſt ſounds: the high notes are the effect of ſmall efforts. In the ſame manner a bell, wide at the mouth, gives a grave ſound; but if it be very maſſy withal, that will render it ſtill graver; but if maſſy, wide, and long or high, that will make the tone deepeſt of all.

Thus, then, will elaſtic bodies give the deepeſt ſonnd, in proportion to the force with which they ſtrike the air: but if we ſhould attempt to increaſe their force by giving them a ſtronger blow, this will be in vain; they will ſtill return the ſame tone; for ſuch is their formation, that they are ſonorous only becauſe they are elaſtic, and the force of this elaſticity is not increaſed by our ſtrength, as the greatneſs of a pendulum's vibration will not be increaſed by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepeſt tones, it has been found, from the nature of elaſtic ſtrings, that the longeſt ſtrings have the wideſt vibrations, and conſequently go backward and forward ſloweſt; while, on the contrary, the ſhorteſt ſtrings vibrate the quickeſt, or come and go in the ſhorteſt intervals. From hence thoſe who have treated of ſounds, have aſſerted, as was ſaid before, that the tone of the ſtring depended upon the length or the ſhortneſs of the vibrations. This, however, is not the caſe. One and the ſame ſtring, when ſtruck, muſt always, like the ſame pendulum, return preciſely ſimilar vibrations; but it is well known, that one and the ſame ſtring, when ſtruck npon, does not always return preciſely the ſame tone: ſo that in this caſe the vibrations follow one rule, and the tone another. The vibrations muſt be invariably the ſame in the ſame ſtring, which does not return the ſame tone invariably, as is well known to muſicians in general. In the violin, for inſtance, they can eaſily alter the tone of the ſtring an octave or eight notes higher, by a ſofter method of drawing the bow; and ſome are known thus to bring out the moſt charming airs imaginable. Theſe peculiar tones are by fidlers called *flute-notes*. The only reaſon, it has been alleged, that can be aſſigned for the ſame ſtring thus returning different tones, muſt certainly be the different force of its ſtrokes upon the air. In one caſe, it has double the tone of the other; becauſe upon the ſoft touches of the blow, only half its elaſticity is put into vibration.

From hence alſo we may account for the cauſe of thoſe charming melancholy gradations of ſound in the Eolian lyre. This inſtrument is eaſily made, being nothing more than a long narrow box of thin dale, about 30 inches long, 5 inches broad, and 1¼ inches deep, with a circle in the middle of the upper ſide or belly about 1½ inch diameter, pierced with ſmall holes. On this ſide are ſeven, ten, or fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins. The ſtrings are all tuned to one and the ſame note; and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound; ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs; it feels for every tone, and by its gradations of ſtrength ſolicits thoſe gradations of ſound, which art has taken different methods to produce.

We ſhall now conſider the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant; to remedy this, therefore, the bow muſt be preſſed the harder, as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much further off as the ſwiftneſs in them exceeds the force in the other.

But there is another property in the vibration of a muſical ſtring, which greatly tends to ſubſtantiate the foregoing theory. If we ſtrike the ſtring of an harpſichord, or any other elaſtic ſounding chord whatever, it returns a continuing ſound. This, till of late, was conſidered as one ſimple uniform tone; but all muſicians now confeſs, that inſtead of one tone it actually returns four tones, and that conſtantly. The notes are, beſides the fundamental tone, an octave above, a twelfth above, and a ſeventeenth. One of the baſs-notes of an harpſichord has been diſſected in this manner by Rameau, and the actual exiſtence of theſe tones proved beyond a poſſibility of being controverted. In fact, the experiment is eaſily tried; for if we ſmartly ſtrike one of the lower keys of an harpſichord, and then take the finger briſkly away, a tolerable ear will be able to diſtinguiſh, that, after the fundamental tone has ceaſed, three other ſhriller tones will be diſtinctly heard; firſt the octave above, then the twelfth, and laſtly the ſeventeenth: the octave above is in general almoſt mixed with the fundamental tone, ſo as not to be eaſily perceived, except by an ear long habituated to the minute diſcriminations of ſounds. So that we may obſerve, that the ſmalleſt tone is heard laſt, and the deepeſt and largeſt one firſt: the two others in order: in ſhort, in the whole theory of ſounds, nothing has given greater room for ſpeculation, conjecture, and diſappointment, than this amazing property in elaſtic ſtrings. The whole ſtring is univerſally acknowledged to be in vibration in all its parts, yet this ſingle vibration returns no leſs than four different ſounds. So that from hence we may juſtly infer, that every note whatſoever is only a ſucceſſion of tones; and that thoſe are moſt diſtinctly heard, whoſe differences are moſt eaſily perceivable.

In ſpeaking of elaſtic and non-elaſtic bodies in a muſical ſenſe, we are not to puſh the diſtinction ſo far as when we ſpeak of them philoſophically. A body is *muſically* elaſtic, all of whoſe parts are thrown into vibrations ſo as to emit a ſound when only part of their ſurface is ſtruck. Of this kind are bells, muſical ſtrings, and all bodies whatever that are conſiderably hollow. Muſical non-elaſtics are ſuch bodies as emit a ſound only from that particular place which is ſtruck: thus, a table, a plate of iron nailed on wood, a bell ſunk in the earth, are all of them non-elaſtics in a muſical ſenſe, though not philoſophically ſo. When a ſolid body, ſuch as a log of wood, is ſtruck with a ſwitch, only that part of it emits a ſound which comes in contact with the ſwitch; the note is acute and loud, but would be no leſs ſo though the adjacent parts of the log were removed. If, inſtead of the ſwitch, a heavier or larger inſtrument is made uſe of, a larger portion of its ſurface then returns a ſound, and the note is conſequently more grave ; but it would not be ſo if the large inſtrument ſtruck with a ſharp edge, or a ſurface only equal to that of the ſmall one.

In ſounds of this kind, where there is only a ſingle thwack, without any repetition, the immediate cauſe of the gravity or acuteneſs ſeems to be the quantity of air diſplaced by the ſounding body ; a large quantity of air diſplaced produces a grave ſound, and a ſmaller quantity a more acute one, the force wherewith the air is diſplaced ſignifying very little. Dr. Prieſtley has made ſome curious experiments concerning the *muſical tone* of electrical diſcharges. The paſſage being entertaining, and not very long, we ſhall here tranſcribe it.

" As the courſe of my experiments has required a great variety of electrical exploſions, I could not help obſerving a great variety in the muſical tone made by the reports. This excited my curioſity to attempt to reduce this variation to ſome meaſure. Accordingly, by the help of a couple of ſpinets, and two perſons who had good ears for muſic, I endeavoured to aſcertain the tone of ſome electrical diſcharges ; and obſerved, that every diſcharge made ſeveral ſtrings, particularly thoſe that were chords to one another, to vibrate: but one note was always predominant, and ſounded after the reſt. As every exploſion was repeated ſeveral times, and three of us ſeparately took the ſame note, there remained no doubt but that the tone we fixed upon was at leaſt very near the true one. The reſult was as follows :

" A jar containing half a ſquare foot of coated glaſs ſounded F ſharp, concert pitch. Another jar of a different form, but equal ſurface, ſounded the ſame.

" A jar of three ſquare feet ſounded C below F ſharp. A battery conſiſting of ſixty-four jars, each containing half a ſquare foot, ſounded F below the C.

" The ſame battery, in conjunction with another of thirty-one jars, ſounded C ſharp. So that a greater quantity of coated glaſs always gave a deeper note.

" Differences in the degree of a charge in the ſame jar made little or no difference in the tone of the exploſion : if any, a higher charge gave rather a deeper note."

Theſe experiments ſhew us how much the gravity or acuteneſs of ſounds depend on the quantity of air put in agitation by the ſounding body. We know that the noiſe of the electric exploſion ariſes from the return of the air into the vacuum produced by the electric flaſh. The larger the vacuum, the deeper was the note ; for the ſame reaſon, the diſcharge of a muſket produces a more acute note than that of a cannon ; and thunder is deeper than either.

The foregoing argument uſed by Dr. Prieſtley on the production of what are called *flute-notes* on the violin, we conceive to be built on a falſe foundation ; for the bow being lightly drawn on an open ſtring, produces no flute-notes, but only the harmonies of the note to which the ſtring is tuned. The flute-notes are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, though at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant : nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficiently to over-turn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed inappretiable, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin, than when faſtened to a plain board, &c. In the ſound of a bell, we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly ; the ſound would indeed become more ſimple, but would ſtill preſerve the ſame tone. In muſical ſtrings the reverberations are vaſtly more quick than in bells ; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes, the vibrations muſt be inconceivably quicker than in any bell, or ſtringed inſtrument : and hence they are of all others the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt. As far as we can judge, quickneſs of vibration contributes to the uniformity, or ſimplicity, but not to the acuteneſs, nor to the loudneſs, of a muſical note.

DEFINITION II.

Under this head we ſhall treat of the propagation of ſounds, and take notice of the obſervations made, among others, by the ingenious Dr. Young, of Trinity College, Dublin, who ſtates them as follow :

" 1. The parts of all ſounding bodies, he obſerves, vibrate according to the law of a cycloidal pendulum : for they may be conſidered as compoſed of an indefinite number of elaſtic fibres ; but theſe fibres vibrate according to that law. Vide Helſham, p. 270.

" 2. Sounding bodies propagate their motions on all ſides *in directum*, by ſucceſſive condenſations and rarefactions, and ſucceſſive goings forward and returnings backward of the particles. Vide Prop. 43. B. 2. Newton.

" 3. The pulſes are thoſe parts of the air which vibrate backwards and forwards ; and which, by going forward, ſtrike (pulſant) againſt obſtacles. The latitude of a pulſe is the rectilineal ſpace through which the motion of the air is propagated during one vibration of the ſounding body.

" 4. All pulſes move equally faſt. This is proved by experiment ; and it is found that they deſcribe 1070 Paris feet, or 1142 London feet in a ſecond, whether the ſound be loud or low, grave or acute.

" 5. To determine the latitude of a pulſe. Divide the ſpace which the pulſe deſcribes in a given time (4) by the number of vibrations performed in the ſame time by the ſounding body, Cor. 1. Prop. 24. Smith's Harmonics, the quotient is the latitude.

" M. Sauveur, by ſome experiments on organ-pipes, found that a body, which gives the graveſt harmonic ſound, vibrates 12 times and a half in a ſecond, and that the ſhrilleſt ſounding body vibrates 51.100 times in a ſecond. At a medium, let us take the body which gives what Sauveur calls his fixed ſound : it performs 100 vibrations in a ſecond, and in the ſame time the pulſes deſcribe 1070 Pariſian feet ; therefore the ſpace deſcribed by the pulſes whilſt the body vibrates once, that is the latitude or interval of the pulſe, will be 10.7 feet.

" 6. To find the proportion which the greateſt ſpace, through which the particles of the air vibrate, bears to the radius of a circle, whoſe perimeter is equal to the latitude of the pulſe.

" During the firſt half of the progreſs of the elaſtic fibre, or ſounding body, it is continually getting nearer to the next particle ; and during the latter half of its progreſs, that particle is getting farther from the fibre, and theſe portions of time are equal (Helſham): therefore we may conclude, that at the end of the progreſs of the fibre, the firſt particle of air will be nearly as far diſtant from the fibre as when it began to move ; and in the ſame manner we may infer, that all the particles vibrate through ſpaces nearly equal to that run over by the fibre.

" Now, M. Sauveur (Acad. Science, an. 1700, p. 141) has found by experiment, that the middle point of a chord which produces his fixed ſound, and whoſe diameter is 1-6th of a line, runs over in its ſmalleſt ſenſible vibrations 1-18th of a line, and in its greateſt vibrations 72 times that ſpace ; that is 72 × 1-18th of a line, or 4 lines, that is, 1-3d of an inch.

" The latitude of the pulſes of this fixed ſound is 10.7 feet (5) ; and ſince the circumference of a circle is to its radius as 710 is to 113, the greateſt ſpace deſcribed by the particles will be to the radius of a circle, whoſe periphery is equal to the latitude of the pulſe as 1-3d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

" If the length of the ſtring be increaſed or diminiſhed in any proportion, *cæteris paribus*, the greateſt ſpace deſcribed by its middle point will vary in the ſame proportion. For the inflecting force is to the tending force as the diſtance of the ſtring from the middle point of vibration to half the length of the ſtring (ſee Helſham and Martin) ; and therefore the inflecting and tending forces being given, the ſtring will vibrate through ſpaces proportional to its length : but the latitude of the pulſe is inverſely as the number of vibrations performed by the ſtring in a given time, (5) that is, directly as the time of one vibration, or directly as the length of the ſtring (Prop. 24, Cor. 7. Smith's Harmonics) ; therefore the greateſt ſpace through which the middle point of the ſtring vibrates, will vary in the direct ratio of the latitude of the pulſe, or of the radius of a circle whoſe circumference is equal to the latitude, that is, it will be to that radius as 1 to 61.3044.

" 7. If the particles of the aërial pulſes, during any part of their vibration, be ſucceſſively agitated, according to the law of a cycloidal pendulum, the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards be agitated, will be ſuch as will cauſe the particles to continue that motion, according to the ſame law, to the end of their vibration.

" 8. If a particle of the medium be agitated, according to the law of a cycloidal pendulum, the comparative elaſtic force, acting on the adjacent particle, from the inſtant in which it begins to move, will be ſuch as will cauſe it to continue its motion, according to the ſame law.

" 9. To find the velocity of the pulſes, the denſity and elaſtic force of the medium being given.

" This is the 49th Prop. B. 2. Newton, in which he ſhews, that whilſt a pendulum, whoſe length is equal to the height of the homogeneous atmoſphere, vibrates once forwards and backwards, the pulſes will deſcribe a ſpace equal to the periphery of a circle deſcribed with that altitude as its radius.

" Cor. 1. He thence ſhews, that the velocity of the pulſes is equal to that which a heavy body would acquire in falling down half the latitude of that homogeneous atmoſphere; and therefore, that all pulſes move equally faſt, whatever be the magnitude or time of its being deſcribed; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

" Cor. 2. And alſo, that the velocity of the pulſes is in a ratio compounded of the direct ſubduplicate ration of the elaſtic force of the medium, and the inverſe ſubduplicate of its denſity. Hence ſounds move ſomewhat faſter in ſummer than in winter. See *Hales de Sonis*, p. 141.

" 10. The ſtrength of a tone is as the moment of the particles of air. The moment of theſe particles, (the medium being given) is as their velocity; and the velocity of theſe particles is as the velocity of the ſtring which ſets them in motion. The velocities of two different ſtrings are equal when the ſpaces which they deſcribe in their vibrations are to each other as the times of theſe vibrations: therefore, two different tones are of equal ſtrength, when the ſpaces, through which the ſtrings producing them vibrate, are directly as the times of their vibration.

DEFINITION III.

Experience has taught us, that ſound travels at the rate of 1142 feet in a ſecond, or near 13 miles in a minute; nor do any obſtacles hinder its progreſs.

The method of calculating its progreſs is eaſily made known. When a gun is diſcharged at a diſtance, we ſee the fire long before we hear the ſound. If then we know the diſtance of the place, and know the time of the interval between our firſt ſeeing the fire and then hearing the report, this will ſhew us exactly the time the ſound has been travelling to us. For inſtance, if the gun is diſcharged a mile off, the moment the flaſh is ſeen, you take a watch and count the ſeconds till you hear the ſound; the number of ſeconds is the time the ſound has been travelling a mile. Again, by the above axiom, we are enabled to find the diſtance between objects that would be otherwiſe immeaſurable. For example, ſuppoſe you ſee the flaſh of a gun in the night at ſea, and tell ſeven ſeconds before you hear the report, it follows therefore, that the diſtance is ſeven times 1142 feet, that is, 24 yards more than a mile and a half. In like manner, if you obſerve the number of ſeconds between the lightning and the report of the thunder, you know the diſtance of the cloud from whence it proceeds.

Derham has proved by experience, that all ſounds whatever travel at the ſame rate. The ſound of a gun, and the ſtriking of a hammer, are equally ſwift in their motions; the ſofteſt whiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following:

Smooth and clear ſounds proceed from bodies that are homogeneous, and of an uniform figure; and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

The velocity of ſound is to that of a briſk wind as fifty to one.

The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rarified.

Every point againſt which the pulſes of ſound ſtrike, becomes a centre from which a new ſeries of pulſes are propagated in every direction.

Sound deſcribes equal ſpaces in equal times.

Sound, like light, after it has been reflected from ſeveral places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whiſpering gallery is conſtructed.

The form of this gallery muſt be that of a concave hemiſphere, and if a low ſound or whiſper be uttered, the vibrations will expand themſelves every way, till being brought to a point, the ſound will be diſtinctly heard.

The augmentation of ſound by means of ſpeaking-trumpets, is very conſiderable. When a perſon ſpeaks through one of theſe inſtruments, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube. For a perſon ſpeaking without the tube, will have the force of his voice ſpent in exciting concentric ſuperficies of air all around the mouth of the trumpet; and when thoſe ſuperficeis or pulſes of air are diffuſed, it is plain the force of the voice will there be diffuſed through the whole ſuperficies of a ſphere; but in the trumpet it will be ſo confined, that at its exit it will be diffuſed through ſo much of that ſpherical ſurface of air as correſponds to the orifice of the tube. But ſince the force is given, its intenſity will be always inverſely as the number of particles it has to move; and therefore in the tube it will be to that without, as the ſuperficies of ſuch a ſphere to the æra of the large end of the tube nearly.

The ingenious Kircher has ſuggeſted principles in his Phonurgia, which are deſerving our attention. He tells us, that " the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity."

Sir Iſaac Newton ſeems alſo to have conſidered this as the principal cauſe, in the Scholium of Prop. 50. B. 2. Princip. when he ſays " we hence ſee why ſounds are ſo much increaſed in ſtenterophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe.

Farther, when we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points; thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequently the ſound increaſed. The confinement too of the voice may have ſome effect, though not ſuch as is aſcribed to it by ſome; for the condenſed pulſes produced by the naked voice, freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

If the tube be laid on any non-elaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking-trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth-piece, becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity, will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe proportionally. The ſeveral cauſes, therefore, of the increaſe of ſound in theſe tubes, Mr. Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity.

An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs: but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottos, mountains, and ruined buildings, return this image of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in Flanders. If a perſon ſung, he only heard his own voice, without any repetition: on the contrary, thoſe who ſtood at ſome diſtance, heard the echo but not the voice; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near, then more diſtant. There is an account in the memoirs of the French academy, of a ſimilar echo near Rouen.

As there may be ſeveral ſphæroids of different magnitudes, ſo there may be ſeveral different echoes of the ſame original ſound. And as there may happen to be a greater number of reflecting points in the ſurface of an exterior ſphæroid than in that of an interior, a ſecond or a third echo may be much more powerful than the firſt, provided that the ſuperior number of reflecting points, that is, the ſuperior number of reeflected pulſes propagated to the ear, be more than ſufficient to compenſate for the decay of ſound which ariſes from its being propagated through a greater ſpace. This is finely illuſtrated in the celebrated echoes at the lake of Killarney in the county of Kerry, in Ireland, where the firſt return of the ſound is much inferior in ſtrength to thoſe which immediately ſucceed it.

From what has been laid down it appears, that for the moſt powerful echo, the ſounding body ſhould be in one focus of the ellipſe, which is the ſection of the echoing ſphæroid, and the hearer in the other. However, an echo may be heard in other ſituations, though not ſo favourably; as ſuch a number of reflected pulſes may arrive at the ſame time at the ear as may be ſufficient to excite a diſtinct perception.

In churches we never hear a diſtinct echo of the voice, but a confuſed ſound when the ſpeaker utters his words too rapidly; becauſe the greateſt difference of diſtance between the direct and reflected courſes of ſuch a number of pulſes as would produce a diſtinct ſound, is never in any church equal to 127 feet, the limit of echoes.

But though the firſt reflected pulſes may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting ſurface may be ſo formed, as that the pulſes which come to the ear after two reflections or more may, after having deſcribed 127 feet or more, arrive at the ear in ſufficient numbers, and alſo ſo nearly at the ſame inſtant, as to produce an echo, though the diſtance of the reflecting ſurface from the ear be leſs than the limit of echoes. This is confirmed by a ſingular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Caſtlecomber, in the county of Kilkenny. As you enter the cave, and continue ſpeaking loud, no return of the voice is perceived; but on your arriving at a certain point which is not above 14 or 15 feet from the reflecting ſurface, a very diſtinct echo is heard. Now this echo cannot ariſe from the firſt courſe of pulſes that are reflected to the ear, becauſe the breadth of the cave is ſo ſmall, that they would return too quickly to produce a diſtinct ſenſation from that of the original ſound: it therefore is produced by thoſe pulſes, which, after having been reflected ſeveral times from one ſide of the grotto to the other, and having run over a greater ſpace than 127 feet, arrive at the ear in conſiderable numbers, and not more diſtant from each other in point of time, than the ninth part of a ſecond.

We ſhall diſmiſs this article with a few entertaining experiments, founded on ſome of the preceding principles.

I. Place a concave mirror of about two feet diameter, in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches diſtance from its ſurface. At the diſtance of about five or ſix feet let there be a partition, in which there is an opening, equal to the ſize of the mirror; againſt this opening muſt be placed a picture, painted in water-colours, on a thin cloth, that the ſound may eaſily paſs through it.

Behind the partition, at the diſtance of two or three feet, place another mirror of the ſame ſize as the former, and let it be immediately oppoſite to it; at the point of which let there be placed the figure of a man ſeated on a pedeſtal, and let his ear be placed exactly in the focus of the firſt mirror: his lower jaw muſt be made to open by a wire, and ſhut by a ſpring; and there may be another wire to move the eyes: theſe wires muſt paſs through the figure, go under the floor, and come up behind the partition.

Let a perſon, properly inſtructed, be placed behind the partition near the mirror. You then propoſe to any one to ſpeak ſoftly to the ſtatue, by putting his mouth to the ear of it, aſſuring him that it will anſwer inſtantly. You then give the ſignal to the perſon behind the partition, who, by placing his ear to the focus of the mirror, will hear diſtinctly what the other ſaid; and, moving the jaw and eyes of the ſtatue by the wires, will return an anſwer directly, which will in like manner be diſtinctly heard by the firſt ſpeaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worceſter; whoſe deſigns, at the time they were publiſhed, were treated with ridicule and neglect as being impracticable, but are now known to be generally if not univerſally practicable. The words of the Marquis are theſe: "How to make a brazen or ſtone head in the midſt of a great field or garden, ſo artificial and natural, that though a man ſpeak ever ſo ſoftly, and even whiſper into the ear thereof, it will preſently open its mouth, and reſolve the queſtion in French, Latin, Welſh, Iriſh, or Engliſh, in good terms, uttering it out of its mouth, and then ſhut it until the next queſtion be aſked.

The two following, of a ſimilar nature, appear to have been inventions of Kircher, by means of which (as he informs us) he uſed to utter feigned and ludicrous conſultations, with a view to ſhew the fallacy and impoſture of ancient oracles.

II. Let there be two heads of plaſter of Paris, placed on pedeſtals, on the oppoſite ſides of a room. There muſt be a tin tube of an inch diameter, that muſt paſs from the ear of one head through the pedeſtal, under the floor, and go up to the mouth of the other. Obſerve, that the end of the tube which is next the ear of the one head, ſhould be conſiderably larger than that end which comes to the mouth of the other. Let the whole be ſo diſpoſed that there may not be the leaſt ſuſpicion of a communication.

Now, when a perſon ſpeaks, quite low, into the ear of one buſt, the ſound is reverberated through the length of the tube, and will be diſtinctly heard by any one who ſhall place his ear to the mouth of the other. It is not neceſſary that the tube ſhould come to the lips of the buſt. If there be two cubes, one going to the ear, and the other to the mouth, of each head, two perſons may converſe together, by applying their mouth and ear, reciprocally to the mouth and ear of the buſts; and at the ſame time other perſons that ſtand in the middle of the chamber, between the heads, will not hear any part of their converſation.

III. Place a buſt on a pedeſtal in the corner of a room, and let there be two tubes, as in the foregoing experiment, one of which muſt go from the mouth and the other from the ear of the buſt, through the pedeſtal, and the floor, to an under apartment. There may be likewiſe wires that go from the under jaw and the eyes of the buſt, by which they may be eaſily moved.

A perſon being placed in the under room, and at a ſignal given applying his ear to one of the tubes, will hear any queſtion that is aſked, and immediately reply; moving at the ſame time, by means of the wires, the mouth and the eyes of the buſt, as if the reply came from it.

IV. In a large caſe, ſuch as is uſed for dials and ſpring-clocks, the front of which, or at leaſt the lower part of it, muſt be of glaſs, covered on the inſide with gauze, let there be placed a barrel-organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there muſt be joined a wire, at the end of which there is a flat circle of cork, of the ſame dimenſion with the inſide of a glaſs tube, in which it is to riſe and fall. This tube muſt communicate with a reſervoir that goes a croſs the front part of the bottom of the caſe, which is to be filled with ſpirits, ſuch as is uſed in thermometers, but not coloured, that it may be the better concealed by the gauze.

This caſe being placed in the ſun, the ſpirits will be rarefied by the heat; and riſing in the tube, will lift up the catch or trigger, and ſet the organ in play; which it will continue to do as long as it is kept in the ſun; for the ſpirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from riſing beyond a certain point by a check placed over it.

When the machine is placed againſt the ſide of a room on which the ſun ſhines ſtrong, it may conſtantly remain in the ſame place, if you incloſe it in a ſecond caſe, made of thick wood, and placed at a little diſtance from the other. When you want it to perform, it will be only neceſſary to throw open the door of the outer caſe, and expoſe it to the ſun.

But if the machine be moveable, it will perform in all ſeaſons by being placed before the fire; and in the winter it will more readily ſtop when removed into the cold.

A machine of this ſort is ſaid to have been invented by Cornelius Dreble, in the laſt century. What the conſtruction of that was, we know not; it might very likely be more complex, but could ſcarce anſwer the intention more readily.

V. Under the keys of a common harpſichord let there be fixed a barrel, ſomething like that in a chamber organ, with ſtops or pins correſponding to the tunes you would have it play. Theſe ſtops muſt be moveable, ſo that the tunes may be varied at pleaſure. From each of the keys let there go a wire perpendicular down: the ends of theſe wires muſt be turned up for about one-fourth of an inch. Behind theſe wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpſichord. The barrel and wires are to be all incloſed in a caſe.

In the chimney of the ſame room where the harpſichord ſtands, or at leaſt in one adjacent, there muſt be a ſmoak-jack, from whence comes down a wire, or cord, that, paſſing behind the wainſcot adjoining the chimney, goes under the floor, and up one of the legs of the harpſichord, into the caſe, and round a ſmall wheel fixed on the axis of that firſt mentioned. There ſhould be pullies at different diſtances, behind the wainſcot and under the floor, to facilitate the motion of the chord.

This machinery may be applied to any other keyed inſtrument as well as to chimes, and to many other purpoſes where a regular continued motion is required.

An inſtrument of this ſort may be conſidered as a perpetual motion, according to the vulgar acceptation of the term; for it will never ceaſe going till the fire be extinguiſhed, or ſome parts of the machinery be worn out.

ACQUIETANDES Plegiis, a writ of juſtices, lying for a ſurety againſt the creditor that refuſes to acquit him after the debt is paid.

ACQUISITION, in general, denotes the obtaining or procuring ſomething. Among lawyers, it is uſed for the right or title to an eſtate got by purchaſe or donation.

ACQUITTAL, a diſcharge, deliverance, or ſetting of a perſon free from the guilt or ſuſpicion of an offence.

ACQUITTANCE, a releaſe or diſcharge in writing for a ſum of money, witneſſing that the party has paid the ſaid ſum. No man is obliged to pay a ſum of money if the demandant refuſes to give an acquittance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRASIA, among phyſicians, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body.

ACRATISMA, in antiquity, a breakfaſt among the old Greeks, conſiſting of a morſel of bread ſoaked in pure unmixed wine.

ACRE, the univerſal meaſure of land in Britain. The word formed from the Saxon *acher*, or the German *aker*, a field. An acre in England contains four ſquare roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by ſtatute. Yet this meaſure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called cuſtomary meaſure, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is alſo divided into 10 ſquare chains, of 22 yards each, that is, 4840 ſquare yards. An acre in Scotland contains four ſquare roods; one ſquare rood is 40 ſquare falls; one ſquare fall, 36 ſquare ells; one ſquare ell, nine ſquare feet and 73 ſquare inches; one ſquare foot, 144 ſquare inches. The Scots acre is alſo divided into 10 ſquare chains; the meaſuring chain ſhould be 24 ells in length, divided into 100 links, each link $8\frac{928}{1000}$ inches; and ſo one ſquare chain will contain 10,000 ſquare links.

Acre *Fight*, an old ſort of duel fought by Engliſh and Scottiſh combatants, between the frontiers of their kingdoms, with ſword and lance: it was alſo called camp-fight, and the combatants champions, from the open field being the ſtage of trial.

Acre *Tax*, a tax laid on land at ſo much per acre. In ſome places this is alſo called acre-ſhot. Impoſitions on lands in the great level are to be raiſed by a proportionable acre-tax, 20 Car. II. cap 8. An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACREME, in ancient law-books, 10 acres ſtatute meaſure.

ACRIBEIA, a term purely Greek, literally denoting an exquiſite or delicate accuracy; ſometimes uſed in our language, for want of a word of equal ſignification.

ACRID, a name for any thing that is of a ſharp or pungent taſte.

ACRIMONY, that quality which renders things acrid to the taſte. Alſo implies aſperity, or ſharpneſs of temper.

ACRIS, the extremities of fractured bones.

ACROAMATIC, in general, denotes a thing ſublime, profound, or abſtruſe. It is ſometimes uſed for any thing kept ſecret, or remote from popular uſe.

ACROAMATICI, a denomination given the diſciples or followers of Ariſtotle, &c. who were admitted into the ſecrets of the inner or acroamatic philoſophy.

ACROATIC. Ariſtotle's lectures to his diſciples were of two kinds, exoteric and acroatic. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations.

ACROBATICA, or Acrobaticum, from ακρος, high, and βαδεω, or βαινω, I go; an ancient engine, whereby people were raiſed aloft, that they might ſee more conveniently about them. The *acrobatica* among the Greeks amounted to the ſame with what they call *ſcanſorium* among the Latins.

ACROCHERISMUS, among the Greeks, a ſort of gymnaſtic exerciſe, in which the two combatants contended with their hands and fingers only, without cloſing or engaging the other parts of the body.

ACROCHORDON, a painful ſort of wart, very prominent and pendulous, having a large head, with a ſmall pedicle or baſe.

ACROCOLIA ſignifies the extremities of animals which are uſed in food, as the feet of calves, ſwine, ſheep, oxen, or lambs, and from which jellies are made. They are recommended by Hippocrates as a proper food where there is a tendency to a dropſy. They are in general recommended as ſtrengtheners to people of weak conſtitutions.

ACROCORION, in botany, a name uſed by ſome authors for the ſeveral ſpecies of the ſpring crocuſes.

ACROE, in botany, the Guinea trefoil. See Phil. Tranſ. No. 232.

ACROMATIC, in optics, a term applied to a particular ſpecies of teleſcope, the moſt perfect of the refracting kind.

ACROMION, in anatomy, the upper part of the ſcapula, or ſhoulder-blade. See System of Anatomy.

ACROMONOGRAMMATICUM, in poetry, a kind of poem, wherein every ſubſequent verſe begins with the letter wherewith the immediately preceding one terminated.

ACROMPHALION, the tip of the navel.

ACRONICAL, Achronycal, or Achronical, in aſtronomy, is a term applied to the riſing of a ſtar, when the ſun is ſet in the evening; but has been promiſcuouſly uſed to expreſs a ſtar's riſing at ſunſet, or ſetting at ſun-riſe.

ACRONYCTÆ, ſtars riſing before twilight, or about ſun-ſet.

ACROSPIRE, a vulgar term for what botaniſts call the plume.

ACROSPIRED, in malt-making, is the grain's ſhooting both at the root and blade end.

ACROSTIC, in poetry, a kind of poetical compoſition, diſpoſed in ſuch a manner, that the initial letters of the verſes form the name of ſome perſon, kingdom, place, motto, &c.

ACROSTICUM, Rustyback, Wall-rue, or Fork-fern, in the Linnæan ſyſtem of botany, a genus of the cryptogamia filices.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament uſed on the prows of their ſhips, which was ſometimes in the ſhape of a buckler, helmet, animal, &c. but more frequently circular, or ſpiral. It was uſual to tear them from the prows of vanquiſhed veſſels, and fix them to the conquerors, as a ſignal of victory.

ACROTELEUTIC, among eccleſiaſtic writers, an appellation given to any thing added to the end of a pſalm; as the Gloria Patri, or Doxology.

ACROTERIA, in architecture, ſmall pedeſtals, uſually without baſes, anciently placed at the middle or two extremes of pediments or frontiſpieces, ſerving to ſupport the ſtatues, &c. It alſo ſignifies the figures placed as ornaments on the tops of churches, and the ſharp pinnacles that ſtand in ranges about flat buildings, with rails and balluſters.

Among ancient phyſicians, it ſignified the larger extremities of the body, as the head, hands, and feet. It has alſo been uſed for the tips of the fingers, and ſometimes for the eminences or proceſſes of bones.

ACROTERIASM, in ſurgery, the amputation of any extremity when putrified.

ACROTHYMIA, in ſurgery, the name of a large tumor in the fleſh, riſing in the ſhape of a wart, though ſometimes depreſſed and flat, called Thymus.

ACROTHYMION, from ακρος, *extreme*, and θυμος, *thyme*. A ſort of wart deſcribed by Celſus as hard, rough, with a narrow baſis and broad top; the top is of the colour of thyme; it eaſily ſplits and bleeds.

ACT, in general, denotes the exertion of power; and differs from power, as the effect from the cauſe.

Act, in logic, is particularly underſtood of an operation of the human mind. There are voluntary and ſpontaneous acts; the former are produced by the operation of the ſoul, the latter without its privity or participation.

Act, in the univerſities, ſignifies a theſis maintained in public by a candidate for a degree, or to ſhow the capacity and proficiency of a ſtudent. The candidates for a degree of bachelor and maſter of arts are to hold philoſophical acts; and thoſe for bachelor of divinity, theological acts, &c. At Oxford, the time when maſters or doctors complete their degrees is alſo called *the act*, which is held with great ſolemnity. At Cambridge, they call it the *commencement*.

Act *of Faith*, *Auto da Fe*, in the Romiſh church, is a ſolemn day held by the inquiſition, for the puniſhment of heretics, and the abſolution of the innocent accuſed. They uſually contrive the Auto to fall on ſome great feſtival, that the execution may paſs with the more awe and regard; at leaſt it is always on a Sunday.

The *Auto da Fe* may be called the laſt act of the inquiſitorial tragedy; it is a kind of gaol-delivery, appointed as oft as a competent number of priſoners in the inquiſition are convicted of hereſy, either by their own voluntary or extorted confeſſion, or on the evidence of certain witneſſes. The proceſs is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the proceſſion. The proceſſion is led up by Dominican friars; after which come the penitents, ſome with ſan-benitoes, and ſome without, according to the nature of their crimes; being all in black coats without ſleeves, and bare-footed, with a wax candle in their hands. Theſe are followed by the penitents who have narrowly eſcaped being burnt, who over their black coats have flames painted with their points turned downwards, *Fuego revolto*. Next come the negative, and relapſed, who are to be burnt, having flames on their habits pointing upwards. After theſe come ſuch as profeſs doctrines contrary to the faith of Rome, who, beſides flames pointing upwards, have their picture painted on their breaſts, with dogs, ſerpents, and devils, all open-mouthed, about it. Each priſoner is attended with a familiar of the inquiſition; and thoſe to be burnt have alſo a Jeſuit on each hand, who are continually preaching to them to abjure. After the priſoners comes a troop of familiars on horſeback; and after them the inquiſitors, and other officers of the court, on mules; laſt of all, the inquiſitor-general on a white horſe, led by two men with black hats and green hat-bands. A ſcaffold is erected in the *Terriera de Paio*, big enough for two or three thouſand people; at one end of which are the priſoners, at the other the inquiſitors. After a ſermon made up of encomiums of the inquiſition, and invectives againſt heretics, a prieſt aſcends a deſk near the middle of the ſcaffold, and having taken the abjuration of the penitents, recites the final ſentence of thoſe who are to be put to death; and delivers them to the ſecular arm, earneſtly beſeeching at the ſame time the ſecular power not to touch their blood, or put their lives in danger. The priſoners being thus in the hands of the civil magiſtrate are preſently loaded with chains, and carried firſt to the ſecular goal, and from thence in an hour or two brought before the civil judge; who, after aſking in what religion they intend to die, pronounces ſentence, on ſuch as declare they die in the communion of the church of Rome, that they ſhall be firſt ſtrangled, and then burnt to aſhes; on ſuch as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many ſtakes ſet up as there are priſoners to be burnt, with a quantity of dry furz about them. The ſtakes of the profeſſed, that is, ſuch as perſiſt in their hereſy, are about four yards high, having a ſmall board towards the top for the priſoner to be ſeated on. The negative and relapſed being firſt ſtrangled and burnt, the profeſſed mount their ſtakes by a ladder; and the Jeſuits, after ſeveral repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is ſtanding at their elbow to receive their ſouls, and carry them with him into the flames of hell. On this a great ſhout is raiſed; and the cry is, let the dogs beards be made; which is done by thruſting flaming furzes faſtened to long poles againſt their faces, till their faces are burnt to a coal, which is accompanied with the loudeſt acclamations of joy. At laſt, fire is ſet to the furz at the bottom of the ſtake, over which the profeſſed are chained ſo high, that the top of the flame ſeldom reaches higher than the ſeat they ſit on; ſo that they rather ſeem roaſted than burnt. There cannot be a more lamentable ſpectacle; the ſufferers continually cry out, while they are able, *Miſericordia per amor de Dios*, "Pity for the love of God!" yet it is beheld by all ſexes, and ages, with tranſports of joy and ſatisfaction.

Act, in dramatic poetry, ſignifies a certain diviſion, or part, of a play, deſigned to give ſome reſpite, both to the actors and ſpectators. The Romans were the firſt who divided their theatrical pieces into acts; for no ſuch diviſions appear in the works of the firſt dramatic poets. Their pieces indeed conſiſted of ſeveral parts or diviſions, which they called *protaſis*, *epitaſis*, *cataſtaſis*, and *cataſtrophe*; but theſe diviſions were not marked by any real interruptions on the theatre. Nor does Ariſtotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finiſhed pieces were divided into five acts.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience, by carrying the fable into execution; the third, to raiſe obſtacles and difficulties: the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary; but may be varied according to the humour of the author, or the nature of the ſubject.

Act *of Grace*, a general releaſe of debtors, on the demiſe of a ſovereign, in Great Britain.

Act, among lawyers, is an inſtrument in writing for declaring or juſtifying the truth of any thing.

Acts, alſo denote the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c.

Acta *Conſiſtorii*, the edicts or declarations of the council of ſtate of the emperors. Theſe edicts were generally expreſſed in ſuch terms as theſe: "The auguſt emperors, Diocleſian and Maximian, in council declared, that the children of Decurions ſhould not be expoſed to wild beaſts in the amphitheatre."

The ſenate and ſoldiers often ſwore, either through abject flattery or by compulſion, upon the edicts of the emperor, as we do upon the bible. And the name of Apidus Merula was eraſed by Nero out of the regiſter of ſenators, becauſe he refuſed to ſwear upon the edicts of the emperor Auguſtus.

Acta *Diurna*, was a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome.

Acta *Populi*, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c. of illuſtrious perſons, and the like.

Acta *Senatus*, among the Romans, were minutes of what paſſed and was debated in the ſenate-houſe.

Public Acts. The knowledge of public acts forms part of a peculiar ſcience, called the diplomatic, of great importance to an hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries.

Acts *of the Apoſtles*, one of the ſacred books of the New Teſtament, containing the hiſtory of the infant-church, during the ſpace of 29 or 30 years from the aſcenſion of our Lord to the year of Chriſt 63. It was written by St. Luke; and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his goſpel. We here find the accompliſhment of ſeveral of the promiſes made by our Saviour; his aſcenſion; the deſcent of the Holy Ghoſt; the firſt preaching of the apoſtles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Chriſtians; and, in ſhort, every thing that paſſed in the church till the diſperſion of the apoſtles, who ſeparated themſelves in order to propagate the goſpel throughout the world. From the period of that ſeparation, St. Luke quits the hiſtory of the other apoſtles, who were then at too great a diſtance from him, and confines himſelf more particularly to that of St. Paul, who had choſen him for the companion of his labours. He follows that apoſtle in all his miſſions, and even to Rome itſelf; for it appears that the Acts were publiſhed in the ſecond year of St. Paul's reſidence in that city, or the 36th year of the Chriſtian æra, and in the 9th or 10th year of Nero's reign. The ſtyle of this work, which was originally compoſed in Greek, is much purer than that of the other canonical writers; and it is obſervable, that St. Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Teſtament, makes uſe of the Septuagint verſion. The council of Laodicea places the Acts of the Apoſtles among the canonical books, and all the churches have acknowledged it as ſuch without any controverſy.

There were ſeveral ſpurious Acts of the Apoſtles; particularly, I. Acts, ſuppoſed to be written by Abdias, the pretended biſhop of Babylon, who gave out that he was ordained biſhop by the apoſtles themſelves when they were upon their journey into Perſia. II. The Actions of St. Peter: this book came originally from the ſchool of the Ebionites. III. The Acts of St. Paul, which is entirely loſt. Euſebius, who had ſeen it, pronounces it of no authority. IV. The Acts of St. John the Evangeliſt; a book made uſe of by the Encratites, Manichæans, and Priſcillianiſts. V. The Acts of St. Andrew; received by the Manichæans, Encratites, and Apotactics. VI. The Acts of St. Thomas the Apoſtle; received particularly by the Manichæans. VII. The Acts of St. Philip. This book the Gnoſtics made uſe of. VIII. The Acts of St. Matthias. Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St. Matthias written in Hebrew; and that a monk of the abbey of St. Matthias at Treves, having got them out of their hands, procured them to be tranſlated into Latin, and publiſhed them; but the critics will not allow them to be authentic.

Acts of Pilate; a relation ſent by Pilate to the emperor Tiberius, concerning Jeſus Chriſt, his death, reſurrection, aſcenſion, and the crimes of which he was convicted before him. It was a cuſtom among the Romans, that the proconſuls and governors of provinces ſhould draw up acts, or memoirs, of what happened in the courſe of their government, and ſend them to the emperor and ſenate. The genuine Acts of Pilate were ſent by him to Tiberius, who reported them to the ſenate; but they were rejected by that aſſembly, becauſe not immediately addreſſed to them: as is teſtified by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged Acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Chriſtian name, ſpread about ſpurious Acts of Pilate; which the emperor, by a ſolemn edict, ordered to be ſent into all the provinces of the empire, and enjoined the ſchool-maſters to teach and explain them to their ſcholars, and make them learn them by heart. Theſe acts, both the genuine and the ſpurious, are loſt. There is indeed extant, in Pſeudo-Hegeſippus, a letter from Pilate to the emperor Claudius, concerning Jeſus Chriſt; but it diſcovers itſelf at firſt ſight not to be authentic.

Act *of Parliament* is a poſitive law, conſiſting of two parts, the words of the act, and its true ſenſe and meaning; which being joined, make the law. The words of acts of parliament ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the act; and ſome acts extend by equity to things not mentioned therein.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the ſea-ſhore, where the Romans uſed to indulge themſelves to a great degree in ſoftneſs and delicacy of living. The word is uſed in this ſenſe by Cicero and Virgil; but Voſſius thinks it can only be uſed in ſpeaking of Sicily, as theſe two authors did.

ACTÆA, *Aconitum Racemoſum, Herb Chriſtopher, or Baneberries*; a genus of the monogynia order, belonging to the polyandria claſs of plants.

ACTE. The elder tree

ACTIAN Games, in Roman antiquity, were ſolemn games inſtituted by Auguſtus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, ſince called Actius. Hence Actian years, an æra commencing from the battle of Actium, called the Æra of Auguſtus.

Virgil inſinuates them to have been inſtituted by Æneas; from that paſſage En. III. v. 280.

> *Actiaque Iliacis celebramus littora ludis.* Æn. iii. 250.

But this he only does by way of compliment to Auguſtus; attributing that to the hero from whom he deſcended, which was done by the emperor himſelf; as is obſerved by Servius.

ACTINIA, in zoology, a genus belonging to the order of vermes molluſca. Progreſſive motion in theſe creatures is ſo ſlow, that it is difficult to perceive any, as they ſcarce advance the length of one inch in an hour. It would ſeem they do not all produce, when handled, the painful ſenſation which had acquired them the name of ſea-nettles. They are viviparous, feed on ſhell fiſh, open their mouths more or leſs according to the ſize of the prey they have to deal with, and then reject the ſhell through the ſame aperture. When the mouth is open, all the tentacula of the actinia may be ſeen, reſembling in that ſituation a full-blown flower, which has given it the denomination of the flower-fiſh.

ACTION, in a general ſenſe, implies nearly the ſame thing with Act. Grammarians, however, obſerve ſome diſtinction between *action* and *act*; the former being generally reſtricted to the common or ordinary tranſactions, whereas the latter is uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourſelves of what is neceſſary, for their ſake. The wiſe man propoſes to himſelf an honeſt end in all his *actions*; a prince ought to mark every day of his life with ſome act of greatneſs. The abbé Girard makes a further diſtinction between the words *action* and *act*. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly ſay, "Be ſure to preſerve a preſence of mind in all your actions; and take care that they be all acts of equity."

Action, in mechanics, implies, either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort.

As it is neceſſary in works of this kind to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindred its effect.

All power is nothing more than a body actually in motion, or which tends to move itſelf; that is, a body which would move itſelf if nothing oppoſed it. The action therefore of a body is rendered evident to us by its motion only; and conſequently we muſt not fix any other idea to the word action, than that of actual motion, or a ſimple tendency to motion. The famous queſtion relating to *vis viva* and *vis mortua*, owes, in all probability, its exiſtence to an inadequate idea of the word action; for had Leibnitz and his followers obſerved, that the only preciſe and diſtinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious diſtinction.

Quantity of ACTION, a name given by M. de Maupertuis, in the memoirs of the Pariſian Academy of Sciences for 1744, and thoſe of Berlin for 1746, to the product of the maſs of a body by the ſpace which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the ſtate of a body, the quantity of action neceſſary to produce ſuch change, is the leaſt poſſible." This principle he applies to the inveſtigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphyſics of final cauſes with the fundamental truths of mechanics, to ſhew the dependence of the colliſion of both elaſtic and hard bodies upon one and the ſame law, which before had always been referred to ſeparate laws; and to reduce the laws of motion, and thoſe of equilibrium, to one and the ſame principle.

ACTION, in ethics, denotes the external ſigns or expreſſions of the ſentiments of a moral agent.

ACTION, in poetry, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds, the principal and the incidental. The principal action is what is generally called the fable; and the incidental an epiſode.

ACTION, in oratory, is the outward deportment of the orator to the accommodation of his countenance, voice, and geſtures to the ſubject of which he is treating.

ACTION, in painting and ſculpture, is the attitude or poſition of the ſeveral parts of the face, body, and limbs of ſuch figures as are repreſented, and whereby they ſeem to be really actuated by paſſion. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſions with regard to animals.

ACTION, in phyſiology, is applied to the functions of the body, whether vital, animal, or natural.

The vital functions, or actions, are thoſe which are abſolutely neceſſary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and reaction of the ſolids and fluids on each other, depend the vital functions. The pulſe and reſpiration are the external ſigns of life. Vital diſeaſes are all thoſe which hinder the influx of the venous blood into the cavities of the heart, and the expulſion of the arterial blood from the ſame. The natural functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The manducation of food, the deglutition and digeſtion thereof, alſo the ſeparation and diſtribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by theſe our aliment is converted into our nature. They are neceſſary to the continuance of our bodies. The animal functions are thoſe which we perform at will, as muſcular motion, and all the voluntary actions of the body: they are thoſe which conſtitute the ſenſes of touch, taſte, ſmell, ſight, hearing; perception, reaſoning, imagination, memory, judgment, and affections of the mind. Without any, or all of them, a man may live, but not ſo comfortably as with them.

ACTION, in commerce, is a term uſed abroad for a certain part or ſhare of a public company's capital ſtock. Thus, if a company has 400,000 livres capital ſtock, this may be divided into 400 actions, each conſiſting of 1000 livres. Hence a man is ſaid to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital ſtock. The transferring of actions abroad is performed much in the ſame manner as ſtocks are with us.

ACTION, in law, is a demand made before a judge for obtaining what we are legally entitled to demand, and is more commonly known by the name of law-ſuit, or proceſs.

ACTIONARY, or ACTIONIST, a proprietor of ſtock in a trading company.

ACTIONS, among merchants, ſometimes ſignify moveable effects; and we ſay the merchant's creditors have ſeized on all his actions, when we mean that they have taken poſſeſſion of all his active debts.

ACTIVE, denotes ſomething that communicates action or motion to another; in which acceptation it ſtands oppoſed to paſſive.

ACTIVE, in grammar, is applied to ſuch words as expreſs action; and is therefore oppoſed to paſſive. The active performs the action, as the paſſive recites it. Thus we ſay, a verb *active*, a conjugation *active*, &c. or an *active* participle. See Syſtem of GRAMMAR.

ACTIVE *Power*, in metaphyſics, the power of executing any work or labour; in contradiſtinction to ſpeculative powers, or the powers of ſeeing, hearing, remembering, judging, reaſoning, &c.

ACTIVE *Principles*, in chemiſtry, ſuch as are ſuppoſed to act without any aſſiſtance from others; as mercury, ſulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty.

Sphere of ACTIVITY, the whole ſpace in which the virtue, power, or influence, of any object, is exerted.

ACTIUS, in mythology, a ſurname of Apollo, from Actium, where he was worſhipped.

ACTOR, in general, ſignifies a perſon who acts or performs ſomething.

ACTOR, among Civilians, the proctor or advocate in civil courts or cauſes: as, *Actor eccleſiæ* has been ſometimes uſed for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the ſteward or head bailiff of a village.

ACTOR, in the drama, is a perſon who repreſents ſome part or character upon the theatre.

ACTORUM TABULÆ, in antiquity, were tables inſtituted by Servius Tullius, in which the births of children were regiſtered.

ACTRESS, in a general ſenſe, implies a female who acts or performs ſomething.

ACTRESS, in the drama, a female performer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reaſon for the uſe of maſks among them.

ACTUAL, ſomething that is real and effective, or that exiſts truly and abſolutely. Thus philoſophers uſe the terms *actual* heat, *actual* cold, &c. in oppoſition to virtual or potential. Hence, among phyſicians, a red-hot iron, or fire, is called an *actual* cautery; in diſtinction from cauteries, or cauſtics, that have the power of producing the ſame effect upon the animal ſolids as actual fire, and are called potential cauteries.

ACTUAL *Sin*, that which is committed by the perſon himſelf; in oppoſition to original ſin, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of ſhips among the Romans, chiefly deſigned for ſwift ſailing.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eaſtern empire, the actuarii were properly officers who kept the military accounts, received the corn from the *ſuſceptores*, or ſtorekeepers, and delivered it to the ſoldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is ſaid, by the ſchoolmen, to *actuate* a power, when it produces an act in a ſubject. And thus the mind may be ſaid to *actuate* the body.

ACTUS, in ancient architecture, a meaſure in length equal to 120 Roman feet. In ancient agriculture, the word ſignified the length of one furrow, or the diſtance a plough goes before it turns.

ACTUS *Minimus*, was a quantity of land 120 feet in length, and four in breadth.

ACTUS *Major*, or ACTUS *Quadratus*, a piece of ground in a ſquare form, whoſe ſide was equal to 120 feet, equal to half the jugerum.

ACTUS *Intervicenalis*, a ſpace of ground four feet in breadth, left between the lands as a path or way.

ACUANITES, in eccleſiaſtical hiſtory, the ſame with thoſe called more frequently manichees. They took the name from Acua, a diſciple of Thomas, one of the twelve apoſtles.

ACUBENE, in aſtronomy, a name given by ſome to a ſtar in the ſouthern claw of Cancer.

ACUHYATLI, in zoology, a large American ſerpent, of a poiſonous nature, uſually called CUCURUCU, or CURUCUCA.

ACUITION, or ACUTITION, in grammar, denotes a ſyllable to be pronounced or marked with an acute accent. In medicine and chemiſtry it ſignifies an increaſe of ſharpneſs, or acidity. In a general ſenſe, acuition implies ſharpneſs.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near to the centre of the volt. Horſes are naturally inclined to this fault in making demi-volts.

ACUMEN, in muſic, ſignifies the ſound produced by intention, or raiſing the voice.

ACUMINA, in antiquity, a kind of military omen, moſt generally ſuppoſed to have been taken from the points or edges of darts, ſwords, or other weapons.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a ſilver needle. They employ this operation in head-achs, lethargies, convulſions, colics, &c.

ACUS, in ichthyology, the name of a long and ſlender ſea-fiſh, which has ſo little fleſh about it, that it is not regarded as eatable. It is common in the Mediterranean, and is called by the Venetian fiſhermen *biſca*, that is, the viper-fiſh. Of this fiſh there are two ſpecies, one of which is called in Engliſh, the needle, or tobacco-pipe fiſh, and the other the gar-fiſh.

ACUTE, an epithet applied to ſuch things as terminate in a ſharp point or edge. And in this ſenſe it ſtands oppoſed to obtuſe.

ACUTE *Angle*, in geometry, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

ACUTE-*angled Triangle*, is a triangle whoſe three angles are all acute.

ACUTE-*angled Cone* is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

ACUTE, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon of ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

ACUTE *Accent*, in grammar. See Syſtem of GRAMMAR.

ACUTE *Diſeaſes*, ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

ACUTELLA, in botany, a name uſed by ſome to expreſs the common Adonis, famous for its ſpreading and tough root.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments. In the ancient armies there were acutiatories, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

ACYROLOGIA, an expreſſion applied figuratively, which implies more than is ſaid, in order to raiſe doubts in the breaſt of the perſon ſo addreſſed.

AD, a Latin prepoſition, originally ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing to another.

AD *Beſtias*, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

AD *Hominem*, in logic, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

AD *Ludos*, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts, or with one another, and thus executing juſtice upon themſelves.

AD *Metalla*, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

AD *Valorem*, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: the duties on ſome articles are paid by the number, weight, meaſure, tale, &c. and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying.

ADAGIO, in muſic. Adverbially, it ſignifies ſoftly, leiſurely; and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio, adagio*, to denote a ſtill greater retardation in the time of the muſic.

ADAL, the pure medicinal virtue of vegetables, ſeparated from the impure.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces.

ADAM's APPLE, a name given to a ſpecies of citrus.

ADAMANT, a name ſometimes given to the diamond. It is likewiſe applied to the ſcoriæ of gold, the magnet, &c.

ADAMIC EARTH, a name given to common red clay, alluding to that ſpecies of earth of which the firſt man is ſuppoſed to have been made.

ADAMI POMUM, in anatomy, a protuberance in the forepart of the throat, formed by the os hyoides. It is thought to be ſo called upon a ſtrange conceit, that a piece of the forbidden apple, which Adam eat, ſtuck by the way, and occaſioned it.

ADAMITES, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, ſuppoſed to have been a branch of the Baſilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-eſtabliſhed in the ſtate of innocence, and to be ſuch as Adam was at the moment of his creation, whence they ought to imitate him in his nakedneſs. They deteſted marriage; maintaining, that the conjugal union would never have taken place upon earth had ſin been unknown.

ADAMUS, the philoſopher's ſtone is ſo called by alchemiſts; they ſay it is an animal, and that it has carried its inviſible Eve in its body, ſince the moment they were united by the Creator.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKIES-BREAD, or AFRICAN CALABASH-TREE, a genus of the monodelphia order, belonging to the polyandria claſs of plants. There is at preſent but one known ſpecies belonging to this genus, the baobab, which is perhaps the largeſt production of the whole vegetable kingdom. It is a native of Africa.

ADAPTERS, or ADOPTERS, among chemiſts, are veſſels in the form of hollow globes, having two mouths or apertures diametrically oppoſite to each other, one of which admits the neck of the retort, and the other is received either by the mouth of another adopter, or into the mouth of the receiver.

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it the Jews keep a feaſt for the death of Moſes; on the 13th, they have the feaſt of Eſther; and on the 14th, they celebrate the feaſt of Purim, for their deliverance from Haman's conſpiracy. As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in Scripture, worth about 15s. ſterling.

ADARME, in commerce, a ſmall weight in Spain, which is alſo uſed at Buenos-Aires, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the demi-gros. But the Spaniſh ounce is ſeven per cent. lighter than that of Paris. Stephens renders it in Engliſh by a dram.

ADATAIS, ADATSI, or ADATYS, in commerce, a muſlin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt-Indies; and the fineſt is made at Bengal.

ADCORDABILIS DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a feud.

ADCRESCENTES, among the Romans, denoted a kind of ſoldiery, entered in the army, but not yet put on duty; from theſe the ſtanding forces were recruited.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in zoology, a name for the Viper.

Sea- ADDER, the Engliſh name of a ſpecies of Syngnathus.

Water-ADDER, a name given to the coluber natrix.

ADDER-*ſtung*, is uſed in reſpect of cattle, when ſtung with any kind of venomous reptiles, as adders, ſcorpions, &c. or bit by a hedge-hog or ſhrew. For the cure of ſuch bites, ſome uſe an ointment made of dragon's blood, with a little barley-meal, and the whites of eggs.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the Pope's right hand, when he rides to viſit the churches.

ADDICE, or ADZE, a kind of crooked ax uſed by ſhip-wrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTIO, or ADDICTION, among the Romans, was the making over goods to another, either by ſale, or by legal ſentence; the goods ſo delivered were called *bona addicta*. Debtors were ſometimes delivered over in the ſame manner; and thence called *ſervi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a perſon for a certain price, unleſs by ſuch a day the owner, or ſome other, give more for it.

ADDITAMENT, ſomething added to another. Thus phyſicians call the ingredients added to a medicine already compounded, additaments.

ADDITION, in a general ſenſe, is the joining together or uniting two or more things, or augmenting a thing by the acceſſion of others thereto.

ADDITION, in arithmetic, algebra, &c. See Syſtems of ARITHMETIC and ALGEBRA.

ADDITION, in muſic, a dot marked on the right ſide of a note, ſignifying, that it is to be ſounded or lengthened half as much more as it would have been without ſuch mark.

ADDITION, in law, is that name or title which is given to a man over and above his proper name and ſurname, to ſhew of what eſtate, degree, or myſtery he is; and of what town, village, or country.

ADDITIONS *of Eſtate*, or *Quality*, are yeoman, gentleman, eſquire, and ſuch like.

ADDITIONS *of Degree*, are thoſe we call names of dignity; as knight, lord, earl, marquis, and duke.

ADDITIONS *of Myſtery*, are ſuch as ſcrivener, painter, maſon, and the like.

ADDITIONS *of Place*, are, of Thorp, of Dale, of Woodſtock. Where a man hath houſehold in two places, he ſhall be ſaid to dwell in both; ſo that his addition in either may ſuffice. Knave was anciently a regular addition. By ſtat. 1. Hen. V. cap. 5.

it was ordained, that in ſuch ſuits or actions where proceſs of outlawry lies, ſuch addition ſhould be made to the name of the defendant, to ſhew his eſtate, myſtery, and place where he dwells; and that the writs not having ſuch additions ſhall abate if the defendant take exception thereto; but not by the office of the court. The reaſon of this ordinance was, that one man might not be troubled by the outlawry of another; but by reaſon of the certain addition, every perſon might bear his own burden.

ADDITIONS, in diſtilling, a name given to ſuch things as are added to the waſh, or liquor, while in a ſtate of fermentation, in order to improve the vinocity of the ſpirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by thoſe of the buſineſs who ſpeak moſt intelligently, *additions*; but many confound them with things of a very different nature, under the name of ferments.

ADDITIONS, in heraldry, ſignify things added to a coat of arms, as marks of honour. Among thoſe we reckon, bordure, quarter, canton, gyron, pile, &c.

ADDRESS, in a general ſenſe, is uſed for ſkill and good management, and of late has been adopted from the French. It is uſed alſo in commerce, as ſynonymous with direction to a perſon or place. The word is formed of the French verb *adreſſer*, to direct any thing to a perſon.

ADDUCENT *Muſcles*, or ADDUCTORS, in anatomy, thoſe muſcles which draw one part of the body towards another. See Syſtem of ANATOMY.

ADEB, in commerce, the name of a large Egyptian weight, uſed principally for rice, and conſiſting of 210 okes, each of three rotolos, a weight of about two drams leſs than the Engliſh pound. But this is no certain weight, for at Roſetto the adeb is only 150 okes.

ADELIA, a genus of the monadelphia order, belonging to the diœcia claſs of plants. Of this genus there are three ſpecies; the bernardia, the ricinella, and acidoton, for which we have no proper names in Engliſh. They are natives of Jamaica, and are akin to the rhicinus, or croton, and may be propagated in in hot-beds from ſeeds procured from Jamaica. For the generic characters, ſee Syſtem of BOTANY.

ADELPHIANI, in church hiſtory, a ſect of ancient heretics, who faſted always on Sundays.

ADELSCALC, in ancient cuſtoms, denotes a ſervant of the king. The word is alſo written adelſchalche, and adelſcalcus. It is compounded of the German *anel*, or *edel*, "noble," and *ſcalc*, "ſervant." Among the Bavarians, *adelſcalcs* appear to have been the ſame with royal thanes among the Saxons, and thoſe called *miniſtri regis* in ancient charters.

ADEMPTION, in the civil law, implies the revocation of a grant, donation, or the like.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria claſs of plants. In the natural method, it belongs to the 33d order, Lomentaceæ. Only one ſpecies of this plant is known in Britain: but there is a variety with ſcarlet ſeeds; which, however, is rare, and grows very ſlowly. It is a native of India, and riſes to a conſiderable height. It is as large as the tamarind tree; ſpreads its branches wide on every ſide, and makes a fine ſhade; for which reaſon, it is frequently planted by the inhabitants in their gardens, or near their habitations. The leaves of this tree are doubly winged, the flowers of a yellow colour, and diſpoſed in a long bunch. Theſe are ſucceeded by long twiſted membranaceous pods, incloſing ſeveral hard compreſſed ſeeds, of a beautiful ſcarlet, or ſhining black colour. This plant muſt be raiſed in a hot bed, and kept during winter in a ſtove.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See Syſtem of ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the Proſtatæ.

ADENOLOGY, the ſame with ADENOGRAPHY.

ADENOS, a kind of cotton, otherwiſe called marine cotton. It comes from Aleppo by the way of Marſeilles, where it pays 20 per cent. duty.

ADEONA, in mythology, the name of a goddeſs invoked by the Romans when they ſet out upon a journey.

ADEPHAGIA, in mythology, the goddeſs of gluttony, to whom the Sicilians paid religious worſhip.

ADEPS, in anatomy, the fat found in the abdomen. It alſo ſignifies animal fat of any kind.

ADEPTS, a term given to alchemiſts who pretended to have found the panacea, or philoſophers ſtone.

ADEQUATE, in a general ſenſe, implies ſomething exactly correſponding with another.

ADEQUATE *Ideas*, are thoſe which perfectly repreſent all the parts and properties of the object.

All ſimple ideas are adequate or perfect, becauſe they are repreſented intire.

On the contrary, the ideas of ſubſtances which are not formed at the pleaſure of the mind, but derived from properties diſcovered by experience, are inadequate or imperfect, becauſe they are only acquainted with ſome of the properties. See Syſtem of LOGIC.

ADES, or HADES, denotes the inviſible ſtate. In the heathen mythology, it comprehends all thoſe regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium.

ADESSENARIANS, ADESSENARII, in church hiſtory, a ſect of Chriſtians who hold the real preſence of Chriſt's body in the euchariſt, though not by way of tranſubſtantiation.

ADFILIATION, a Gothic cuſtom, whereby the children of a former marriage are put upon the ſame footing with thoſe of the ſecond. This is alſo called *unio prolium*, and ſtill retained in ſome parts of Germany.

ADHA, a feſtival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and laſt of their year. This month being particularly deſtined for the ceremonies which the pilgrims obſerve at Mecca, it takes its name from thence, for the word ſignifies the month of pilgrimage. On that day they ſacrifice with great ſolemnity, at Mecca, and no where elſe, a ſheep, which is called by the ſame name as the feſtival itſelf. The Turks commonly call this feſtival the Great Beiram, to diſtinguiſh it from the leſſer, which ends their faſt, and which the Chriſtians of the Levant call the Eaſter of the Turks. The Mahometans celebrate this feſtival, out of the city of Mecca, in a neighbouring valley; and ſometimes they ſacrifice a camel on the occaſion.

ADHESION, in a general ſenſe, implies the ſticking or adhering of bodies together.

ADHESION, in philoſophy, the ſame as coheſion.

ADHESION, in anatomy, a term for one part ſticking to another, which in a natural ſtate are ſeparate. For the moſt part, if any of thoſe parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in aſtronomy, a ſtar of the ſixth magnitude, upon the garment of Andromeda, under the laſt ſtar in her foot.

ADHOA, in ancient cuſtoms, denotes what we otherwiſe call relief. In which ſenſe we ſometimes alſo find the word written *adhoa*, *adhoamentum*, and *adhogamentum*.

ADIANTHIUM, in botany, maiden-hair; a genus of the order of filices, belonging to the cryptogamia claſs of plants.

ADIAPHORISTS, in church hiſtory, a name importing lukewarmneſs, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melancthon, whoſe diſpoſition was vaſtly more pacific than that of Luther.

ADIAPHOROUS, ADIAPHORUS, a name given by Mr. Boyle to a kind of ſpirit diſtilled from tartar and ſome other vegetable bodies, and which is neither acid, vinous, or urinous; but in many reſpects different from any other ſort of ſpirit.

ADJECTIVE, in grammar, a kind of noun joined with a ſubſtantive, either expreſſed or implied, to ſhew its qualities or accidents. See Syſtem of GRAMMAR.

ADJOURNMENT, the putting off a court, or other meeting, till another day. There is a difference between the adjournment and the prorogation of the parliament; the former not only being for a ſhorter time, but alſo done by the houſe itſelf; whereas the latter is an act of royal authority.

ADIPOSE, a term uſed by anatomiſts for any cell, membrane, &c. that is remarkable for its fatneſs.

ADIPSOS, ſignifies the Egyptian palm-tree.

ADIT, in a general ſenſe, the paſſage to, or entrance of, any thing.

ADIT *of a Mine*, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the ſame with *cuniculus* or drift, and is diſtinguiſhed from air-ſhaft. The adit is uſually made on the ſide of a hill, towards the bottom thereof, about four, five, or ſix feet high, and eight wide, in form of an arch: ſometimes cut in the rock, and ſometimes ſupported with timber, ſo conducted as that the ſole or bottom of the adit may anſwer to the bottom of the ſhaft, only ſomewhat lower, that the water may have a ſufficient current to paſs away without the uſe of the pump. Damps and the impurity of the air are the great impediments againſt driving adits above 20 or 30 fathoms, by reaſon of the neceſſity, in this caſe, of letting down air ſhafts from the day to meet the adit, which are often very expenſive, both on account of the great depth of mines, and the hardneſs of the mineral ſtrata to be cut through. The beſt remedy againſt this is that practiſed in the coal-mines near Liege, where they work their adits without air-ſhafts: the manner of which is deſcribed by Sir Robert Moray. Vide Phil. Tranſ. No. 5.

ADIT *of a Mine* is ſometimes uſed for the air-ſhaft itſelf, being a hole driven perpendicularly from the ſurface of the earth into ſome part of a mine, to give entrance to the air. To draw off the ſtanding water in winter, in deep mines, they drive up an adit, or air-ſhaft, upon which the air diſengages itſelf from the water, when it begins to run with ſuch violence as produces a noiſe equal to the burſting of a cannon, daſhes every thing in the way againſt the ſides of the mine, and looſens the very rocks at a diſtance. Ibid. No. 26.

ADJUDICATION, implies the act of adjudging, or determining, a cauſe in favour of ſome perſon.

ADJUNCT, among philoſophers, ſignifies ſomething added to another, without being any neceſſary part of it. Thus water by cloth or a ſponge, is an adjunct, but no neceſſary part of either of theſe ſubſtances.

Adjunct, in metaphyſics, ſome quality belonging to either the body or mind, whether natural or acquired. Thus, thinking is an adjunct of the mind, and growth an adjunct of the body.

Adjunct, in muſic, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two fifths, which, from the intervals that conſtitute the relation between them and it, are called its adjuncts.

Adjunct is alſo uſed to ſignify a colleague, or ſome perſon aſſociated with another as an aſſiſtant.

Adjuncts, in rhetoric and grammar, ſignify certain words or things added to others, to amplify or augment the force of the diſcourſe.

Adjuncts, or **Adjoints**, in the royal academy of ſciences at Paris, denote a claſs of members, attached to the purſuit of particular ſciences. The claſs of adjuncts was created in 1716, in lieu of the eleves: they are twelve in number; two for geometry, two for mechanics, two for aſtronomy, two for anatomy, two for chemiſtry, and two for botany. The eleves not taken into this eſtabliſhment were admitted on the foot of ſupernumerary adjuncts.

ADJUTANT, in the military art, is an officer whoſe buſineſs it is to aſſiſt the major. Each battalion of foot and regiment of horſe has an adjutant, who receives the orders every night from the brigade major; which, after carrying them to the colonel, he delivers out to the ſerjeants. When detachments are to be made, he gives the number to be furniſhed by each company or troop, and aſſigns the hour and place of rendezvous. He alſo places the guards, receives and diſtributes the ammunition to the companies, &c. and, by the major's orders, regulates the prices of bread, beer, and other proviſions. The word is ſometimes uſed by the French for an *aid-du-camp*.

Adjutants *General*, among the Jeſuits, a ſelect number of fathers, who reſided with the general of the order, each of whom had a province or country aſſigned him, as England, Holland, &c. and their buſineſs was to inform the father-general of ſtate occurrences in ſuch countries. To this end they had their correſpondents delegated, emiſſaries, viſitors, regents, provincials, &c.

ADJUTORIUM, a term uſed by phyſicians for any medicine in a preſcription but the capital one.

ADLEGATION, in the public law of the German empire, a right claimed by the ſtates of the empire of adjoining plenipotentiaries, in public treaties and negociations, to thoſe of the emperors, for the tranſacting of matters which relate to the empire in general. In which ſenſe adlegation differs from legation, which is the right of ſending ambaſſadors on a perſon's own account.

ADLOCUTION, *Adlocutio*, in antiquity, is chiefly underſtood of ſpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find theſe adlocutions expreſſed on medals by the abbreviature, Adlocut. Coh.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book. In which ſenſe, *admanuenſes* amount to the ſame with laymen; and ſtand oppoſed to clerks, who were forbid to ſwear on the book, their word being to be reputed as their oath; whence they were alſo denominated *fide digni*.

ADMEASUREMENT, *Admenſuratio*, in law, a writ which lies for the bringing thoſe to reaſon, or mediocrity, who uſurp more of any thing than their ſhare. This writ lies in two caſes; termed,

Admeasurement *of Dower*, *Admenſuratio dotis*, where the widow of the deceaſed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

Admeasurement *of Paſture*, *Admenſuratio paſturæ*; this lies between thoſe who have common of paſtures appendant to their freehold, or common by vicinage, in caſe any of them ſurcharge the common with more cattle than they ought.

ADMINICLE, a term uſed chiefly in old law books, to imply an aid, help, aſſiſtance, or ſupport.

ADMINICULATOR, an ancient officer of the church, whoſe buſineſs it was to attend to and defend the cauſe of the widows, orphans, and others deſtitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exerciſe of diſtributive juſtice; among eccleſiaſtics, it is often uſed to expreſs the giving or diſpenſing the ſacraments, &c.

ADMINISTRATOR, in law, he to whom the ordinary commits the adminiſtration of the goods of a perſon deceaſed, in default of an executor. An action lies for, or againſt an adminiſtrator, as for or againſt an executor; and he ſhall be accountable to the value of the goods of the deceaſed, and no farther; unleſs there be waſte, or other abuſe chargeable on him. If the adminiſtrator dies, his executors are not adminiſtrators; but the court is to grant a new adminiſtration. If a ſtranger, who is neither adminiſtrator or executor, take the goods of the deceaſed, and adminiſter, he ſhall be charged and ſued as an executor, not as an adminiſtrator. The origin of adminiſtration is derived from the civil law. Their eſtabliſhment in England is owing to a ſtatute made in the 31ſt year of Edw. III. till then, no office of this kind was known beſide that of executor: in caſe of a want of which, the ordinary had the diſpoſal of goods of perſons inteſtate, &c.

Administrator is ſometimes uſed for the preſident of a province; for a perſon appointed to receive, manage, and diſtribute the revenues of an hoſpital or religious houſe; for a prince who enjoys the revenues of a ſecularized biſhopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRABILIS Sal, the ſame with Glauber's ſalt.

ADMIRAL, a great officer or magiſtrate, who has the government of a navy, and the hearing of all maritime cauſes.

Du Cange aſſures us, that the Sicilians were the firſt, and the Genoeſe the next, who gave the denomination of Admiral to the commanders of their naval armaments; and that they took it from the Saracen or Arabic Emir, a general name for every commanding officer. As for the exact time when the word was introduced among us, it is uncertain; ſome think it was in the reign of Edward I. Sir Henry Spelman is of opinion that it was firſt uſed in the reign of Henry III. becauſe neither the laws of Oleron made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term admiral was not uſed in a charter in the eighth of Henry III. wherein he granted this office to Richard de Lacey, by theſe words Maritimam Angliæ; but in the 56th year of the ſame reign, not only the hiſtorians, but the charters themſelves, very frequently uſed the word Admiral.

Anciently there were generally three or four admirals appointed in the Engliſh ſeas, all of them holding the office *durante bene placito:* and each of them having particular limits under their charge and government; as admirals of the fleets of ſhips, from the mouth of the Thames northward, ſouthward, or weſtward. Beſides theſe, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was ſtyled *admiralis quinque portuum*; and we ſometimes find that one perſon has been admiral of the fleets to the ſouthward, northward, and weſtward: but the title of *admiralis Angliæ* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commiſſions afterwards was granted to the ſucceeding admirals. It may be obſerved, that there was a title above that of admiral of England, which was, *locum-tenens regis ſuper mare*, the king's lieutenant-general of the ſea; this title we find mentioned in the reign of Richard II. Before the uſe of the word admiral was known, the title of *cuſtos maris* was made uſe of.

Lord High **Admiral** *of England*, in ſome ancient records called *capitanus maritimarum*, an officer of great antiquity and truſt, as appears by the laws of Oleron, ſo denominated from the place they were made at by Richard I. The firſt title of *Admiral of England*, expreſsly conferred upon a ſubject, was given by patent of Richard II. to Richard Fitz-Allen, jun. earl of Arundel and Surrey; for thoſe who before enjoyed this office were ſimply termed admirals, though their juriſdiction ſeems as large, eſpecially in the reign of Edward III. when the court of admiralty was firſt erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of deciſion in all maritime caſes both civil and criminal: he judges of all things done upon or beyond the ſea, in any part of the world; upon the ſea-coaſts, in all ports and havens, and upon all rivers below the firſt bridge from the ſea. By him, vice-admirals, rear-admirals, and all ſea-captains, are commiſſioned; all deputies for particular coaſts, and coroners to view dead bodies found on the ſea-coaſts, or at ſea: he alſo appoints the judges for his court of admiralty, and may impriſon, releaſe, &c. All ports and havens are *infra corpus comitatus*, and the admiral hath no juriſdiction of any thing done in them. Between high and low water-mark, the common-law and the high-admiral have juriſdiction by turns, one upon the water, and the other upon the land.

The lord-admiral has power, not only over the ſeamen ſerving in his ſhips of war, but over all other ſeamen, to arreſt them for the ſervice of the ſtate; and, if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the ſame to the ſheriffs, mayors, bailiffs, &c. who ſhall cauſe them to be apprehended and impriſoned.

To the lord high-admiral belong all penalties and amercements of all tranſgreſſions at ſea, on the ſea-ſhore, in ports and havens, and all rivers below the firſt bridge from the ſea; the goods of pirates and felons condemned or enſlaved, ſea-wrecks, goods floating on the ſea, or caſt on the ſhore (not granted to lords of manors adjoining to the ſea), and a ſhare of lawful prizes; alſo all great fiſhes, commonly called *royal fiſhes*, except whales and ſturgeons: to which add, a ſalary of 7000l. a year.

In ſhort, this is ſo great an office, in point of truſt, honour, and profit, that it has been uſually given to princes of the blood, or the moſt eminent perſons among the nobility. We have had no high admiral for ſome years; the office being put in commiſſion, or under the adminiſtration of the lords commiſſioners of the admiralty, who by ſtatute have the ſame power and authority as the lord high admiral.

ADMIRAL alſo implies the commander in chief of any ſingle fleet or ſquadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-maſt head.

ADMIRAL is alſo an appellation given to the moſt conſiderable ſhip of a fleet of merchant-men, or of the veſſels employed in the cod-fiſhery of Newfoundland. This laſt has the privilege of chooſing what place he pleaſes on the ſhore to dry his fiſh; gives proper orders, and appoints the fiſhing-places to thoſe who come after him; and as long as the fiſhing-ſeaſon continues, he carries a flag on his main-maſt.

Vice **ADMIRAL** is the commander of the ſecond ſquadron, and carries his flag at the mizen-top-maſt head.

Vice **ADMIRAL** is alſo an officer appointed by the lords commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great Britain, with judges and martials under them, for executing juriſdiction within their reſpective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

Rear **ADMIRAL** is the commander of the third ſquadron, and carries his flag at the fore-top-maſt head.

ADMIRAL, in zoology, the Engliſh name of a ſpecies of the voluta, a ſhell-fiſh belonging to the order of vermes teſtacea.

ADMIRALTY properly ſignifies the office of lord high-admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners called *lords of the admiralty*.

ADMIRALTY *Court*. See Court of ADMIRALTY.

ADMIRATION, in grammar, a note or character marked thus! and intimating ſomething worthy to be admired or wondered at.

ADMITTENDO, CLORICO, a writ iſſued out of the common pleas and granted to him who hath recovered his right of preſentation againſt the biſhop.

ADMONITION, in eccleſiaſtical affairs, a part of diſcipline much uſed in the ancient church. It was the firſt act, or ſtep, towards the puniſhment or expulſion of delinquents. In caſe of private offences, it was performed according to the evangelical rule, privately: in caſe of public offence, openly, before the church. If either of thoſe ſufficed for the recovery of the fallen perſon, all further proceedings in the way of cenſure ceaſed: if they did not, recourſe was had to excommunication.

ADMONITIO *Fuſtium*, among the Romans, a military puniſhment, not unlike our whipping, only it was performed with vine-branches.

ADMORTIZATION, in the feudal cuſtoms, the reduction of the property of lands or tenements to mortmain.

ADNATA, in anatomy, one of the coats of the eye, which is alſo called conjunctiva and albuginea.

ADNATA, is alſo uſed for any hair, wool, or the like, which grows upon animals or vegetables.

ADNATA, or *Adnaſcentia*, among gardeners, denote thoſe offſets, which, by a new germination under the earth, proceed from the lily, narciſſus, hyacinth, and other flowers, and afterwards grow to true roots. French call them *cayeux*, "ſtalks."

ADNOUN is uſed by ſome grammarians to expreſs what we more uſually call an adjective.

ADOLESCENCE, the eſtate of growing youth; or that period of a perſon's age commencing from his infancy, and terminating at his full ſtature or manhood. The word is formed of the Latin *adoleſcere*, to grow. The ſtate of adoleſcenſe laſts ſo long as the fibres continue to grow, either in magnitude or firmneſs. The fibres being arrived at the degree of firmneſs and tenſion ſufficient to ſuſtain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; ſo that their farther accretion is ſtopped, from the very law of their nutrition.

ADONAI, one of the names of the ſupreme Being in the Scriptures. The proper meaning of the word is *my Lords*, in the plural number; as *Adoni is my Lord*, in the ſingular. The Jews, who either out of reſpect, or ſuperſtition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not ſo ſcrupulous; nor is there any law which forbids them to pronounce the name of God. Calmet.

ADONAIS, a name given by ancient botaniſts to the flower now called anemony.

ADONIA, in antiquity, ſolemn feaſts in honour of Venus, and in memory of her beloved Adonis.

ADONIDES, a name given to botaniſts who deſcribed or made catalogues of plants cultivated in any particular place.

ADONIS, *Birds-eye*, or *Pheaſants-eye*; a genus of the polyandria order, belonging to the polygynia claſs of plants. It is aſſociated with the *Multiſiliquæ*, or 26th Nat. Order.

ADOPTIANI, in church-hiſtory, a ſect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jeſus Chriſt, in his human nature, is the Son of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his ſon, and appoints him for his heir.

The cuſtom of adoption was very common among the ancient Greeks and Romans: yet it was not practiſed, but for certain cauſes expreſſed in the laws, and with certain formalities uſual in ſuch caſes. It was a ſort of imitation of nature, intended for the comfort of thoſe who had no children: wherefore he that was to adopt was to have no children of his own, and to be paſt the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, becauſe that it would have been contrary to the order of nature; nay, it was even required that the perſon who adopted ſhould be eighteen years older than his adopted ſon, that there might at leaſt appear a probability of his being the natural father.

Among the Greeks it was called *υιοτης*, *filiation*. It was allowed to ſuch as had no iſſue of their own; excepting thoſe who were not *κυριοι εαυτων*, *their own maſters*, e. g. ſlaves, women, madmen, infants, or perſons under twenty years of age; who being incapable of making wills, or managing their own eſtates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any ſuch were adopted, it was neceſſary firſt to make them free of the city.

The Romans had two forms of adoption; one before the pretor; the other at an aſſembly of the people, in the times of the commonwealth, and afterwards by a reſcript of the emperor. In the former, the natural father addreſſed himſelf to the pretor, declaring that he emancipated his ſon, reſigned all his authority over him, and conſented he ſhould be tranſlated into the family of the adopter. The latter was practiſed, where the party to be adopted was already free; and this was called *adrogation*. The perſon adopted changed all his names; aſſuming the prename, name, and ſurname, of the perſon who adopted him.

Beſides the formalities preſcribed by the Roman law, various other methods have taken place; which have given denominations to different ſpecies of adoption, among the Gothic nations, in different ages. As,

ADOPTION *by Arms*, was when a prince made a preſent of arms to a perſon, in conſideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Juſtinian; and Coſroes, nephew of the king of Perſia, by the emperor Juſtin. The obligation here laid on the adoptive ſon was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name,

ADOPTION *by Baptiſm*, is that ſpiritual affinity which is contracted by god-fathers and god-children in the ceremony of baptiſm. This kind of adoption was introduced into the Greek church, and came afterwards into uſe among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was ſo far conſidered as adoptive father, that his god-children were ſuppoſed to be intitled to a ſhare in the inheritance of his eſtate.

ADOPTION *by Hair*, was performed by cutting off the hair of a perſon, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boſon king of Arles; which, perhaps, is the only inſtance in hiſtory, of adoption, in the order of the eccleſiaſtics; a law that profeſſes to imitate nature, not daring to give children to thoſe in whom it would be thought a crime to beget any.

ADOPTION *by Teſtament*, that performed by appointing a perſon heir by will, on condition of his aſſuming the name, arms, &c. of the adopter. Of which kind we meet with ſeveral inſtances in the Roman hiſtory.

Among the Turks, the ceremony of adoption is performed by obliging the perſon adopted to paſs through the ſhirt of the adopter. Hence, among that people, to adopt, is expreſſed by the phraſe, *to draw another through my ſhirt*. It is ſaid, that ſomething like this has alſo been obſerved among the Hebrews; where the prophet Elijah adopted Eliſha for his ſon and ſucceſſor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly ſo called, does not appear to have been practiſed among the ancient Jews: Moſes ſays nothing of it in his laws; and Jacob's adoption of his two grandſons, Ephraim and Manaſſeh, is not ſo properly an adoption, as a kind of ſubſtitution, whereby thoſe two ſons of Joſephwere allotted an equal portion in Iſrael with his own ſons.

ADOPTION is alſo uſed, in theology, for a federal act of God's free grace; whereby thoſe who are regenerated by faith, are admitted into his houſehold, and intitled to a ſhare in the inheritance of of the kingdom of heaven.

ADOPTION is alſo applied by the Greeks, to the admitting a monk, or brother, into a monaſtic community; ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another.

In eccleſiaſtical writers we find adoptive women, or ſiſters, (*adoptivæ fœminæ, or ſorores*,) uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſubintroductæ*.

ADORATION is particularly uſed for the act of praying, or preferring our requeſts or thankſgivings to Almighty God.

ADORATION is alſo uſed for certain extraordinary civil honours or reſpects which reſemble thoſe paid to the Deity, yet are given to men.

ADORATION is more particularly uſed for kiſſing one's hand in preſence of another, as a token of reverence. The Jews adored by kiſſing their hands and bowing down their heads; whence, in their language, *kiſſing* is properly uſed for *adoration*.

ADOS, ſignifies water in which red hot iron has been cooled.

ADOSCULATION, a term uſed by Dr. Grew, to imply a kind of impregnation, without intromiſſion; and in this manner he ſuppoſes the impregnation of plants is effected by the falling of the farina foecundans on the piſtil.

ADOSEE, in heraldry, ſignifies two figures or bearings being placed back to back.

ADOXA, TUBEROUS MOSCHATEL, HOLLOWROOT, or INGLORIOUS; a genus of the tetragynia order, belonging to the octandria claſs of plants. In the natural method it belongs to the 13th order, or ſucculentæ. The leaves and flowers ſmell like muſk, from whence it has by ſome been called muſk-crowfoot. For the genuine characters ſee the Syſtem of BOTANY.

AD PONDUS OMNIUM, among phyſicians, an abbreviation in their preſcriptions, ſignifying that the laſt mentioned ingredient is to weigh as much as all the reſt together.

AD QUOD DAMNUM, in law, a writ directed to the ſheriff, commanding him to inquire into the damage which may befal from granting certain privileges to a plaee, as a fair, a market, or the like.

ADRACHNE, in botany, a ſpecies of the ſtrawberry-tree.

ADRASTEA, in antiquity, an epithet given to the goddeſs Nemeſis, or Revenge. It was taken from king Adraſtus, who firſt erected a temple to that deity.

ADRASTIA *Certamina*, in antiquity, a kind of Pythian games, inſtituted by Adraſtus king of Argos, in the year of the world 2700, in honour of Apollo, at Sicyon. Theſe are to be diſtinguiſhed from the Pythian games at Delphi.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches; the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. Theodoret is the only perſon who has preſerved the name and memory; but he gives us no account of their origin. Probably this ſect, and the ſix others which ſprung from the Simonians, took their name from the particular diſciples of Simon. The ſecond were the followers of Adrian Hamſtead, the anabaptiſt; and held ſome particular tenets.

ADRIFT, the ſtate of a ſhip broke looſe from her moorings, and driven without controul at the mercy of the wind, ſeas, or current, or of all of them together.

ADRIUNE, in botany, the cyclamen, or ſow bread.

ADROGATION, in Roman antiquities, a ſpecies of adoption, whereby a perſon who was capable of chooſing for himſelf was admitted by another into the relation of a ſon. The word is compounded of *ad*, to, and *rogare*, to aſk, on account of a queſtion put in the ceremony of it, Whether the adopter would take ſuch a perſon for his ſon? and another to the adoptive, Whether he conſented to become ſuch a perſon's ſon?

ADROP, in alchemy, the philoſopher's ſtone.

ADSCRIPTS, in mathematics, natural tangents.

ADSIDELLA, in antiquity, the table at which the flamens ſat during the ſacrifices.

ADSTRICTION, among phyſicians, a term uſed to denote the rigidity of any part.

ADVANCE, in the mercantile ſtyle, denotes money paid before goods are delivered, work done, or buſineſs performed.

ADVANCED, in a general ſenſe, denotes ſomething poſted or ſituated before another. Thus,

ADVANCED *Ditch*, in fortification, is that which ſurrounds the glacis or eſplanade of a place.

ADVANCED *Guard*, or *Vanguard*, in the art of war, the firſt line or diviſion of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches firſt towards them.

ADNANCED *Guard* is more particularly uſed for a ſmall party of horſe ſtationed before the main guard.

ADVANCER, among ſportſmen, one of the ſtarts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Mooriſh cuſtoms, a kind of ambulatory village, conſiſting of tents, which theſe people remove from one place to another, as ſuits their conveniency.

ADVENT, in the calendar, properly ſignifies the approach of the feaſt of the nativity. It includes four Sundays, which begin on St. Andrew's day, or on the Sunday before or after it. During advent, and to the end of the octaves of epiphany, the ſolemnizing of marriage is forbid without a ſpecial licence. It is appointed to employ the thoughts of Chriſtians on the firſt advent or coming of Chriſt in the fleſh, and his ſecond advent or coming to judge the world. The primitive Chriſtians practiſed great auſterity during this ſeaſon.

ADVENTITIA *Canæ*, in antiquity, a welcome-home feaſt, in honour of a perſon returned from a long journey; uſually prepared by his friends.

ADVENTITIOUS, what caſually accrues from without, i. e. not belonging to the body to which it is ſubjoined.

ADVENTITIOUS, in civil law, implies caſual legacies.

ADVENTITIOUS, in eutomology, ſhells that cannot be claſſed.

ADVENTURE, in a general ſenſe, implies ſome extraordinary or accidental event. It alſo denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among merchants, a writing ſigned by a merchant, teſtifying the goods mentioned in it to be ſhipped on board a certain veſſel belonging to another perſon, who is to run all hazards; the merchant only obliging himſelf to account to him for the produce.

ADVENTURER, in a general ſenſe, denotes one who hazards ſomething.

ADVENTURERS, is particularly uſed for an ancient company of merchants and traders, eſtabliſhed for the diſcovery of lands, territories, trades, &c. unknown. The ſociety of adventurers had its riſe in Burgundy, and its firſt eſtabliſhment from John Duke of Brabant in 1248; being known by the name of The Brotherhood of St. Thomas à Becket. It was afterwards tranſlated into England, and ſucceſſively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of Merchant Adventurers.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or ſuffering; or to mark ſome circumſtance or quality ſignified by them. The word is formed from the prepoſition *ad*, to, and *verbum*, a verb; and ſignifies literally a word joined to a verb, to ſhew how, when, or where, one is, does, or ſuffers; as, the boy paints *neatly*; writes *ill*; the houſe ſtands *there*, &c. See GRAMMAR.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day-books.

ADVERSATIVE, in grammar, a word expreſſing ſome difference between what goes before and what follows it. Thus, in the phraſe, "He is an honeſt man, but a great enthuſiaſt," the word *but* is an adverſative conjunction.

ADVERSATOR, in antiquity, a ſervant who attended the rich in returning from ſupper, to give them notice of any obſtacles in the way, at which they might be apt to ſtumble.

ADVERTISEMENT, in a general ſenſe, denotes any information given to perſons intereſted in an affair; and is more particularly uſed for a brief account of an affair inſerted in the public papers, for the information of all concerned.

ADULT, an appellation given to any thing that is arrived at maturity: thus we ſay, an adult perſon, an adult plant, &c.

ADULTERATION, the act of debaſing, by an improper mixture, ſomething that was pure and genuine.

ADULTERATION *of Coin*, properly imports the making or caſting of a wrong metal, or with too baſe or too much alloy.

Adulterations of coins are effected divers ways; as, by forging another ſtamp or inſcription; by mixing impure metals with the gold or ſilver: moſt properly, by making uſe of a wrong metal, or an undue alloy, or too great an admixture of the baſer metals with gold or ſilver. Counterfeiting the ſtamp, or clipping and leſſening the weight, do not ſo properly come under the denomination of adulterating. Adulterating is ſomewhat leſs extenſive than debaſing, which includes diminiſhing, clipping, &c.

To adulterate or debaſe the current coin, is a capital crime in all nations.

ADULTERER, a man who commits adultery.

ADULTERESS, a woman guilty of adultery. An adultereſs, by our law, undergoes no temporal puniſhment whatever, except the loſs of her dower; and ſhe does not loſe even that, if her huſband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be obſerved, that adultereſſes are ſuch either by the canon or civil law. According to the former, a woman is an adultereſs who, either being herſelf married, converſes carnally with another man; or being ſingle herſelf, converſes with a man that is married. According to the latter, ſhe is not an adultereſs, if ſhe be not herſelf in the married ſtate, though ſhe converſes with a man that is. The crime, in this caſe, was more properly called *ſtuprum* than *adulterium*. Hence, among the Romans, the word *adultera*, adultereſs, differed from *pellex*, which denoted a ſingle woman who cohabited with a married man: and *pellex* differed from *concubina*, which ſignified her who had only intercourſe with an unmarried man. The former was reputed infamous, and the latter innocent.

ADULTERINE, in the civil law, is particularly applied to a child iſſued from an adulterous amour or commerce.

ADULTERY, an unlawful commerce between one married perſon and another, or between a married and unmarried perſon.

Puniſhments have been annexed to adultery in moſt ages and nations, though of different degrees of ſeverity. In many it has been capital; in others venial, and attended only with ſlight pecuniary mulcts. Some of the penalties are ſerious, and even cruel; others of a jocoſe and humorous kind. Even contrary things have been enacted as puniſhments for adultery. By ſome laws the criminals are forbid marrying together, in caſe they became ſingle; by others, they are forbid to marry any beſides each other; by ſome, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauſeous.

Among the rich Greeks, adulterers were allowed to redeem themſelves by a pecuniary fine; the woman's father, in ſuch caſes, returned the dower he had received from her huſband, which ſome think was refunded by the adulterer. Another puniſhment among thoſe people was, putting out the eyes of adulterers.

By the Jewiſh law, adultery was puniſhed by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging an adultereſs, or a woman ſuſpected of the crime, by making her drink the bitter waters of jealouſy; which, if ſhe were guilty, made her ſwell.

In Spain, they puniſhed adultery in men by cutting off that part which had been the inſtrument of the crime. In Poland, before Chriſtianity was eſtabliſhed, they puniſhed adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there faſtened him by the teſticles with a nail; laying a razor within his reach, and leaving him under a neceſſity, either of doing juſtice upon himſelf, or of periſhing in that condition.

The Saxons formerly burnt the adultreſs, and over her aſhes erected a gibbet, whereon the adulterer was hanged. In this kingdom, likewiſe, adultery, by the ancient laws, was ſeverely puniſhed. King Edmund the Saxon ordered adultery to be puniſhed in the ſame manner as homicide; and Canute the Dane ordered that a man who committed adultery ſhould be baniſhed, and that the woman ſhould have her noſe and ears cut off. In the time of Henry I. it was puniſhed with the loſs of eyes and genitals.

In Britain, adultery is reckoned a ſpiritual offence, that is, cognizable by the ſpiritual courts, where it is puniſhed by fine and penance. The common lawt akes no farther notice of it, than to allow the party grieved an action and damages.

Adultery is ſometimes uſed, in a more extenſive ſenſe, for any ſpecies of impurity or crime, againſt the virtue of chaſtity.

ADVOCATE, among the Romans, a perſon ſkilled in their law, who undertook the defence of cauſes at the bar. The Roman advocates anſwered to one part of the office of a barriſter in England, viz. the pleading part; for they never gave counſel, that being the buſineſs of the *juriſconſulti*.

Advocate is ſtill uſed in countries and courts where the civil law obtains, for thoſe who plead and defend the cauſes of clients truſted to them.

Advocate is more particularly uſed, in church hiſtory, for a perſon appointed to defend the rights and revenues of a church or religious houſe.

Conſiſtorial Advocates; officers of the conſiſtory at Rome, who plead in all oppoſitions to the diſpoſal of benefices in that court: they are ten in number.

Elective Advocates, thoſe choſen by the abbot, biſhop, or chapter; a particular licence being had from the king, or prince, for that purpoſe. The elections were originally made in the preſence of the count of the province.

Fiſcal Advocate, *fiſci advocatus*, in Roman antiquity, an officer of ſtate under the Roman emperors, who pleaded in all cauſes wherein the *fiſcus*, or private treaſury, was concerned.

Matricular Advocates were the advocates of the mother or cathedral churches.

Military Advocates, thoſe appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. Theſe were introduced in the times of confuſion, when every perſon was obliged to maintain their own property by force: biſhops and abbots not being permitted to bear arms, and the ſcholaſtic or gowned advocates being equally unacquainted with them, recourſe was had to knights, noblemen, ſoldiers, or even to princes.

Nominative Advocates, thoſe appointed by a king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord. By ſome regulations, no perſon was capable of being elected advocate, unleſs he had an eſtate in land in the ſame county.

Subordinate Advocates, thoſe appointed by other ſuperior ones, acting under them, and accountable to them. There were various reaſons for the creation of theſe ſubordinate advocates; as, the ſuperior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great diſtance of ſome of the church-lands, and their lying in the dominions of foreign princes.

Supreme or *Sovereign* Advocates, were thoſe who had the authority in chief; but acted by deputies or ſubordinate advocates. Theſe were called alſo *principal*, *greater*, and ſometimes *general* advocates. Such in many caſes were kings, &c. when either they had been choſen advocates, or became ſuch by being founders or endowers of churches. Princes had alſo another title to advocateſhip, ſome of them pretending to be *advocati nati* of the churches within their dominions.

Advocate, in the Engliſh courts, are more generally called *counſel*.

ADVOWEE, in law, implies the patron of a church, or the perſon who has a right to preſent a benefice.

ADVOWSON, or Advowzen, in common law, ſignifies a right to preſent to a vacant benefice. Advowſon is ſo called, becauſe the right of preſenting to the church was firſt gained by ſuch as were founders, benefactors, or maintainers of the church.

Though the nomination of fit perſons to officiate in every dioceſe was originally in the biſhop, yet they were content to let the founders of churches have the nomination of the perſons to the churches ſo founded, reſerving to themſelves a right to judge of the fitneſs of the perſons ſo nominated.

Advowſons formerly were moſt of them appendant to manors, and the patrons were parochial barons: the lordſhip of the manor and patronage of the church were ſeldom in different hands, until advowſons were given to religious houſes. But of late times the lordſhip of the manor and advowſon of the church have been divided.

Advowſons are *preſentative*, *collative*, or *donative*: *preſentative*, where the patron preſents or offers his clerk to the biſhop of the dioceſe, to be inſtituted in his church; *collative*, where the benefice is given by the biſhop, as original patron thereof, or by means of a right he has acquired by lapſe; *donative*, as where the king or other patron does, by a ſingle donation in writing, put the clerk into poſſeſſion, without preſentation, inſtitution, or induction.

ADUST, Adustus, among phyſicians, &c. is applied to ſuch humours as by long heat become of a hot and fiery nature. Such is cholar ſuppoſed to be. Melancholy is uſually conſidered as black and aduſt bile. Blood is ſaid to be aduſt, when, by reaſon of ſome extraordinary heat, its more ſubtile parts are all evaporated, leaving the groſſer, with all the impurities therein, half torrified.

ADY, in natural hiſtory, a name given to the palm-tree of the iſland of St. Thomas.

ADYNAMIA, in medicine, debility, or weakneſs, from ſickneſs.

ADYNAMON, among ancient phyſicians, a kind of weak factitious wine, prepared from muſt boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in Pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter.

ADZE, or Addice, a cutting tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly uſed for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus.

ÆCHMALOTARCHA, in Jewiſh antiquity, a title given to the principal leader or governor of the Hebrew captives reſiding in Chaldea, Aſſyria, and the neighbouring countries.

The Jewiſh writers aſſure us, that the *æchmalotarchæ* were only to be choſen out of the tribe of Judah. The eaſtern Jews had their princes of the captivity, as the weſtern Jews their patriarchs. The Jews are ſtill ſaid to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones.

ÆDES, in Roman antiquity, beſides its more ordinary ſignification of a houſe, likewiſe ſignified an inferior kind of temple, conſecrated to ſome deity.

ÆDILE, *Ædilis*, in Roman antiquity, a magiſtrate whoſe chief buſineſs was to ſuperintend buildings of all kinds, but more eſpecially public ones, as temples, aqueducts, bridges, &c.

ÆDILITIUM Edictum, among the Romans, was that whereby a remedy was given a buyer, in caſe a vicious or unſound beaſt, or ſlave, was ſold him. It was called *ædilitium*, becauſe the preventing of frauds in ſales and contracts belonged eſpecially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treaſure, and ſacred utenſils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball compoſed of a ſubſtance reſembling hair, generated in the ſtomach of the chamois-goat. This ball is of the ſame nature with thoſe found in cows, hogs, &c.

ÆGIAS, among phyſicians, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGILOPS, the name of a tumor in the great angle of the eye; either with, or without, an inflammation. The tumor, before it becomes ulcerous, is properly called *anchilops*; and, after it is got into the lachrymal paſſages, and has rendered the os lachrymale carious, *fiſtula lachrymalis*.

If the ægilops be accompanied with an inflammation, it is ſuppoſed to take its riſe from the abundance of blood which a plethoric habit diſcharges on the corner of the eye. If it be without an inflammation, it is ſuppoſed to proceed from a viſcous pituitous humour thrown upon this part.

The method of cure is the ſame as that of the ophthalmia. But before it has reached the lachrymal paſſages, it is managed like other ulcers. If the ægilops be neglected, it burſts, and degenerates into a fiſtula, which eats into the bone.

Ægilops, Wild Feſtuc; a genus of the monœcia order, belonging to the polygamia claſs of plants, and ranking under the 4th natural order, Gramina.—For the generic characters, ſee Syſtem of Botany.

ÆGILOPS is alſo the trivial name of a ſpecies of QUERCUS.

ÆGINETA, in Botany, the name given by Linnæus to a genus in plants belonging to the claſs of *didynamia angioſpermia*.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, becauſe he was repreſented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, GOAT-FRIEND; a genus of the monogynia order, belonging to the tetandria claſs of plants.—For the Generic characters, ſee Syſtem of BOTANY. There is only one ſpecies, a native of Martinico.

ÆGOBOLIUM, in antiquity, the ſacrifice of a goat offered to Cybele.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUTWORT, GOATSFOOT, HERB GERARD, or ASHWEED; a genus of the digynia order, belonging to the pentandria claſs of plants.—For the Generic characters, ſee Syſtem of BOTANY. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens: the leaves reſemble thoſe of Angelica, and it carries ſmall white flowers. Its roots run ſo faſt as to render it a very troubleſome weed.

ÆGOPRICON, a genus of the monœcia order, belonging to the diandria claſs of plants.—For the Generic characters, ſee Syſtem of BOTANY. There is but one ſpecies, a native of Surinam.

ÆGYPTIACUM, in pharmacy, the name of ſeveral detergent ointments.

ÆINATÆ, in antiquity, a denomination given to the ſenators of Miletus, becauſe they held their deliberations on board a ſhip, and never returned to land till matters had been agreed on.

AEM, AM, or AME, a liquid meaſure uſed in moſt parts of Germany; but different in different towns. The aem commonly contains 20 vertils, or 80 maſſes; that of Heidelbergh is equal to 48 maſſes; and that of Wirtembergh 160 maſſes.

ÆMOBOLIUM, in antiquity, the blood of a bull, or ram, offered in the ſacrifices, called *taurobolia* and *criobolia*; in which ſenſe the word occurs in antient inſcriptions.

ÆNEATORES, in antiquity, the muſicians in an army, including thoſe who played trumpets, horns, &c. The word is formed from *æneus*, on account of the brazen inſtruments uſed by them.

ÆNEID, the name of Virgil's celebrated epic poem. The ſubject of the Æneid is the eſtabliſhment of Æneas in Italy. Nothing could be more intereſting to the Romans than to look back to their origin from ſo famous a hero. While the object was ſplendid itſelf, the traditionary hiſtory of his country opened intereſting fields to the poet; and he could glance at all the future great exploits of the Romans, in its antient and fabulous ſtate. Therefore the ſtory is extremely happy, inaſmuch as every particular that can enhance the value of unity, action, and probability, are combined to give this elegant poem due weight and conſequence; and indeed ſurpaſſes almoſt every compoſition in the Roman language.

ÆNIGMA denotes any dark ſaying, wherein ſome well-known thing is concealed under obſcure language.

Painted ÆNIGMAS are repreſentations of the works of nature, or art, concealed under human figures, drawn from hiſtory or fable.

The Form of ÆNIGMAS conſiſts in the words, which, whether they be in proſe or verſe, contain either ſome deſcription, a queſtion, or a proſopopæia. The laſt kind are the moſt pleaſing, inaſmuch as they give life and action to things which otherwiſe have them not.

The Explication of ÆNIGMAS makes a conſiderable exerciſe; and that one of the moſt difficult and amuſing, where wit and penetration have the largeſt field. By explaining an ænigma is meant the finding a motto correſponding to the action and perſons repreſented in a picture, taken either from hiſtory or mythology. The great art of this exerciſe conſiſts in the choice of a motto, which either by itſelf, or the circumſtances of time, place, perſon who ſpeaks, or thoſe before whom he is ſpeaking, may divert the ſpectators, and furniſh occaſion for ſtrokes of wit; alſo in ſhowing to advantage the conformities between the figure and the thing figured, giving ingenious turns to the reaſons employed to ſupport what is advanced, and in artfully introducing pieces of poetry to illuſtrate the ſubject and awaken the attention of the audience.

In antient hiſtory we meet with ſome ænigmas complicated to a degree, and which have greatly perplexed the interpreters of them. Such is that celebrated ancient one, *Ælia Lælia Criſpis*, of which we have two exemplars; one found 140 years ago on a marble near Bolognia; the other in an antient MS. written in Gothic letters at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bolognian Ænigma.

D. M.
Ælia Lælia Criſpis;
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,
Nec anus;
Nec caſta, nec meretrix,
Nec pudica;
Sed omnia:
Sublata
Neque fame, neque ferro,
Neque veneno;
Sed omnibus:
Nec cœlo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priſcius,
Nec maritus, nec amator,
Nec neceſſarius;
Neque mærem, neque gaudens,
Neque flens;
Hanc,
Nec molem, nec pyramidem,
Nec ſepulchrum,
Sed omnia,
Scit et neſcit, cui poſuerit.

That is to ſay, "To the gods manes, Ælia Lælia Criſpis; neither man, nor woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaſte, nor a whore; but all theſe: killed neither by hunger, nor ſteel, nor poiſon; but by all theſe: reſts neither in heaven, nor on earth, nor in the waters; but every where. Lucius Agatho Priſcius, neither her huſband, nor lover, nor friend; neither ſorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all theſe." In the MS. at Milan, inſtead of D. M. we find A. M. P. P. D. and at the end the following addition:

Hoc eſt ſepulchrum intus cadaver non habens
Hoc eſt cadaver ſepulchrum extra non habens,
Sed cadaver idem eſt et ſepulchrum.

We find near 50 ſeveral ſolutions of this ænigma advanced by learned men. Marius Michael Angelus maintains Ælia Lælia Criſpis to ſignify rain-water falling into the ſea. Ri. Vitus firſt explained it of Niobe turned to a ſtone, afterwards of the rational ſoul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima*; Fr. Schottus, of an eunuch; Nic. Bernardus, of the philoſopher's ſtone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the ſame ſituation, and buried by three different men at the ſame time; Neſmondius, of a law-ſuit; Jo. Gaſ. Gerartius, of love; Zu. Boxhornius, of a ſhadow; P. Terronius, of muſic; Fort Licetus, of generation, friendſhip. and privation: M. Ov. Montalbanus, of hemp; Car. Cæſ. Malvaſia, of an abortive girl promiſed in marriage; Pet. Mengulus, of the rule of chaſtity, preſcribed by the founder of the military religion of St. Mary; M. de Ciconia, of pope Joan; Heumannus, of Lot's wife; and laſtly, J. C. S. an anonymous writer in the Leipſic Acts, of the Chriſtian church.

ÆNICMATOGRAPHY, or ÆNIGMATHOLOGY, the art of reſolving or making ænigmas.

ÆNITHOLOGIUS, in poetry, a verſe of two dactyls and three trochæi.

ÆOLIC, in a general ſenſe, denotes ſomething belonging to Æolis.

ÆOLIC, or ÆOLIAN, in grammar, one of the five dialects, of the Greek tongne. It was firſt uſed in Bœotia; whence it paſſed in Æolia, and was that which Sappho and Alcæus wrote in. The Æolic dialect generally throws out the aſpirate or ſharp ſpirit, and agrees in ſo many things with the DORIC dialect that the two are uſually confounded together.

The *Æolic digama* is a name given to the letter F, which the Æolians uſed to prefix to words beginning vowels, as Ζοινος for οινος; alſo to inſert between vowels, as οΖις for οις.

ÆOLIC *Verſe*, in proſody, a verſe conſiſting of an iambus, or ſpondee; then of two anapeſts, ſeparated by a long ſyllable; and, laſtly, another ſyllable. Such as, *O ſtelliferi conditor orbis.* This is otherwiſe called *eulogic* verſe; and, from the chief poets who uſed it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in hydraulics, is a hollow ball of metal, generally uſed in courſes of experimental philoſophy, in order to demonſtrate the poſſibility of converting water into an elaſtic ſteam or vapour by heat. The inſtrument, therefore, conſiſts of a ſlender neck, or pipe, having a narrow orifice inſerted into the ball by means of a ſhouldered ſcrew. This pipe being taken out, the ball is filled almoſt full of water, and the pipe being again ſcrewed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there iſſues from the orifice a vapour, with prodigious violence and great noiſe, which continues till all the included water is diſcharged. The ſtronger the fire is the more elaſtic and violent will be the ſteam; but care muſt be taken that the ſmall orifice of the pipe be not, by any accident, ſtopped up; becauſe the inſtrument would, in that caſe, infallibly burſt, and with ſuch violence as may greatly endanger the lives of the perſons near it. Another way of introducing the water is to heat the ball red hot when empty, which will drive out almoſt all the air; and then by ſuddenly immerging it in water, the preſſure of the atmoſphere will force in the fluid, till it is nearly full. Des Cartes and others have uſed this inſtrument to account for the natural cauſe and generation of the wind: and hence it was called Æolopila, q. d. *pila Æoli*, the ball of Æolus, or of the god of the winds.

ÆOLUS, in heathen mythology, the god of the winds, was ſaid to be the ſon of Jupiter by Acaſta, or Sigeſia, the daughter of Hipotus; or, according to others, the ſon of Hippotus by Meneclea, daughter of Hyllus king of Lipara.

ÆON, a Greek word, properly ſignifying the age or duration of any thing.

ÆON, among the followers of Plato, was uſed to ſignify any virtue, attribute, or perfection: hence they repreſented the deity as an aſſemblage of all poſſible æons; and called him *pleroma*, a Greek term ſignifying fullneſs. The Valentinians, who, in the firſt ages of the church, blended the conceits of the Jewiſh cabaliſts, the Platoniſts, and the Chaldean philoſophers, with the ſimplicity of the Chriſtian doctrine, invented a new kind of theogony, or genealogy of gods (not unlike that of Heſiod) whom they called by ſeveral glorious names, and all by the general appellation of ÆONS: among which they reckoned Ζωη, life; Δολος, word; Μονογενης, only-begotten; Πληρωμα, fullneſs; and many other divine powers and emanations, amounting in number to thirty: which they fancied to be ſucceſſively derived from one another; and all from one ſelf-originated deity, named *Bythus*, i. e. profound or unfathomable; whom they called likewiſe, The moſt high and ineffable Father.

ÆORA, among ancient writers on medicine, is uſed for geſtation; which ſort of exerciſe was often preſcribed by the phyſicians of thoſe days. Other exerciſes conſiſted principally in the motion of the body; but in the *æora* the limbs were at reſt, while the body was carried about and moved from place to place, in ſuch a manner as the phyſician preſcribed.

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is ſometimes alſo written in antient authors *Era*. The origin of the term is conteſted, though it is generally allowed to have had its riſe in Spain. Sepulveda ſuppoſes it formed from A. ER. A. the notæ or abbreviatures of the words, *annus erat Auguſti*, occaſioned by the Spaniards beginning their computation from the time their country came under the dominion of Auguſtus, or that of receiving the Roman calendar. This opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviatures *A* never ſtood for *annus*, unleſs when preceded by *V* for *vixit*; and that it ſeems improbable they ſhould put ER for *erat*, and the letter A, without any diſcrimination, both for *annus* and *Auguſtus*. Voſſius nevertheleſs favours the conjecture, and judges it at leaſt as probable, as either that of Iſidore, who derives *æra* from *æs*, the "tribute-money," wherewith Auguſtus taxed the world: or that of Scaliger himſelf, who deduces it likewiſe from *æs*; though in a different manner. *Æs*, he obſerves, was uſed among the ancients for an *article* or *item* in an account; and hence it came alſo to ſtand for a ſum or number itſelf. From the plural *æra*, came by corruption *æra*, *æram*, in the ſingular; much as *Oſtia*, *Oſtiam*, the name of a place, from *Oſtia*, the mouths of the Tyber.

The difference between the terms æra and epoch is, that the æras are certain points fixed by ſome people, or nation; and the epochs are points fixed by chronologiſts and hiſtorians. The idea of an æra comprehends alſo a certain ſucceſſion of years proceeding from a fixed point of time, and the epoch is that time itſelf. Thus the Chriſtian æra began at the epoch of the birth of Jeſus Chriſt.

ÆRA is alſo uſed by ſome writers of the barbarous ages to ſignify any year.

ÆRA ſignifies alſo cockle or darnel.

ÆRARIUM, the treaſury or place where the public money was depoſited amongſt the Romans.

ÆRARIUM *Sanctius* contained the monies ariſing from the twentieth part of all legacies: this was kept for the extreme neceſſities of the ſtate.

ÆRARIUM *Privatum* was the emperor's privy purſe, or the place where the money ariſing from his private patrimony was depoſited.

ÆRARIUM *Viceſimarum*, the place where the money ariſing from the taxes levied from foreign countries was laid up, ſo called becauſe it moſt commonly conſiſted of a twentieth part of the produce.

ÆRARIUM *Ilithyæ*, or *Junonis Luncinæ*, was where the monies were depoſited which parents paid for the birth of each child.

There are ſeveral other treaſuries mentioned in hiſtory, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treaſury of Rome, either becauſe Saturn firſt taught the Italians to coin money, or, which is moſt likely, becauſe this temple was the ſtrongeſt and moſt ſecure, and therefore the fitteſt place for that purpoſe.

ÆRARIUM differs from *fiſcus*, as the firſt contained the public money, the ſecond that of the prince. The two are, however, ſometimes indiſcriminately uſed for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been ſtruck off the liſt of his century. Such perſons were ſo called becauſe they were liable to all the taxes (æra) without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in aſſemblies, of enjoying any poſt of honour or profit; in effect, were only ſubject to the burdens, without the benefits of ſociety; yet they retained their freedom, and were not reduced to the condition of ſlaves. To be made an *ærarii*, was a puniſhment inflicted for ſome offence, and reputed one degree more ſevere than to be expelled a tribe, *tribu moveri*.

ÆRARIUS was alſo an officer inſtituted by Alexander Severus, for the diſtribution of the money given in largeſſes to the ſoldiery or people.

ÆRARIUS was alſo uſed for a perſon employed in coining or working braſs.

Theſe are ſometimes called *ærarii fuſores*: at other times, *ærarius* is diſtinguiſhed from *fuſor*; the former anſwering to what we now call copper-ſmiths, the latter to founders.

ÆRATIUS was likewiſe applied to a ſoldier who received pay.

AERIAL, in a general ſenſe, denotes ſomething partaking of the nature of air.

AERIAL *Perſpective*. See Syſtem of PERSPECTIVE.

AERIANS, in church-hiſtory, a branch of Arians, who to the doctrines of that ſect, added ſome peculiar dogmas of their own; as, that there is no difference between biſhops and prieſts; a doctrine maintained by many modern divines, particularly of the preſbyterian and reformed churches. The ſect received its denomination from Aerius, an Armenian prieſt of the fourth century. He founded his doctrine chiefly upon ſome paſſages in St. Paul; and, among others, upon that in 1 Tim. iv. 14. where the apoſtle exhorts him not to neglect the gift he had received by *the laying on of the hands of the Preſbytery*. Here, obſerves Aerius, is no mention of biſhops: on the contrary, Timothy evidently received his ordination from the preſbyters or prieſts. Epiphanius zealouſly maintains the ſuperiority of biſhops againſt the Aerians. The word *preſbytery*, uſed by the apoſtle, he obſerves, includes both biſhops and prieſts; the whole ſenate or aſſembly of the eccleſiaſtics of the place.

Flos ÆRIS, among alchemiſts, ſignifies ſmall ſcales procured from copper melted by a ſtrong heat; it is ſometimes uſed for ærugo or verdigriſe.

AEROGRAPHY, from αηρ, air, and γραφω, I deſcribe; a deſcription of the air, or atmoſphere, its limits, dimenſions, properties, &c. This amounts to much the ſame with aerology, unleſs we ſuppoſe the latter to enter into the rational, and the former to confine itſelf to a deſcription of the more obvious affections thereof.

A NEW SYSTEM of AEROLOGY.

THIS Science includes all the phenomena, properties, ingredients, nature, ſpecies, and uſes of that inviſible fluid which ſurrounds this globe, called Air, on which depends the life of the kingdoms of nature.

DEFINITION I.

The ancients conſidered air to be an homogeneous fluid, the component parts of which were beyond the reach of man's wiſdom to diſcover. Its common operations were thought to be performed either by its heat or cold, its moiſture or dryneſs. And if any effects were diſcovered, which could not be explained by theſe, ſuch as the appearance of peſtilential diſeaſes, they were reckoned to be entirely ſupernatural, and the immediate effect of Divine Power. But however ſimple and homogeneous this fluid may have been thought in former times, it is ſo far from poſſeſſing the ſimplicity of an element, that it is the receptacle of all kinds of effluvia produced from terreſtrial ſubſtances, as well artificial as natural.

Hence, whatever may be the nature of the aërial fluid, when abſolutely pure, that which we breathe, and commonly goes under the name of air, muſt be conſidered as an exceedingly heterogeneous mixture, various at various times, and which it is by no means poſſible to analiſe with accuracy. Air ſeems to be a kind of maſs where all the poiſonous effluvia ariſing from putrid and corrupted matters are depoſited; yet it has a wonderful facility of purifying itſelf, and one way or other of depoſiting theſe vapours contained in it, ſo that it never becomes noxious, except at particular places, and for a ſhort time; the general maſs remaining upon all occaſions pretty much the ſame.

The way in which this purification is effected is different, according to the nature of the vapour with which the air is loaded. That which moſt univerſally prevails is water; and from experiment it appears, that the quantity of aqueous vapour contained in the atmoſphere is immenſe. Dr. Halley has proved, that the evaporation from the Mediterranean ſea is alone ſufficient to ſupply all the rivers that run into it with water.

Dr. Watſon, in his chemical eſſays, has demonſtrated, that where there had been no rain for the ſpace of a month, the evaporation from an acre of land, was no leſs than 1600 gallons of water in 24 hours. But in rainy weather he has proved, by ſeveral experiments, that the evaporation of liquids is not leſs than 3600 gallons per acre in the ſame time. Thus the air is every moment purified by the perpetual aſcent of theſe vapours.

Yet it is not entirely from the aqueous vapour that the air is purified at this time; for part of the effluvia ariſing from putrid and decayed ſubſtances of every kind, by attaching itſelf to the aqueous vapour, aſcends along with it. This phlogiſtic vapour, as the modern philoſophical text defines it, is alſo abſorbed by vegetables, as is proved by numerous experiments, and it may be aſſerted with great probability, that it is their proper food.

The phlogiſtic vapours which aſcend along with the water, probably continue there, and deſcend along with the rain; whence the fertilizing qualities of rain-water above thoſe of any other. Thus we may ſee why a dry air, whether cold or hot, muſt always be wholeſome; but as the atmoſphere cannot always receive vapours, it is obvious, that when great rains come on, eſpecially if attended with heat, the lower regions of the air muſt be overloaded with vapours both of the aqueous and phlogiſtic kind, and of conſequence be very unwholeſome.

But beſides the aqueous and phlogiſtic vapours, both of which are ſpecifically lighter than common air, there are others, which being ſpecifically heavier, cannot be carried off in this manner. Hence theſe groſs vapours contaminate certain places in the atmoſphere, rendering them not only unhealthy, but abſolutely poiſonous, viz.

1. Sulphureous, acid, and metalline exhalations, produced by volcanos, that deſcend in conſequence of their ſpecific gravity, and ſpread deſtruction all around them, poiſoning not only animals, but vegetables alſo.

2. The vapours ariſing from houſes where metals are ſmelted have the ſame pernicious qualities.

3. Emanations of fixed air, which ſometimes proceed from old lavas, ſo that the air ſeems not capable of purifying itſelf, otherwiſe than, either by diſperſing them by winds, or by letting them ſubſide by their ſuperior gravity, till they are abſorbed by the earth or water, according as it is their nature to unite with one or other of theſe elements. Hence, ſcarce any conſtitution of the atmoſphere can diſpel theſe noxious effluvia; nor does it ſeem probable that peſtilential diſtempers ever ceaſe, until the contagion has operated ſo long, and been ſo frequently communicated from one to another, that, like a ferment much expoſed to the atmoſphere, it becomes vapid, communicates a milder infection, and at laſt loſes its ſtrength altogether.

As the air is a ſolid body, it muſt need have gravity, or weight, which has been demonſtrated by experiment. For a bottle that holds a wine quart filled with air, weighs 16 grains heavier than when empty: and as a wine quart of water 14,621 grains, it is evident by this analogy, that common air is to water in its gravitation, as 1 is to 914 exactly.

By means of its gravity, the air preſſes with great force upon all bodies according to the extent of their ſurface; which I compute at 15 lb. on every ſquare inch.

According to ſome experiments made by M. Amontons and de la Hire, a column of air on the ſurface of the earth, and 36 fathoms high, is equal in weight to three lines depth of mercury. By the barometer the preſſure of the atmoſphere appears to be very different; ſometimes being only equal to a column of 28, and varying from thence to 31 inches. The whole quantity of preſſure muſt thus be immenſe, and has been computed equal to a globe of lead of 60 miles in diameter.

The gravity of the atmoſphere accompliſhes many uſeful purpoſes in nature. It prevents the arterial veſſels of animals and the ſap-veſſels of plants, from being too much diſtended by the expanſive power, which has a perpetual tendency to ſwell them out: as in the operation of cupping, where the preſſure of the air is taken off from a particular part, the expanſive force inſtantly acts, and ſwells out the veſſels to a great degree. Hence when animals are put into an air pump, their whole bodies ſwell.

By the gravity of the air the union of fluid bodies is promoted, which would otherwiſe inſtantly ceaſe in vacuo. For oils and ſalts, which remain united in air, ſeparate as ſoon as that fluid is extracted. Hence alſo when hot water is put under an exhauſted receiver, it boils violently, becauſe the preſſure of the air being now taken off, the particles of ſteam, which exiſted inviſibly in the water, and which the gravity of the atmoſphere prevented from flying off ſo ſoon, are now hurried up with great velocity by means of the exceſſive comparative gravity of the aqueous fluid. For on the gravity of the air depends the aſcent of water in pumps, ſyphons, &c. and likewiſe all the phenomena of the barometer. But it differs from all other fluids, as it can be compreſſed into a much leſs ſpace than what it naturally poſſeſſed. Nor can it be congealed like other fluids. However, it is to be remarked, that it is of a different denſity in every part upward from the earth's ſurface, decreaſing in its weight the higher it riſes, and therefore muſt alſo decreaſe in denſity.

The air is of an elaſtic ſpringy nature, and the force of its ſpring is equal to its weight. The elaſticity of the air was firſt aſcertained by ſome experiments of lord Bacon, who, upon this principle, conſtructed the firſt thermometor, which he called his vitrum calendare. Of this power we have numerous proofs. Thus, a blown bladdar being ſqueezed in the hand, we find the included air ſenſibly reſiſt; ſo that upon ceaſing to compreſs, the cavities or impreſſions made in its ſurface are readily expanded again and filled up.

The ſtructure and office of the air pump depend on this elaſtic property. Every particle of air always exerts an endeavour to expand, and thus ſtrives againſt an equal endeavour of the ambient particles; whoſe reſiſtance happening by any means to be weakened, it immediately diffuſes itſelf into an immenſe extent. Hence it is that thin glaſs bubbles, or bladders filled with air, and exactly cloſed, being included in the exhauſted receiver of an air pump, burſt by the force of the air they contain; and a bladder nearly flaccid ſwells in the receiver, and appears full. The ſame effect alſo takes place, though in a ſmaller degree, on carrying the flaccid bladder to the top of an high mountain.

It has been queſtioned among philoſophers, whether this elaſtic power of the air is capable of being deſtroyed or diminiſhed; but by ſeveral experiments I am ſatisfied it cannot.

The weight or preſſure of the air has no dependence on its elaſticity; but would be the ſame whether it had ſuch a property or not. In effect, the law of this elaſticity is, that it increaſes as the denſity of the air increaſes; and the denſity increaſes as the force increaſes by which it is preſſed. Now there muſt neceſſarily be a ballance between the action and re-action; i. e. the gravity of the air which tends to compreſs it, and the elaſticity by which it endeavours to expand, muſt be equal. Hence the elaſticity increaſing, or diminiſhing univerſally as the denſity increaſes or diminiſhes, it is no matter whether the air be compreſſed and retained in ſuch a ſpace by the weight of the atmoſphere, or by any other means; it muſt endeavour, in either caſe, to expand with the ſame force; conſequently if air near the earth be pent up in a veſſel, and all communication with the external fluid cut off, the preſſure of the incloſed air will be equal to the weight of the atmoſphere at the time the quantity was confined.

No ſtandard can be ſettled relative to the limitation of the denſity, compreſſion, rarefaction, or dilutation of the air. Therefore I omit the uſeleſs theorics of ſeveral authors on its principles and properties; as I ſhall not obtrude any thing I cannot aſſert as a fact, and for which proofs can be given.

The elaſtic power of this fluid inſinuates into the pores of bodies, thereby putting the particles of ſuch bodies into perpetual oſcillations; for the degree of heat, and the air's gravity and denſity, and conſequently its elaſticity and expanſion, never remaining the ſame for the leaſt ſpace of time, there muſt be an inceſſant vibration or dilatation and contraction in all bodies.

We obſerve this reciprocation in ſeveral inſtances, particularly in plants, the air veſſels of which do the office of lungs; for the contained air alternately expanding and contracting, according to the increaſe or diminution of the heat, alternately preſſes the veſſels and eaſes them again, thus keeping up a perpetual motion in their juices.

Hence we find, that no vegetation or germination will proceed in vacuo. The air is very inſtrumental in the production and growth of vegetables, not only by invigorating their ſeveral juices while in an elaſtic active ſtate, but alſo by greatly contributing in a fixed ſtate to the union and firm connections of their ſeveral conſtituent parts.

From the ſame cauſe it is that the air contained in the bubbles of ice, by its continual action burſts the ice. Thus alſo entire columns of marble ſometimes cleave in the winter time, from the increaſed elaſticity of ſome little bubble of air contained in them. From the ſame principle ariſe all putrefaction and fermentation, neither of which will proceed even in the beſt diſpoſed ſubjects in vacuo.

Since we find ſuch great quantities of elaſtic air generated in the ſolution of animal and vegetable ſubſtances, a good deal muſt conſtantly ariſe from the diſſolution of theſe aliments in the ſtomach and bowels, which is much promoted by it; and, in reality, all natural corruption and alteration ſeem to depend on the air.

This fluid acts not only by its common properties of gravity and elaſticity, but produces numerous other effects ariſing from the peculiar ingredients of which it conſiſts.

Thus, It not only diſſolves and attenuates bodies by its preſſure and attrition, but as a chaos containing all kinds of menſtrua, and conſequently poſſeſſing powers for diſſolving all bodies. It is known that iron and copper readily diſſolve and become ruſty in air, unleſs well defended with oil. Stones alſo undergo the changes incident to metals. Air has a conſiderable operation upon vitriol, even when a ſtrong fire could act no farther upon it. It has been proved by experiment, that the fumes of a corroſive liquor work more ſuddenly and manifeſtly on metal when ſuſtained in the air, than the menſtruum itſelf did, which emitted fumes on thoſe parts of the metal which it covered; referring to the effects of the effluvia of vinegar on copper.

The diſſolving power of air is increaſed by heat, and by other cauſes. It combines with water, and by acceſs of cold depoſits part of the matter which was kept diſſolved in it by a greater degree of heat. Hence the water, by being depoſited and condenſed upon any cold body, ſuch as glaſs, &c. in windows, forms fogs, and becomes viſible.

In chemical operations air is a very neceſſary and important agent; the reſult of particular proceſſes depending on its preſence or abſence, on its being open or incloſed. Thus, the parts of vegetables or animals can only be calcined in open air; in cloſe veſſels they never become any other than black coals. And theſe operations are effected by the changes to which the air is liable.

The changes in the air ariſe from various cauſes, and are obſervable not only in its mechanical properties, ſuch as gravity, denſity, &c. but in the ingredients that compoſe it.

The effluvia of animals, minerals and vegetables have their effect in varying the air: as is evident in contagious diſeaſes, murrains, plagues, and other mortalities, which are ſpread by an infected air.

From what has been obſerved it is evident, that the aerial fluid agitates bodies when in motion; reſiſts the motions made in it; ſuſtains bodies floating in it; and only differs in its general properties from the groſſer fluids; great rarity, elaſticity and tranſparency, being its diſtinguiſhing characters. The whole maſs of this fluid, with its contents, is called the atmoſphere; a term made uſe of when the effects that ariſe from its form, magnitude, denſity, rarefaction or dilatation are conſidered: but when the fluid of which the maſs is compoſed is indefinitely ſpoken of, with a view to develope its qualities, and conſider it independent of the bodies immerſed in, or mixed with it, it is called the air or aer.

This fluid is compoſed of an innumerable multitudeo f ſmall particles, generally defined atoms, alluding to their inviſible ſtate to the naked eye, or even to almoſt all magnifying glaſſes. And as thoſe particles are not in contact, they repel each other with a force that may be diminiſhed, but cannot be deſtroyed, by any degree of cold known in the vicinity of the earth. For if the particles were in contact the fluid could not be compreſſed; and if they did not repel each other, the fluid could not expand when the compreſſing force is removed. This property of the air has been proved by various methods; and as it is the received opinion of the philoſophers of the age, I think it neceſſary to add, the methods made uſe of for ſuch ſatisfaction: however, they ſhall be enumerated in their proper order.

The firſt object of enquiry that will follow from what has been already advanced, is the extent of the atmoſphere, i. e. its magnitude. In anſwer to which, it is only neceſſary to obſerve, that it is not only extended over the face of the earth, but that of the ſea likewiſe; as is evident from the ſuſpenſion and motion of the clouds; which proves alſo that its altitude is conſiderable; but the meaſure of this altitude muſt be obtained from its effects. If the ſpecific gravity of the air be found, and alſo its whole preſſure on bodies, it will be eaſy to diſcover the quantity of the fluid and its height, if ſuppoſed to be uniformly denſe. Or it may be deduced from optical conſiderations, by obſerving the effect it has on the light of the ſun.

We ſhall now proceed in order to aſcertain, agreeable to the lateſt diſcoveries, the ſeveral kinds of aerial fluid; a curious intereſting ſubject, in which every claſs of readers will find amuſement as well as uſeful knowledge.

DEFINITION II.

Dephlogiſticated Air poſſeſſes ſome of the properties of common air in a very eminent degree, but is deficient in others. Thoſe in which it excels are the ſupport of flame and of animal life. It is rather more elaſtic than common air; as it likewiſe exceeds it a little in ſpecific gravity, the proportion betwixt it and common air being that of 160 to 152. On introducing a lighted candle into dephlogiſticated air, the flame not only grows larger, but becomes exceedingly bright; and when the air is very pure, the candle burns with a crackling noiſe, as if the air contained ſome combuſtible matter, at the ſame time that the wax or tallow waſtes ſurpriſingly faſt.

The heat of the flame is in proportion to its light. If we fill a bladder with dephlogiſticated air, and then faſten to its neck a glaſs tube, whoſe aperture is drawn to a fine point, the dephlogiſticated air, if driven out by preſſing the bladder, will augment the heat of a candle to ſuch a degree, that if any ſmall bits of metal, placed on a piece of charcoal, be held in the apex of the flame, they will almoſt inſtantly be melted. Even grains of platina may by this means be melted; and in a larger fire there is no doubt that the effects of burning mirrors might be equalled.

On mixing dephlogiſticated and inflammable air together, an exploſion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpoſe ſhould be very ſtrong, be filled with a little more than one-third of dephlogiſticated, and the reſt inflammable air, and the flame of a candle preſented to its mouth, it will explode nearly as loud as a ſmall piſtol.

It has been, almoſt throughout all ages, believed, that combuſtion in every inſtance diminiſhed common air, or reduced it to a ſmaller volume: but the late experiments of Mr. Lavoiſier have ſhown, that this is a miſtake; and that in ordinary proceſſes attended with the production of fixed and phlogiſticated air, the quantity of vapour produced is equivalent to that abſorbed, or otherwiſe made to diſappear during the operation. With dephlogiſticated air the caſe is very different, as it ſuffers by diminution.

The purity of dephlogiſticated air is aſcertained by its degree of diminution with nitrous air; which, like that of the diminution by liver of ſulphur, or otherwiſe, is to be conſidered as a phlogiſtic proceſs, or kind of burning, eſpecially as a conſiderable degree of heat is thereby generated. Very great differences are perceived in this reſpect; and according to the quantity of diminution, the air is ſaid to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends.

Dephlogiſticated air is much inferior to that of the common atmoſphere in ſupporting vegetable life. This has been aſcertained by the experiments of Dr. Prieſtley, and others, as herein after mentioned.

Dephlogiſticated air is one of the conſtituent and elementary parts of water, inflammable air being the other; though the opinion is ſtill conteſted by ſome foreign chemiſts. See Phil. Tranſ. Vol. 74, No. 125.

In Auguſt 1774, Dr. Prieſtley diſcovered dephlogiſticated air. The circumſtances which led him to the diſcovery, were his having always procured inflammable air from ſpirit of ſalt, by adding to it ſpirit of wine, oil of olives, oil of turpentine, charcoal, phoſphorus, bees wax, and even ſulphur. Hence he ſuſpected, that the common might be compoſed of ſome kind of acid united with phlogiſton. On this ſuppoſition he extracted air from mercurius calcinatus *per ſe*, by expoſing it to the focus of a burning-glaſs 12 inches in diameter; and, having repeated the experiment with red precipitate and minium, he found, that though a quantity of fixed air was always produced, yet after that was ſeparated, the remainder ſupported flame much more vigorouſly than common air; for a candle burned in it with a flame very much enlarged, and with a crackling noiſe, at the ſame time that it appeared fully as much diminiſhed by the teſt of nitrous air. When he concluded, that it was reſpirable; and, on making the experiment, found that it actually was ſo, for a mouſe lived a full half hour in a quantity of this fluid; which, had it been common air, would only have kept it alive half that time. Nor did the animal ſeem to be otherwiſe injured than by the cold; as it preſently revived on bringing it near the fire, and the remainder of the air ſtill appeared better than that of the atmoſphere, when the teſt of nitrous air was applied to it.

This pure kind of air being diſcovered, the doctor next proceeded to name it dephlogiſticated, from his opinion that common air, in the act of burning, abſorbed phlogiſton; of conſequence, he ſuppoſed, that which abſorbed the moſt, or which moſt vigorouſly and for the greateſt length of time ſupported flame, was ſuppoſed to contain the ſmalleſt quantity of this ſubſtance. In the courſe of his inquiries why this kind of air comes to be ſo much dephlogiſticated, he fell upon a method of extracting it from a great variety of ſubſtances; viz. by moiſtening them with ſpirit of nitre, and then diſtilling them with a ſtrong heat. Thus he obtained it from flowers of zinc, chalk, quick lime, ſlacked lime, tobacco-pipe clay, flint, Muſcovy talcs, and even glaſs. He then found, that by ſimply diſſolving any metal in the nitrous acid, and then diſtilling the ſolution, he could obtain very pure air; and Mr. Warltire found even the trouble of diſtillation unneceſſary; nothing more being requiſite than to moiſten red lead with the ſpirit of nitre, and then pour upon it the oil of vitriol, which inſtantly diſengaged the dephlogiſticated air without applying any more heat than what was generated by the mixture.

As the nitrous acid was univerſally concerned in the firſt proceſſes for obtaining this kind of air, it was for ſome time generally believed to be a peculiar property of that acid alone to produce it; but Dr. Prieſtley ſoon found, that it might not only be procured where no nitrous acid was employed, but where the ſubſtances were treated with vitriolic acid. It was indeed evident, from the very firſt experiment, that nitrous acid was not eſſentially neceſſary; ſince pure air was procured from precipitate *per ſe*, in the preparation of which no nitrous acid is employed. The Abbé Fontana found, that 192 grains of this ſubſtance yielded 26½ cubic inches of dephlogiſticated air, at the ſame time that the weight of it was reduced to $178\frac{7}{8}$ grains, which is nearly the weight of that quantity of air. It had formerly been obſerved, that the weight of mercury is augmented during its converſion into precipitate *per ſe*, as that of lead is by its converſion into minium. The experiments juſt now mentioned ſhow, that during this proceſs the air is decompounded; the pure dephlogiſticated part of it being abſorbed by the metal, and appearing again on the application of heat; and the ſame appears to be the caſe with red lead, from the experiment of Mr. Warltire already mentioned. With regard to this laſt ſubſtance, however, a very great ſingularity is obſerved; viz. that when newly prepared it yields none at all, and even for ſome time after the produce is much ſmaller than when it has been long kept. The reaſon of this ſeems to be, that the minium ſtill contains a conſiderable quantity of phlogiſton, which flies off into the atmoſphere by long keeping, a larger quantity of the dephlogiſticated part of the atmoſphere being imbibed at the ſame time. The mode of applying heat has alſo a very conſiderable effect on the quantity of air produced.

By heat alone, Doctor Prieſtley found, that ſedative ſalt, manganeſe, lapis calaminaris, and the mineral called *lapis ponderoſus, wolfram*, or *tungſten*, would yield dephlogiſticated air; the firſt indeed in very ſmall quantity, and ſometimes even of a quality very little ſuperior to common air.

In his experiments with the nitrous acid, as it had conſtantly been found, that by pouring on more nitrous acid on the reſiduum, and repeating the operation, more dephlogiſticated air might be obtained, the doctor determined to try whether the ſame would not hold good with vitriolic acid alſo. The ſame product he obtained from blue vitriol, ſolution of copper in the vitriolic acid, and from a ſolution of mercury in that acid. From the later experiments of Mr. Lavoiſier, however, it appears that the Doctor's proceſs had not been conducted with ſufficient care; as from two ounces of the dry ſalt formed by a combination of vitriolic acid with mercury, the former obtained 6 drachms 12 grains of running mercury, beſides 3 drachms 58 grains of mercurial ſublimate of two different colours. Dephlogiſticated air was likewiſe obtained from pure calx of tin, or putty, mixed with oil of vitriol; but none in any trial with the marine acid, excepting when it was mixed with minium; in which caſe the air obtained was probably that which the minium would have yielded without any addition.

The reſult of all theſe, and innumerable other experiments made by philoſophers in different countries, was, that dephlogiſticated air may be obtained from a vaſt variety of mineral and metallic ſubſtances by means of the vitriolic and nitrous acids. It now remained only to diſcover in what manner this fluid, ſo eſſentially neceſſary to the ſupport of animal life, is naturally produced in quantities ſufficient for the great expence of it throughout the whole world, by the breathing of animals, the ſupport of fires, &c. This diſcovery, indeed, had been made before even the exiſtence of dephlogiſticated air itſelf was known.

Dr. Prieſtley, after having tried various methods of purifying contaminated air unſucceſsfully, found at laſt, that ſome kinds of vegetables anſwered this purpoſe very effectually; for which diſcovery he received the thanks of the Royal Society. Among the vegetables employed on this occaſion, he found mint anſwer the purpoſe very effectually. "When air," ſays he, "has been freſhly and ſtrongly tainted with putrefaction, ſo as to ſmell through the water, ſprigs of mint have preſently died upon being put into it, their leaves turning black; but if they do not die preſently, they thrive in a moſt ſurpriſing manner. In no other circumſtances have I ſeen vegetation ſo vigorous as in this kind of air, which is immediately fatal to animal life. Though theſe plants have been crowded in jars filled with this kind of air, every leaf has been full of life; freſh ſhoots have branched out in various directions, and grown much faſter than other ſimilar plants growing in the ſame expoſure in common air." Having in conſequence of this obſervation rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a ſprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the ſprig, had become reſpirable; for a mouſe lived very well in this, whereas it died the moment it was put into the other.

Having tried the power of ſeveral ſorts of vegetables upon air infected by reſpiration or by the burning of candles, he found that it was generally rendered worſe by their vegetation; and the longer the plants were kept in the infected air, the more they phlogiſticated air; though in ſeveral caſes it was undoubtedly meliorated, eſpecially by the ſhoots of ſtrawberries and ſome other plants, introduced into the vials containing foul air, and inverted in water, which were placed near them, whilſt their roots continued in the earth in the garden. Sometimes the infected air was ſo far mended by the vegetation of plants, that it was in a great meaſure turned into dephlogiſticated air. "On the whole," ſays Dr. Prieſtley, "I ſtill think it probable, that the vegetation of healthy plants, growing in ſituations natural to them, have a ſalutary effect on the air in which they grow. For one inſtance of the melioration of air in theſe circumſtances ſhould weigh againſt an hundred in which the air is made worſe by it, both on account of the diſadvantages under which all plants labour, in the circumſtances in which theſe experiments muſt be made, as well as the great attention and many precautions that are requiſite in conducting ſuch a proceſs."

At the time Dr. Prieſtley made theſe experiments, he ſuppoſed the air was meliorated merely by the abſorption of phlogiſton from that which had been tainted; but the experiments of Dr. Ingenhouſz, made in 1779, ſhewed that this was accompliſhed, not only by the abſorption juſt mentioned, but by the emiſſion of dephlogiſticated air. He obſerved in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when expoſed to the light of the ſun; but, in the night time, or when they are not influenced by the ſolar rays, they nontaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it poſſible to diſcover by the external properties of a plant, whether it be fit for this purpoſe or not; as ſome which have a bad ſcent, and are entirely unfit for food, ſhew themſelves much ſuperior to others whoſe external appearance would ſeem preferable. His method of making the experiment was, to fill a vial with air, fouled either by reſpiration or combuſtion; after which a ſprig of any plant was introduced, by paſſing it through the water in which the vial was immerced. The vial was then ſtopped; or it was removed into a ſmall baſon full of water, and expoſed to the ſun, or ſituated in ſome other proper place as occaſion required. Air phlogiſticated by breathing, and in which a candle could not burn, after being expoſed to the ſun for three hours, with a ſprig of peppermint in it, was ſo far corrected, as to be again capable of ſupporting flame. The following experiment, however, made with a muſtard plant, may be looked upon as deciſive: a plant of this kind was put into a glaſs receiver containing common air, and its ſtem cut off even with the mouth of the receiver. The veſſel was then inverted in an earthen pan, containing ſome water to keep the plant alive, and the whole apparatus was ſet over-night in a room. Next morning the air was found ſo much contaminated, that it extinguiſhed the flame of a wax taper. On expoſing the apparatus to the ſun for a quarter of an hour, the air was found to be ſomewhat corrected; and after an hour and an half it was ſo far improved, that by the teſt of nitrous air it appeared conſiderably better than common air.

It appears from Dr. Phillips's experiments, that dephlogiſticated air, in very conſiderable quantity, may, in certain circumſtances, be procured from water alone. The ſubſtance of theſe is, that water, eſpecially pump water, when expoſed to the light of the ſun, emits air ſlowly: but after ſome time a green matter appears on the bottom and ſides of the glaſs; after which it emits very pure air in great quantities, and continues to do ſo for a very long time, even after the green matter has ſhewn ſome ſymptoms of decay by becoming yellow. He obſerved, that the water which naturally contained the greateſt quantity of fixed air, yielded alſo the greateſt quantity of that which was dephlogiſticated; but that the quantity of the latter much exceeded that of the fixed air contained even in any water. The light of the ſun was found to be an eſſential requiſite in the formation of this air, as very little, and that of a much worſe quality, was produced in the dark.

Some poiſonous plants, as the hyoſcyamus, lauro-ceraſus, nightſhade, the tobacco-plant, a triplex vulvaria, cicuta aquatica, and ſabina, were found very fit for the purpoſe of producing dephlogiſticated air: but the pureſt kind of air was extracted from the aquatic vegetables, the turpentine trees, and eſpecially from the green matter he collected in a ſtone trough which was kept continually filled with water from a ſpring near the high road. The purity of this dephlogiſticated air, he ſays, was equal, if not ſuperior, to that procured by the beſt chemical proceſſes; as it ſometimes required eight times its own quantity of nitrous air to ſaturate it. All parts of the plants were not found equally proper for the production of dephlogiſticated air; the full grown leaves yielded it in greateſt quantity and purity, eſpecially from their under ſurface. It was alſo procured from the green ſtalks. One hundred leaves of Naſturtium Indicum put into a jar holding a gallon, filled with ordinary pump water, and expoſed from 10 to 12 o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and expoſing them again to the ſun till ſeven o'clock, about half as much was produced, of a quality ſtill ſuperior to the former; and next morning by eleven o'clock they yielded as much more of an equal quality.

The roots of plants generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers and fruits, in general, yield a very ſmall quantity of noxious air, and contaminate a great quantity of common air at all times, eſpecially in the night, and when kept in the dark. Two dozen of young French beans, kept in a quart jar of common air for a ſingle night, contaminated the air to ſuch a degree, that a very lively chicken died by being confined in it in leſs than half a minute.

The obſervations of Dr. Ingenhouſz, on the whole, ſays Mr. Cavallo, clearly ſhew, "that the vegetation of plants is one of the great means employed by nature to purify the atmoſphere, ſo as to counteract, in a great meaſure, the damage done by animal reſpiration, combuſtion, &c. It may only be ſaid, that vegetation does not appear to be ſufficient to remedy entirely that damage." The

Doctor, however, ſpeaks very highly of the powers of vegetables in this reſpect. He informs us, that their office in yielding dephlogiſticated air begins a few hours after the ſun has made his appearance in the horizon, or rather after it has paſſed the meridian, and ceaſes with the cloſe of day; excepting ſome plants which continue it a ſhort time after ſun-ſet: the quantity of dephlogiſticated air, yielded by plants in general, is greater in a clear day than when it is ſomewhat cloudy. It is alſo greater when the plants are more expoſed to the ſun, than when they are ſituated in ſhady places. He obſerves, moreover, that the damage done by plants in the night is more than counterbalanced by the benefit they afford in the day time.

After the publication of Dr. Ingenhouſz's experiments, it became generally believed, that the atmoſphere was meliorated by the common proceſs of vegetation, and that plants abſorbed the phlogiſtic part as their food, diſcharging the pure dephlogiſticated air as an excrement; which is juſt the reverſe of what happens to animals, who abſorb the pure part in reſpiration, and reject the phlogiſtic. In the Philoſophical Tranſactions for 1787, however, we find a number of experiments related by Sir Benjamin Thompſon, which ſeems to render this matter dubious. One very conſiderable objection is, that the green matter, already mentioned in Dr. Prieſtley's experiments, when carefully obſerved by a good microſcope, appears not to be of a vegetable, but of an animal nature. The colouring matter of the water, ſays he, is evidently of an animal nature; being nothing more than the aſſemblage of an infinite number of very ſmall, active, oval-formed animalculus, without any thing reſembling *tremella*, or that kind of green matter or water-moſs which forms upon the bottom and ſides of the veſſel when this water is ſuffered to remain in it for a conſiderable time, and into which Dr Ingenhouſz ſuppoſes the animalculus above mentioned to be actually transformed.

This gentleman has alſo found, that ſeveral animal ſubſtances, as well as vegetables, have a power of ſeparating dephlogiſticated air from water when expoſed to the light of the ſun, and that for a very great length of time. Not that the ſame quantity of water will always continue to furniſh air; but the ſame animal ſubſtance being taken out, waſhed, and put into freſh water, ſeems to yield dephlogiſticated air, without any kind of limitation.

Raw ſilk poſſeſſes a remarkable power of this kind. To determine it, Sir Benjamin introduced 30 grains of this ſubſtance, previouſly waſhed in water, into a thin glaſs globe $4\frac{1}{2}$ inches in diameter, having a cylindrical neck $\frac{3}{4}$ths of an inch wide, and twelve inches long, inverting the globe into a jar filled with the ſame kind of water, and expoſing it to the action of the ſun in the window. It had not been ten minutes in this ſituation, when the ſilk became covered with an infinite number of air-bubbles, gradually increaſing in ſize, till, at the end of the two hours, the ſilk was buoyed up, by their means, to the top of the water. By degrees they began to ſeparate themſelves, and form a collection of air in the upper part of the globe; which, when examined by the teſt of the nitrous air, appeared to be very pure. In three days he had collected $3\frac{1}{4}$ cubic inches of air; into which a wax-taper being introduced, that had juſt before been blown out, the wick only remaining red, it inſtantly took fire, and burned with a bright and enlarged flame. The water in the globe appeared to have loſt ſomething of its tranſparency, and had changed its colour to a very faint greeniſh caſt, having at the ſame time acquired the ſmell of raw ſilk. This was ſeveral times repeated with freſh water, repeating the ſame ſilk, and always with a ſimilar reſult; but with this difference, that when the ſun ſhone very bright, the quantity of air produced was not only greater, but its quality ſuperior to that yielded when the ſun's rays were feeble, or when they were frequently intercepted by flying clouds. This air, however, (ſays he), was always not only much better than common air, but even than that produced by the freſh leaves of plants expoſed in water to the ſun's rays in the experiments of Dr Ingenhouſz; and, under the moſt favourable circumſtances, it was ſo good, that one meaſure of it required four of nitrous air to ſaturate it, and the whole five meaſures were reduced to 1.35.

An experiment was next made in order to determine the effect of darkneſs upon the production of air: and in this caſe only a few inconſiderable bubbles were formed, which remained attached to the ſilk; nor was the caſe altered by removing the globe into a German ſtove. Some ſingle bubbles, indeed, had detached themſelves from the ſilk and aſcended to the top, but the air was in too little quantity to be meaſured or proved. The medium heat of the globe, when expoſed to the ſun's rays, was about 90° of Fahrenheit, though ſometimes it would riſe as high as 96; but air was frequently produced, when the heat did not exceed 65 and 70°. On reverſing this experiment, in order to try the effect of light without heat, it was found, that by plunging the globe into a mixture of ice and water, which brought it to the temperature of about 50° of Fahrenheit, the produce of air was diminiſhed, though it ſtill continued in conſiderable quantity.

The effect of artificial light, inſtead of that of the ſun, was next tried. For this purpoſe all the air was removed from the globe; and its place being ſupplied with a quantity of freſh water, ſo as to render it quite full, it was again inverted in the jar, and removed into a dark room ſurrounded with ſix lamps and reflectors; ſix wax candles were alſo placed at different diſtances from three to ſix inches from it, and diſpoſed in ſuch a manner as to throw the greateſt quantity of light poſſible upon the ſilk, taking care at the ſame time that the water ſhould not acquire a greater heat than 90°. In this ſituation the ſilk began to be covered with air-bubbles in about ten minutes; and in ſix hours as much was collected as could be proved by nitrous air, when it was found to be very pure. A freſh-gathered, healthy leaf of a peach tree, and a ſtem of the pea plant with three leaves upon it, furniſhed air by expoſure to the ſame light, but in ſmaller quantities than by the action of the ſolar rays. The air produced in the dark, in whatever manner procured, was always in too ſmall quantity to be meaſured.

In order to diſcover the comparative fineneſs of air produced from vegetables and from raw ſilk, a ſmall quantity of air from the ſtem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw ſilk and ſeveral of the ſubſtances already mentioned. An entire plant of houſewort, of a moderate ſize, furniſhed only three-thirds of a cubic inch of air in ſeven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly ſuperior.

The experiments of Dr. Prieſtley alluded to were thoſe in which inflammable air was ſuppoſed by Mr. Lavoiſier to be procured from water, by paſſing its ſteam through red-hot iron tubes. It was ſoon diſcovered, however, by Dr. Prieſtley, that this inflammable air did not proceed from the water, but from the iron of the tube; and might be obtained by tranſmitting aqueous vapour through charcual or iron placed in tubes of copper, glaſs, or earthen ware, made red-hot, but not through theſe tubes by themſelves. In this caſe, the loſs of the water employed exceeded that of the inflammable air produced in the proportion of 1.3 to 2; and the iron which had thus abſorbed the water appeared exactly ſimilar to that which had been burned in dephlogiſticated air in the manner already related. His concluſions from thence are theſe: "Since iron gains the ſame addition of weight by being melted in dephlogiſticated air, and alſo by the addition of water when red hot, and becomes, as I have already obſerved, the ſame ſubſtance in all reſpects, it is evident that this air or water, as exiſting in the iron, is the very ſame thing; and this can hardly be explained but on the ſuppoſition that water conſiſts of two kinds of air, viz. inflammable and dephlogiſticated."

Of theſe proceſſes he gives the following explanation: "When iron is heated in dephlogiſticated air, we may ſuppoſe, that, tho' part of its phlogiſton eſcapes, to enter into the compoſition of the ſmall quantity of fixed air which is then procured, yet enough remains to form water with the dephlogiſticated air which it has imbibed, ſo that this calx conſiſts of the intimate union of the pure earth of iron and of water; and therefore, when the ſame calx, thus ſaturated with water, is expoſed to heat in inflammable air, this air enters into it, deſtroys the attraction between the water and the earth, and revives the iron, while the water is expelled in its proper form."

The whole of the doctor's opinions on the component parts of this kind of air, however, are ſummed up in the following ſentence in his Obſervations relating to Theory. "The only kind of air that is now thought to be properly elementary, and to conſiſt of a ſimple ſubſtance, is dephlogiſticated air; with the addition at leaſt of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the weight of bodies, it can hardly be called an element in their compoſition. Dephlogiſticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other ſubſtances, which, till lately, have been thought to be ſimple."

The experiments of the French philoſophers were of the ſame nature with thoſe of Mr. Cavendiſh, but conducted on a larger ſcale. The inference drawn from them was the ſame with that already mentioned, viz. that dephlogiſticated and inflammable air in all caſes are the two conſtituent parts of water. This opinion is adopted by Mr. Kirwan in his Treatiſe on Phlogiſton. "The experiments of Mr. Cavendiſh, and of Mr. Monge," ſays he, "appear to me to leave no room to doubt, that when very pure dephlogiſticated and inflammable air are inflamed, the product is mere water; for when theſe airs are employed in the proper proportion, only 0.02 of the mixture of both airs retains its aerial form. Now it is impoſſible to ſuppoſe that all the water obtained pre-exiſted in theſe airs; that is, that 49 parts in 50 were mere water.

Notwithſtanding theſe poſitive concluſions, however, by ſome of the moſt reſpectable names in this country, the evidences adduced have been unſatisfactory to ſome French chemiſts; who maintain, that Meſſrs. Cavendiſh, Prieſtley, and Kirwan, are totally miſtaken with regard to the production of water from dephlogiſticated and inflammable air; contending, that the water obtained had previouſly exiſted in the air, and was not originally produced in the operation. The fact, indeed, becomes ſomewhat dubious from ſome experiments related by Dr. Prieſtley himſelf, and of which we ſhall now proceed to give an account.

One conſequence of the hypotheſis in queſtion is evident, that if water really be produced by the dephlagration of either dephlogiſticated or common air with inflammable air, the quantity of liquid obtained ought to increaſe in proportion to the quantity of the two airs conſumed, and that without any limitation. This, however, is not the caſe, as Dr. Prieſtley has obſerved. He had ſucceeded indeed with ſcales of iron and copper, and in the experiment with the latter, the production of water was ſo copious, that when only 3½ ounce meaſures of air were abſorbed, the water ſtood in drops on the inſide of the veſſel, and ſome of theſe ran down it. Water was alſo procured by firing dephlogiſticated and inflammable air from iron by the electric ſpark in a cloſe veſſel, an experiment ſimilar to thoſe made by Mr. Lavoiſier at Paris. In his firſt experiment he put 3.75 ounce meaſures of a mixture of air, of which one-third was dephlogiſticated and two-thirds inflammable air from iron, in a cloſe veſſel, and, after the exploſion, found in it one grain of moiſture; but on repeating the experiment with half as much dephlogiſticated as inflammable air, he could perceive no ſign of moiſture. The greateſt difficulty, however, which he ſays he ever met with reſpecting the preceding theory, aroſe from his never having been able to produce any water when he revived red precipitate in inflammable air, or at leaſt no more than might have been ſuppoſed to be contained in the inflammable air as an extraneous ſubſtance.

In order to make the experiments with the ſcales of iron and that with the red precipitate as much alike as poſſible, and compare them both to the greateſt advantage, he made them one immediately after the other, with every circumſtance as nearly the ſame as he could. The inflammable air was the ſame in both experiments, and both the ſcales of iron and red precipitate were made as dry as poſſible. They were heated in veſſels of the ſame ſize and form, and equally confined by dry mercury; and yet, with the former, water was produced as copiouſly as before, viz. running down the inſide of the veſſel in drops, when only four ounce meaſures of inflammable air were abſorbed: and only 0.75 of an ounce meaſure remained, there was hardly any ſenſible quantity of water produced, "certainly," ſays he, "not one-tenth of what appeared in the experiment with the ſcales of iron. In this experiment there can be no doubt but that the dephlogiſticated air produced from the red precipitate united with the inflammable air in the veſſel; and as no water equal to the weight of the two kinds of air was produced, they muſt have formed ſome more ſolid ſubſtance, which, in the ſmall quantities I was obliged to uſe, could not be found.

"The difficulty, with reſpect to what becomes of the two kinds of air, was not leſſened by the attempts which I made to collect all that I could from repeated decompoſitions of inflammable and dephlogiſticated air in a cloſe veſſel. As I had produced water in this proceſs, when no more than a ſingle exploſion was made at a time, I thought that by continuing to make exploſions in the ſame veſſel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a conſiderable part of an ounce. And as I ſhould know exactly what quantity of air I decompoſed, I had no doubt of being able to aſcertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one third dephlogiſticated, and two thirds inflammable, from iron and oil of vitriol. But though I had a ſenſible quantity of water at the firſt exploſion (in each of which between four and five ounce meaſures of the mixture of air were uſed) I was ſurpriſed to perceive no very ſenſible increaſe of the quantity of water on repeating the exploſions. Having therefore expended 48 ounce meaſures of the mixture, the proceſs was diſcontinued; and, collecting the water with all the care I could, I found no more than three grains, when there ought to have been eleven.

"In this proceſs the inſide of the veſſel was always very black after each exploſion; and when I poured in the mercury after the exploſion, though there was nothing viſible in the air within the veſſel, there iſſued from the mouth of it a denſe vapour. This was the caſe, though I waited ſo long as two minutes after any exploſion, before I proceeded to put in more mercury in order to make another; which, if the vapour had been ſteam, would have been time more than ſufficient to permit it to condenſe into water. I even perceived this vapour when I had a quantity of water in the veſſel, and the exploſion was conſequently made over it, as well as in contact with the ſides of the veſſel which were wetted with it; ſo that, as this vapour had paſſed through the whole body of water when the veſſel was inverted, it is probable that it muſt have conſiſted of ſomething elſe than mere water. But I was never able to collect any quantity of it, though it muſt have been ſomething procured by the union of the two kinds of air."

In order to collect a quantity of this vapour, he contrived an apparatus, which, by diffuſing it through a thin glaſs veſſel, he ſuppoſed would condenſe all the contents, whether fluid or ſolid; but after repeating the experiment as carefully as poſſible, by taking 20 exploſions, and repeating the whole ſeveral times over, he could find nothing in the veſſel beſides a ſmall quantity of water, which, added to that in the ſtrong veſſel, came far ſhort of the weight of the air that was decompoſed.

"All the conjecture," ſays he, "that I can advance, in order to explain this phenomenon is, that ſince ſoot yields pure air, part of the ſoot is formed by the union of the dephlogiſticated air in the atmoſphere, and the inflammable air of the fuel: but *ſmoke*, which contains much *ſoot*, is ſoon diſperſed, and becomes inviſible in the open air. Such, therefore, may be caſe here. The ſoot formed by the union of the two kinds of air may be diffuſed through the air in the veſſel in which they are exploded, and be carried inviſibly into the common atmoſ-phere; which may account for my not being able to collect any quantity of it in this apparatus."

Not diſcouraged by this bad ſucceſs, the Doctor attempted to collect this volatile matter by means of a quantity of water incumbent upon the mercury in the ſtrong glaſs veſſel in which the exploſions were made, though he had found that part of it could eſcape through the water. He decompoſed a great quantity of the two kinds of air in theſe circumſtances; and preſently found that water became very cloudy, and was at length filled with a blackiſh matter. This he collected, and found that it remained perfectly black upon the earthen veſſel in which the water containing it was evaporated; which would not have been the caſe if the blackiſh matter in the water had been that powder of mercury which is produced by agitating it in pure water: For that black maſs always became white running mercury the moment the water was evaporated from it. If a ſufficient quantity of this matter could have been procured, he could have ſatisfied himſelf whether it was ſoot or not.

"That water, in great quantities (ſays he), is ſometimes produced from burning inflammable and dephlogiſticated air, is evident from the experiments of Meſſrs. Cavendiſh and Lavoiſier. I have alſo frequently collected conſiderable quantities of water in this way, though never quite ſo much as the weight of the two kinds of air decompoſed. My apparatus for this purpoſe was the following: into the mouth of a large glaſs balloon I introduced a tube, from the orifice of which there continually iſſued inflammable air from a veſſel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Preſently after lighting it, the inſide of the balloon always became cloudy, and the moiſture ſoon gathered in drops, and ſettled in the lower part of the balloon. To catch what might iſſue in the form of vapour, in the current of air through the balloon, I placed the glaſs tube, in which I always found ſome water condenſed. It is very poſſible, however, that in both theſe modes of experimenting, the water may be converted into a kind of vapour, which is very different from ſteam, and capable of being conveyed a great way through air, or even water, without condenſation along with the air with which it is mixed; and on this account it may not be poſſible, in either of theſe modes of experimenting, to collect all the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condenſed by cold, is very little underſtood, but well deſerves the attention of philoſophers.

That the water collected in the balloon comes from the decompoſition of the air, and not from the freſh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and conſequently there muſt have been the ſame current of the external air through it, no moiſture was found in the balloon.

DEFINITION III.

As it has been obſerved, that air was diminiſhed, in ſome caſes at leaſt, by burning, univerſally by reſpiration, and by ſome other proceſſes, it was imagined that phlogiſton was a body of ſuch a ſingular nature, that when mixed with air, it always diminiſhed its bulk, inſtead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was alſo ſuppoſed by ſome, that the phlogiſton was not only entirely devoid of gravity, but that it was a principle of poſitive levity; ſo that the abſolute weight of bodies was diminiſhed by an union with it, and augmented when it was expelled, though their ſpecific gravity was diminiſhed. Various other properties were attributed to phlogiſton; ſuch as that of giving elaſticity to air, of conſtituting flame by a chemical combination with air, &c. Its emiſſion into the atmoſphere was ſuppoſed to be always attended with a diminution of air; and therefore, all proceſſes in which air was diminiſhed and become noxious, ſuch as that by liver of ſulphur, a mixture of iron filings and brimſtone, &c. were called phlogiſtic proceſſes. Reſpiration of animals was taken into the ſame account; but neither in this, nor in combuſtion, was it allowed that any kind of vital ſpirit was abſorbed by the blood, or ſeparated from the air by the burning body. On the contrary, it was ſtrenuouſly argued, that all this was performed by the *emiſſion* of *phlogiſton* from the lungs or the inflamed ſubſtance, which depraved the air, and diminiſhed it in bulk; and as all air was ſuppoſed to contain phlogiſton, it was likewiſe imagined, that in all caſes where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accompliſhed, not by the emiſſion of any thing into the atmoſphere, but by the mere abſorption of phlogiſton. In other reſpects this ſubſtance was thought to be an exceedingly powerful principle in nature; the light of the ſun itſelf and the electric fluid being ſaid to be modifications of it, the different kinds of aris to be *phlogiſtic vapours*, &c.; ſo that the whole ſyſtem of nature ſeemed ready to be abſorbed by it at once.

The formidable powers of this principle were firſt checked by the diſcoveries of Mr. Lavoiſier, though the latter erred equally on the contrary ſide; and not content with keeping the phlogiſtic principle within due bounds, would needs deny its exiſtence altogether. In a treatiſe publiſhed in the year 1782, he firſt impugns Dr. Prieſtley's theory of reſpiration, and denies that "the reſpiration of animals has the property of phlogiſticating air in a manner ſimilar to what is effected by the calcination of metals and many other chemical proceſſes; and that it ceaſes not to be reſpirable till the inſtant when it becomes ſurcharged, or at leaſt ſaturated with phlogiſton."

In order to diſprove this aſſertion, he introduced four ounces of mercury to 50 cubic inches of common air, propoſing to calcine the metal by keeping it for 12 days in a heat almoſt equal to that which is neceſſary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per ſe* were formed, and the air in the veſſel was diminiſhed by about one-ſixth of its volume. In this ſtate it did not precipitate lime-water; but inſtantly extinguiſhed candles, and killed animals immerſed in it; no longer affording any red vapours, or being diminiſhed by mixture with nitrous air: on diſtilling the precipitate produced, about as much dephlogiſticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the veſſel, he recompoſed a fluid nearly of the ſame goodneſs wlth common air. Hence he draws the following concluſions: 1. That 5-6ths of the air we breathe are mephitic, or incapable of ſupporting the reſpiration of animals, or the inflammation and combuſtion of bodies. 2. That the ſurplus, or only 1-5th of the volume of atmoſpherical air, is reſpirable. 3. That in the calcination of mercury, this metallic ſubſtance abſorbs the ſalubrious part, leaving only the mephitic portion of the air. 4. That by reuniting theſe two portions which had been ſeparated, we can recompound air ſimilar to that of the atmoſphere.

To determine the effects of reſpiration upon air, a live ſparrow was placed under a glaſs receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulſed. Notwithſtanding the heat of the animal, which neceſſarily, at firſt, rarefied the air in the receiver, there was a ſenſible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, inſtead of increaſing afterwards, the diminution became ſomething leſs in about half an hour; and when the animal was dead, and the air in the reciever had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-ſixtieth part. This air which had been reſpired by the ſparrow, though in many reſpects ſimiliar to that in which the mercury had been calcined, differed from it in this reſpect, that it precipitated lime-water, and, by introducing cauſtic fixed alkali to it, was reduced one-ſixth in bulk by the abſorption of fixed air; after which it appeared exactly the ſame with that produced by the calcination of mercury or other metals; and atmoſpherical air was recompoſed by mixing this with pure dephlogiſticated air in the proportions already mentioned.

That common air is compounded of two kinds of elaſtic fluids, Mr. Scheele has proved by the following experiment: "I diſſolved (ſays he) one ounce of alkaline liver of ſulphur in eight ounces of water; of this ſolution I poured four ounces into an empty bottle, whoſe capacity was 24 ounces, and worked it well; then I turned the bottle, immerſed its neck into a ſmall veſſel with water, and kept it in this poſition a fortnight. The ſolution had partly loſt its red colour, and ſome ſulphur had been precipitated from it during this time. After this I put the bottle in the ſame poſition in a larger veſſel with water, keeping the mouth and neck under water, and the bottom of the bottle above water, and thus I drew the cork under water, which immediately ruſhed with violence into the bottle. On examining the quantity of water in the bottle, it was found, that during this fortnight, ſix parts out of 20 of air were loſt." On repeating the experiment with the ſame materials, and in the ſame bottle, only four parts out of 20 were loſt by ſtanding a week, and more than ſix after four months.

From theſe experiments and many others ſimilar, it appears that the doctrine of phlogiſton had been carried too far by Dr. Prieſtley and other Britiſh philoſophers, and that the air conſiſts of two kinds of fluids; one perfectly ſalutary, and friendly in the higheſt degree to animal life; the other altogether unfit for it. Theſe two appear incapable of being converted directly into one another by any proceſs: for though both of them are deſtructible, yet they are always converted into other ſubſtances; from which, indeed, either the one or the other may be extracted at pleaſure by employing the proper methods. The ſtrongeſt arguments in favour of the tranſmutation of phlogiſticated air into that of a purer kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former caſe, however, it has been obſerved, that this ſeeming purification is no other than an exchange of one air for the other; the vegetables abſorbing the phlogiſticated, and emitting the dephlogiſticated air in its ſtead. With reſpect to the agitation in water, the matter remained more dubious; and it is only in the laſt volume of Dr. Prieſtley's treatiſe that we have any account of this being accompliſhed by an emiſſion of purer air from the water. "In the infancy of my experiments," ſays he, "I concluded, that all kinds of air were brought by agitation to the ſame ſtate; the pureſt air being partially phlogiſticated, and air completely phlogiſticated being thereby made purer; inflammable air alſo loſing its inflammability, and all of them brought into ſuch a ſtate as that a candle would juſt go out in them. This inference I made from all the kinds of air with which I was then acquainted, and which did not require to be confined by mercury, being brought to that ſtate by agitation in a trough of water, the ſurface of which was expoſed to the open air; never imagining that when the air in my jar was ſeparated from the common air by a body of water, generally about twelve inches in depth (adding that within to that without the jar), they could have any influence on each other. I have, however, been long convinced, that, improbable as it then appeared to me, this is actually the caſe."

Phlogiſticated air is now generally believed to be a combination of the nitrous acid with phlogiſton; and that, in its gradual progreſs towards this, which is its ultimate ſtage, it firſt aſſumes the character of phlogiſticated nitrous acid; then of nitrous air, in which it readily parts with its phlogiſton to the atmoſphere; or rather to the dephlogiſticated part of it; and laſtly, it becomes phlogiſticated air, in which the union between the principles is ſo ſtrong, that it cannot be broken by ſimple expoſure to dephlogiſticated air without heat; though the experiments of Mr. Cavendiſh ſhow, that this may be done by means of the electric ſpark, which produces the moſt violent heat we can imagine. See Phil. Tranſ. Vol. 75.

Common air conſiſts of one part of dephlogiſticated and four of phlogiſticated air; ſo that a mixture of five parts of pure dephlogiſticated air and three of common air, is the ſame thing as a mixture of ſeven parts of dephlogiſticated air with three of phlogiſticated.

From the experiments before mentioned, it is evident the chief cauſe of the diminution of air is the converſion of the phlogiſticated kind into nitrous acid; yet it ſeemed not unlikely, that when any liquor containing inflammable matter was in contact with the air in a tube, ſome of this matter might be burnt by the ſpark, and thereby diminiſh the air. In order to determine this, the electric ſpark was paſſed through dephlogiſticated air included between different liquors; and the reſult of the experiments was, that when dephlogiſticated air, containing only 1-20th part of its bulk of phlogiſticated air, was confined between ſhort columns of ſoap-leys, and the ſpark paſſed through it till no farther diminution could be perceived, the air loſt $\frac{28}{80}$ds of its bulk; which is not a greater diminution than might very likely proceed from the decompoſition of the ſmall quantity of phlogiſticated air contained in it, as the dephlogiſticated air might eaſily be mixed with a ſmall quantity of common air while putting into the tube. When the ſame dephlogiſticated air was confined between columns of diſtilled water, the diminution was rather greater than before, and a white powder was formed on the ſurface of the quickſilver beneath: the reaſon of which, in all probability, was, that the acid produced in the operation corroded the quickſilver, and formed the powder; and that the nitrous air produced by that corroſion united to the dephlogiſticated air, and cauſed a greater diminution than would otherwiſe have taken place. When a ſolution of litmus was uſed inſtead of diſtilled water, the ſolution ſoon acquired a red colour; which grew paler as the ſpark was continued, till it became quite colourleſs and tranſparent. The air was diminiſhed by almoſt one-half, and might perhaps have been further diminiſhed had the ſpark been continued. When lime-water was let up into the tube, a cloud was formed, and the air was further diminiſhed by about one-fifth; the remainder was good dephlogiſticated air. In this experiment, therefore, the litmus was, if not burnt, at leaſt decompounded, ſo as to loſe entirely its purple colour, and to yield fixed air; ſo that, though ſoap-leys cannot be compounded by this proceſs, yet the ſolution of litmus can, and ſo very likely might the ſolutions of many other ſubſtances be. But there is nothing in any of theſe experiments which favours the opinion of the air being at all diminiſhed by means of phlogiſton communicated to it by the electric ſpark.

DEFINITION IV.

Van Helmont firſt diſcovered fixed air, which he called *gas ſilveſtre*, from its being emitted in great quantities by burning charcoal. Subſequent diſcoveries ſhow, that a fluid of the ſame kind may be plentifully produced, by fermenting liquor, in almoſt every kind of combuſtion, and naturally generated in vaſt quantities in mines and coal-pits, where it is known by the name of the choak-damp; that it exiſts in a concrete ſtate in alkaline ſalts, chalk, limeſtone, the ſhells of marine animals, magneſia alba, &c. in a very large proportion, conſtituting one half, and ſometimes more of their weight; and that it might always be extracted from the atmoſphere, in unlimited quantity, by expoſing certain ſubſtances to it. On examining the nature of this fluid, it was found ſo manifeſtly acid, that it has now obtained a place among theſe ſubſtances under the name of aërial acid; or, more improperly, cretaceous acid, from its being contained in great quantities in chalk, as has been already mentioned.

Fixed air is the heavieſt of all permanently elaſtic fluids, excepting thoſe derived from the mineral acids. Mr. Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous ſpar by marine acid, whoſe ſpecific gravity was 1.0145. He obſerves, however, that though this air was obtained in the drieſt manner poſſible, and that the globe which contained it appeared perfectly free from moiſture; yet, when carried into a room 27 degrees colder, the inſide of the globe was covered with dew, which ſoon formed viſible drops. In its concrete ſtate, fixed air is one of the heavieſt bodies in nature. Mr. Kirwan, in the 71ſt volume of the Philoſophical Tranſactions, gives an account of his ingenious method of finding the ſpecific gravity of fixed air in its fixed ſtate, when combined with calcareous earth; from which it appears, that fixed air, in that ſtate, is prodigiouſly concentrated, and, were it poſſible to exiſt by itſelf in that concentrated ſtate, it would be the heavieſt body known, gold and platina excepted.

Fixed air differs conſiderably in its properties from the airs already mentioned. The compound nature of it, and the principles from which it is formed, were firſt diſcovered by Mr. Kirwan; but Dr. Prieſtley was not convinced by the proofs he adduced, till after making ſome experiments of his own. The firſt was, by firing ſhavings of iron in dephlogiſticated air; when he obſerved a conſiderable reſiduum of fixed air, though that in the receiver had been of the pureſt dephlogiſticated kind, and iron could only have yielded inflammable air. The hypotheſis of Mr. Kirwan was ſtill further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogiſticated air. On heating theſe in a glaſs retort, they gave a great quantity of fixed air, in ſome portions of which nineteen-twentieths were abſorbed by lime-water, and the reſiduum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was ſo pure that only one-fortieth part remained unabſorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol.

In ſome of theſe experiments it appeared, that three ounce-meaſures of dephlogiſticated air went to the compoſition of two of fixed air: for one ounce of red precipitate gave 60 ounce-meaſures of dephlogiſticated air; and, when mixed with two ounces of iron-filings, it gave about 40 ounce-meaſures of fixed air that were actually abſorbed by water, beſides a reſiduum that was inflammable. The ſame proportion was obtained when half the quantity of materials were made uſe of; but on uſing an ounce of each, only 20 ounce-meaſures of fixed air, including the reſiduum, could be got.

In conſidering this ſubject farther, it occurred to Dr. Prieſtley, that his experiments, in which charcoal was uſed, lay open to an objection, that ſince dry wood, and imperfectly made charcoal, yield fixed air, it might be ſaid, that all the elements of fixed air are contained in charcoal: and though this ſubſtance alone, even with the aſſiſtance of water, will not yield fixed air, this might be effected by treating it with other ſubſtances without their importing any thing to it; eſpecially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decompoſed with the dephlogiſticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak; and pounding it while hot, inſtantly mixed four meaſures of it with one of red precipitate, and putting them into an earthen retort, got, with a heat no greater than what was ſufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was leſs, and at laſt no fixed air at all was obtained; but as the reſiduum was worſe than the common atmoſphere, he is thence inclined to believe, notwithſtanding Mr. Cavendiſh's experiments, that phlogiſticated air may be compoſed of phlogiſton and dephlogiſticated air.

In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing one ounce of precipitate with the ſame quantity of perfect charcoal hot from the retort in which it was made. Putting theſe into a coated retort, he expelled from them, by a ſtrong heat, about 30 ounce-meaſures of air, the whole of which was the pureſt fixed air, leaving only about one-fortieth part unabſorbed by water, and this almoſt perfectly phlogiſticated.

Fixed air may be alſo produced from red precipitate mixed with braſs filings, with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is eaſily converted. In this laſt caſe Dr. Prieſtley ſuppoſes that the fixed air was produced from the dephlogiſticated kind abſorbed by the metals and the phlogiſton of the lead; and this is confirmed by an obſervation that the fixed air always comes firſt in the proceſs, when the phlogiſton is moſt readily ſeparated, but afterwards the produce becomes quite pure and dephlogiſticated. In attempting, however, to increaſe the quantity of fixed air by heating this black powder in dephlogiſticated air, he found only an augmentation of the quantity of dephlogiſticated air, and that of the pureſt kind.

"Perhaps," ſays he, "as deciſive a proof as any of the real production of fixed air from phlogiſton and dephlogiſticated air, may be drawn from the experiments in which I always found a quantity of it when I burned ſulphur in dephlogiſticated air. In one of theſe experiments, to which I gave particular attention, ſix ounce-meaſures and an half of the dephlogiſticated air were reduced to about two ounce-meaſures, and one-fifth of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were abſorbed by water, the remainder was very pure dephlogiſticated air.

That dephlogiſticated air actually enters into the compoſition of the fixed air, is evident from the weight of the latter, which far exceeds that of the charcoal diſperſed in the proceſs. For, in an experiment made, the weight of the fixed air produced was 4.95 grains. Conſequently, ſuppoſing the charcoal to be wholly phlogiſton, as it is very nearly ſo, fixed air may be ſaid to conſiſt of 3.45 parts of dephlogiſticated air, and 1.5 of phlogiſton; ſo that the dephlogiſticated air is more than three times the proportion of phlogiſton in it. I muſt not conclude, however, without obſerving, that, in one experiment, I never failed to produce fixed air; though it is not eaſy to ſee how one of its ſuppoſed elements, viz. dephlogiſticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of theſe experiments, four ounce-meaſures of the vitriolic acid air were reduced to 0.65 of an ounce-meaſure; and of the quantity loſt three and an half meaſures were fixed air abſorbed by lime-water, and the remainder weakly inflammable."

DEFINITION V.

In the year 1767, Mr. Cavendiſh firſt publiſhed the remarkable properties of inflammable air. Its effects, however, had long before been fatally experienced by miners; in whoſe ſubterraneous habitations it is often collected in ſuch quantities as to produce the moſt dreadful effects. It is produced in abundance from putrid animal and vegetable ſubſtances; and, in general, by all thoſe which part with their phlogiſton eaſily. Being much lighter than common air, it always riſes to the top of thoſe places where it is generated; ſo that it cannot be confined except in ſome vaulted place, but always ſtrives to aſcend and mix with the atmoſphere.

Inflammable air is, by itſelf, very noxious, and will inſtantly put an end to animal life; but when mixed with atmoſpherical air, may be breathed in much greater quantity than fixed air. Its great inflammability in this ſtate, however, renders it very dangerous to bring any lights, or even to ſtrike a flint with ſteel, in thoſe places where it abounds. But this only takes place when the inflammable air is mixed with common atmoſpherical or with dephlogiſticated air; in which caſe, the exploſion is much more violent than the former; for pure inflammable air extinguiſhes flame as effectually as fixed or phlogiſticated air.

Beſides the ſubterraneous places already mentioned, this kind of air is found in ditches; over the ſurface of putrid waters, out of which it eſcapes; in burying places; in houſes of office, where putrid animal and vegetable matters are accumulated; and may, by ſtanding or boiling, be extracted from the waters of moſt lakes and rivers, eſpecially thoſe in which great quantities of fermenting and putrefying matters are thrown: and as putrefaction thus ſeems to be the principal ſource of inflammable air, thence happens, that much more of it is produced in warm than in cold climates. In thoſe countries, we are informed by Dr. Franklin, that if the mud at the bottom of a pond be well ſtirred, and a lighted candle brought near to the ſurface of the water immediately after, a flame will inſtantly ſpread a conſiderable way over the water, from the accenſion of the inflammable air, affording a very curious ſpectacle in the night-time.

In colder climates, the generation of inflammable air is not ſo plentiful as to produce this phenomenon; nevertheleſs Mr. Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about London. "Fill a wide-mouthed bottle with the water of the pond, and keep it inverted therein; then, with a ſtick, ſtir the mud at the bottom of the pond, juſt under the inverted bottle, ſo as to let the bubbles of air which come out of it enter into the bottle; which air is inflammable. When by thus ſtirring the mud in various places, and catching the air in the bottle until this is filled, a cork or glaſs ſtopper muſt be put over it whilſt ſtanding in water; and then the bottle muſt be taken home, in order to examine the contained inflammable fluid at leiſure."

The great quantity of inflammable air produced in warm climates has given occaſion to ſome philoſophers to ſuppoſe, that it may poſſibly have ſome ſhare in producing certain atmoſpherical meteors. The weak lightnings without any exploſion, which are ſometimes perceived near the horizon in ſerene weather, are by them conjectured to proceed from inflammable air fired by electric exploſions in the atmoſphere. Mr. Volta ſuppoſes that the *ignes fatui* are occaſioned by the inflammable air which proceeds from marſhy grounds, and is ſet on fire by electric ſparks: but theſe phenomena can be accounted for in a more probable manner from the action of the electric fluid itſelf.

This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable ſubſtance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the general name of inflammable air, have ſcarce any other property in common to them all, beſides thoſe of inflammability, and being ſpecifically lighter than the common atmoſpherical air. In other reſpects, the differences between them are very conſiderable. The ſcent, weight, power of burning, of preſerving their properties, and the phenomena attending their combuſtion, are by no means the ſame in them all; ſome burning in an exploſive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, neceſſary to make a proper diſtinction between an inflammable elaſtic fluid or inflammable gas, which may be properly called ſo, and that which is evidently made by combining an inflammable ſubſtance with common air; which being eaſily ſeparable from the air, leaves that fluid in the ſtate it was before. Thus a drop of ether, put into a quantity of common air, mixes itſelf with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but if the air to which ether is added be waſhed in water, the latter is ſoon ſeparated from it.

Common air becomes alſo inflammable by being tranſmitted through ſeveral eſſential oils; and thus the air contiguous to the plant called fraxinella becomes inflammable in calm and hot weather, by the emiſſion of its inflammable air. By heat alone, a conſiderable quantity of this kind of air may be extracted from moſt inflammable ſubſtances, and even from ſome of the metals. Dr. Hales obtained inflammable air by ſimply diſtilling wax, pitch, amber, coals, peaſe, and oyſter ſhells; and Mr. Fontana informs us, that he obtained a conſiderable quantity of inflammable air from ſpathoſe iron, by the action of fire only applied to it in a mattraſs. Dr. Prieſtley, however, obtained it from a vaſt number of other ſubſtances, by diſtilling them in a gun-barrel; to the extremity of which was luted a tobacco-pipe, or ſmall glaſs tube, with a flaccid bladder tied on the end. He obſerves, that the heat muſt be ſuddenly applied, in order to get a conſiderable quantity of air from theſe ſubſtances. "Notwithſtanding, ſays he, the ſame care may be taken in luting, and in every other reſpect, ſix, or even ten, times more air may be got by a ſudden heat than by a ſlow one, though the heat that is laſt applied be as intenſe as that which was applied ſuddenly. A bit of dry oak, weighing about twelve grains, will generally yield a ſheep's bladder full of inflammable air with a briſk heat, when it will only yield two or three ounce-meaſures if the ſame heat be applied gradually." When he wanted to extract inflammable air from metals, a glaſs was uſed, the focus of which afforded a more intenſe heat than any furnace he could apply; and in this way he obtained inflammable air from ſeveral metals; as iron, braſs, and tin; but with the metallic calces he had no ſucceſs.

Dr. Prieſtley repeated his experiments of procuring inflammable air not only with water, but with other fluids. Sending the vapour of two ounces of ſpirit of wine through a red-hot earthen tube, he obtained 19 0 ounce-meaſures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-meaſures of it weighed eight grains leſs than an equal quantity of common air. He collected alſo 0.35 of an ounce-meaſure of water. In this experiment, the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the ſpirit of wine originally was 821 grains; ſo that as little was loſt in the proceſs as could be expected. Repeating the experiment with vitriolic ether, an ounce of it treated in the ſame manner in an earthen tube almoſt filled with pieces of broken earthen retorts and crucibles, one tenth part of an ounce of water was collected, and 740 ounce-meaſures of inflammable air were procured, without any mixture or fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogiſticated air. Twenty-nine ounce-meaſures of this weighed five grains leſs than an equal quantity of common air. Vapour of ſpirit of turpentine yielded inflammable air mixed with much black ſmoke, which ſoon collected on the ſurface of the water in the receiver. The ſmell of this air was exceedingly offenſive, and its flame was much leſs luminous than that of the former. Its ſpecific gravity was the ſame with that of the air procured from ſpirit of wine.

In extracting air from ſolid ſubſtances, the ſteam of water was always neceſſary; and thus inflammable air was produced from a great number of different ones. From ſulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature ſimilar to that from oil of vitriol and iron. From arſenic, the produce was one-ſeventh of fixed air; but all the reſt ſtrongly inflammable, with a ſcent ſcarcely diſtinguiſhable from that of phoſphorus. Both theſe experiments, however, were very troubleſome, on account of the volatility of the matters, which ſublimed and choaked up the tubes. From two ounces of the ſcales of iron, or fining cinder, which he has found to be the ſame thing, Dr. Prieſtley obtained 580 ounce-meaſures of air; one-tenth of the firſt part of which was fixed air, but afterwards it was all inflammable. From charcoal expoſed to the red-hot ſteam of water, inflammable air was procured in great quantities. From ninety-four grains of perfect charcoal, that is, prepared with a ſtrong heat ſo as to expel all fixed air from it, and 240 ounces of water, 840 ounce-meaſures of air were obtained, one-fifth part of which was fixed air; and the inflammable part appeared likewiſe, by decompoſition, to have a quantity of fixed air intimately combined with it.

I have obſerved, ſays the doctor, that when ſufficient care is taken to free inflammable air from acid vapour that may be accidentally contained in it, it is not in the ſmalleſt degree affected by a mixture of alkaline air. On the whole I have at preſent no doubt, but that pure inflammable air, though it certainly contains water, does not neceſſarily contain any acid: yet an acid vapour may be eaſily diffuſed through it, and may perhaps in many caſes be obſtinately retained by it, as no kind of air ſeems to be capable of ſo great a variety of impregnations as inflammable air is."

In his analyſis of different kinds of inflammable air, the Doctor obſerves, that the difference moſt commonly perceived is, that ſome of them burn with a lambent flame, ſometimes white, ſometimes yellow, and ſometimes blue; while another kind always burns with an exploſion, making more or leſs of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this laſt kind; and that from wood, coal, or other inflammable ſubſtances by means of heat, belongs to the former. It has alſo been obſerved, that theſe kinds of inflammable air have different ſpecific gravities; the pureſt, or that which is extracted from iron, &c. being about ten times as light as common air; but ſome of the other kinds not more than twice as light.

Inflammable air, when produced in the drieſt way poſſible, is exceedingly light, but Dr. Prieſtley has found, that by ſtanding on water, a very conſiderable increaſe is made in its ſpecific gravity; ſo that from being ten or twelve times lighter than atmoſpherical air, it ſoon becomes only ſeven times lighter. This great propenſity to unite with water is alſo taken notice of by Mr. Kirwan; who tells us, that the bulk of inflammable air obtained over water with the aſſiſtance of heat towards the end, was one-eighth greater than when produced over mercury; but that the weight of it in the former caſe was only eight or nine times leſs than common air.

There is an aſtoniſhing variety in the different kinds of inflammable air, the cauſe of which is very imperfectly known. The lighteſt, and therefore probably the pureſt kind, ſeems to conſiſt of phlogiſton and water only. But it is probable that oil, and that of different kinds, may be held in ſolution in ſeveral of them, and be the reaſon of their burning with a lambent flame, and alſo of their being ſo readily reſolved into fixed air when they are decompoſed by dephlogiſticated air.

Inflammable air is abſorbed by water in conſiderable quantities, but by the application of heat may be expelled again in equal quantities. By agitation in water Dr. Prieſtley was formerly of opinion that this kind of air might be rendered as good as common air; but this undoubtedly proceeds from the atmoſpherical air tranſmitted by the water, as is the caſe with phlogiſticated air. After a quantity of water, which had abſorbed as much inflammable air as it could, had been ſuffered to ſtand a month, it was expelled by heat, and found to be as ſtrongly inflammable as ever. The water, after the proceſs, depoſited a kind of filmy matter; which the Doctor ſuppoſed to be the earth of the metal that had been employed in producing it.

Plants in general grow tolerably well in inflammable air, and the willow plant has been obſerved to abſorb great quantities of it. Its inflammability is not in the leaſt diminiſhed by the putrefaction of animal ſubſtances, nor does their putrefaction ſeem to be retarded by it. Animals confined in it are killed almoſt as ſoon as in fixed air: but inſects, which can live a conſiderable time in phlogiſticated air, live alſo a conſiderable time in this kind of air: but at laſt they become torpid, and appear to be dead, though they will ſtill recover if removed into the open air. Mr. Cavallo relates, that the Abbé Fontana, having filled a large bladder with inflammable air, began to breathe in it in his preſence: after having made a very violent expiration, in which caſe the effects are moſt powerful. The firſt inſpiration produced a great oppreſſion in his lungs, the ſecond made him look very pale, and the third was ſcarce accompliſhed when he fell on his knees through weakneſs. Birds and ſmall quadrupeds, incloſed in ſmall veſſels of this air died after a very few inſpirations.

The inflammability of air has given occaſion to various projects by different perſons concerning it; ſuch as that of employing it to give light and heat; and lamps have been deſcribed, which may be lighted by the electric ſpark in the night-time. By its means alſo very pretty artificial fires are made, with glaſs tubes bent in various directions, and pierced with a great number of ſmall apertures. The inflammable gas is introduced into theſe tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is preſſed, the inflammable air, being made to paſs into the tube, iſſues out of all the ſmall apertures, and is ſet on fire by a lighted taper. None of theſe contrivances, however, have ever been applied to any uſe; and the ſcheme of Mr. Volta, who propoſed to ſubſtitute its exploſive force inſtead of gun-powder, is found inſufficient, on account of the weakneſs of the exploſion, except when the two airs are fired in very great quantities, which would be incompatible with the ſmall bulk neceſſary for warlike engines.

DEFINITION VI.

Dr. Prieſtley has the honour of having found out the properties of ſulphurated inflammable air, in the following manner. Having, among others, treated mangane ſe in this manner, by ſtopping one end of the heated tube with a cork before the ſteam was applied, he received forty ounce-meaſures of air, of which one-ſixth was fixed air and the reſt of the ſtandard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the ſteam, air was produced more copiouſly than before. Of 50 ounces of this air, one-ſeventh was fixed, and the reſt, of the ſtandard of 1.8, exploſively inflammable. The laſt portions were very turbid; and the ſcent, eſpecially that of the laſt portion, was very ſulphurous, tinging the water of a very dark colour, by depoſiting in it a quantity of blackiſh water. However, the air itſelf became preſently tranſparent, and had no other appearance than that of any other kind of air. On looking at the jar in about ten minutes after, it was quite black and opaque; ſo that nothing could be ſeen in the inſide of it. On expoſing it to the open air, the colour diſappeared, and a yellow or brown incruſtation was left upon it. The ſame change took place when the veſſel was inverted in water, in order to obſerve the alteration of the air withall; but on examining this air, no ſenſible change was perceived. In ſome caſes, indeed, he thought the air was injured, but it was much leſs ſo than he had expected. After depoſiting the black matter, the air ſtill retained its ſulphurous ſmell, and he did not imagine that it would ever leave it entirely. On trying other ſpecimens of mangane ſe, no air of this kind was obtained; but ſome time after, having occaſion to make a large quantity of inflammable air, he uſed, inſtead of freſh iron, ſome that had been already melted in vitriolic acid air. Diſſolving this with a conſiderable quantity of freſh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and depoſited more ſediment than had appeared in the experiment with the mangane ſe.

On burning a quantity of this kind of air it appeared to contain ſome vitriolic acid, the balloon being filled with a very denſe white fume, which rendered the water ſenſibly acid to the taſte. On decompoſing it with dephlogiſticated air, however, he found the diminution exactly the ſame as when common inflammable and dephlogiſticated air were uſed; ſo that it appeared to contain neither more or leſs phlogiſton than the other; only there was a ſmall quantity of fixed air produced, which is never the caſe with common inflammable air from vitriolic acid and iron. When the ſulphurated inflammable air is received over mercury, very little black matter is produced; and it is remarkable, that though the black matter collected, when the air is taken through water, ſoon grows yellow upon expoſing it to the air, it is not the caſe with that which remains in the water; it adheres to the evaporating veſſel in form of a black incruſtation, which does not burn blue until it has been digeſted in the nitrous acid, which deprives it of its ſuperfluous phlogiſton, and leaves it both of the colour and ſmell of ſulphur.

DEFINITION VII.

Dr. Prieſtley has the credit of having found out the principles of alkaline air, which in the beginning of his experiments, he procured from common ſpirit of ſal-ammoniac with quicklime, or the materials from which it is made. He did not at that time proſecute the diſcovery farther than by impregnating water with it; by which means he could make a much ſtronger alkaline ſpirit than any to be met with in the ſhops. His method of procuring it was by mixing one part of pounded ſal-ammoniac with three parts of ſlacked lime; and for common experiments the ſame quantity of materials would laſt a conſiderable time.

This kind of air, when pure, is inſtantly fatal to animal life, and extinguiſhes flame; though, when mixed with common atmoſpherical air, it is ſlightly inflammable, and alſo medicinal in faintings and other caſes of debility. A candle dipped into a jar of this air is extinguiſhed; but juſt before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour, and ſometimes a weak flame ſpreads for a conſiderable way, or even through the whole body of the alkaline air. It is readily abſorbed by water, and diſſolves ice almoſt as faſt as an hot fire. On confining ſome water impregnated with alkaline air in a glaſs tube, and thus expoſing it to a ſtrong heat in a ſand-furnace for ſome days, it was obſerved that a white ſediment or incruſtation was formed on the ſurface. The Doctor remarked, that bits of linen, charcoal, and ſponge, admitted into a quantity of alkaline air, diminiſhed it, and acquired a very pungent ſmell; eſpecially the ſponge, a bit of which, about the ſize of an hazle-nut, abſorbed an ounce meaſure. It is remarkable that copper, which is ſo eaſily corroded by the common volatile alkalis, is not affected by alkaline air. The ſpecific gravity of this kind of air is, by Mr. Kirwan, determined to be to that of common air as 600 to 1000; though, as he juſtly obſerves, this muſt differ very conſiderably according to the quantity of moiſture it contains.

On heating red precipitate in alkaline air, the doctor obſerved that the mercury was revived as in other caſes, and a conſiderable quantity of water was produced. " It has even, ſays he, run down in drops in the inſide of a veſſel which contained five ounce-meaſures of the air; and a conſiderable quantity of dephlogiſticated air was found in the reſiduum."

Dr. Prieſtley in examining the phenomena which attend the converſion of alkaline air into the inflammable kind, was induced to believe that it was occaſioned by heat alone, without the concurrence of light. The effects of the former were firſt perceived on heating ſome ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a conſiderable increaſe of quantity inſtead of decreaſe in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. With ſcales of iron a ſimilar enlargement was perceived; but in this way he could never increaſe the quantity to more than double that which had been originally employed, and even after this the whole ſmelled ſtrongly of volatile alkali; the iron had undergone no change.

The doctor now, concluding from theſe experiments that the change of alkaline into inflammable air was produced by this cauſe alone proceeded to repeat the experiment, by heating in the alkaline air bits of dry crucibles, or of earthen retorts, which had been juſt before expoſed to very great heats, ſo that they could not be ſuppoſed to give out any air themſelves, and therefore could only ſerve to communicate a ſtrong heat to the alkaline air; and in theſe experiments the reſult was the ſame as when ochre and iron were made uſe of. The bits of white earthen ware were always turned black; but finding the ſame effect of augmenting the air and giving it an inflammable quality, though he uſed the bit of crucible over and over again, he was thoroughly convinced that the change was effected by heat alone.

In all theſe experiments, however, with a burning-glaſs, as a ſtrong light was alſo concerned, he heated a quantity of alkaline air in a green glaſs retort, receiving in a glaſs tube, filled with water, all the air that could be expelled from it by heat. At firſt it was all abſorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly abſorbed, and at laſt none of them were ſo. Theſe were altogether inflammable; ſo that no doubt remained of the change being produced by heat alone, without any intervention of light.

It was farther obſerved, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the proceſs. He was inclined therefore to ſuppoſe, that ſomething might be depoſited from the air which might attach itſelf to the clay.

The doctor, in ſome former experiments, had obſerved that iron, which had long ruſted in nitrous air, gave out a ſtrong ſmell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found it was much ſooner produced by making uſe of a weak ſolution of copper; by putting iron into which he obtained that ſpecies of nitrous air called *dephlogiſticated.* A phial containing ſome of this iron, which had been uſed only once for the purpoſe juſt mentioned, having been kept cloſe corked for about two months, was accidentally broken; when ſome pieces of the iron were found covered with a green cruſt, and theſe had a ſtrong ſmell of volatile alkali. On making ſome more experiments on this ſubject, he found that two months ſtanding was requiſite to produce the alkaline ſmell deſired.

DEFINITION VIII.

Nitrous air is plentifully obtained in all caſes where the nitrous acid is combined with phlogiſton: thus, when it is mixed with metals, or animal or vegetable ſubſtances, nitrous air is produced in great quantities; but very ſparingly when treated with metallic calces, earths, or other matters which are ſaid to contain little or no phlogiſton. All the metals, except gold, platina, and regulus of antimony, which are not ſoluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from theſe, when diſſolved in aqua regia, ſome quantity of this air may be obtained.

A diverſity in the ſtrength of the acid will diſcover material differences in the production of this kind of air. For inſtance, if we diſſolve copper in ſtrong nitrous acid, no nitrous air is produced, though the ſame materials will yield air in great quantities, by the mere affuſion of water to dilute the acid. This is very properly explained by Dr. Prieſtley, from the property that the nitrous acid has of attracting phlogiſton, which is evident from what happens in the ſolution of mercury. When ſtrong ſpirit of nitre is poured upon this metal the ſolution ſoon begins, and is very rapid, yet not a ſingle bubble of elaſtic fluid is produced; but in a ſhort time the acid next to the mercury is changed of an orange colour, which is an indication of its having acquired phlogiſton, probably from the nitrous air which is decompoſed the moment it is formed, and before its particles are united into viſible bubbles. The bubbles of air, indeed, break through the coloured acid, but they diſappear the moment they come in contact with the pale coloured acid. As ſoon as the whole quantity of acid has aſſumed the orange colour, nitrous air eſcapes from it in conſiderable quantities; but the mixture of water deprives the acid of its power of decompoſing nitrous air. For the eaſy production of nitrous air from copper and mercury the ſtrong and pale-coloured nitrous acid ought to be diluted with at leaſt two or three parts of water to one of the acid.

No other degree of heat is neceſſary, in common experiments, than that produced by the effervescence itſelf, except mercury be uſed, which requires the application of ſome degree of heat; but when the metal expoſes a very great ſurface to the acid, as is the caſe when the filings of the metal are uſed, the efferveſcence and production of nitrous air are often much quicker than can be conveniently managed.

With reſpect to the properties of nitrous air, it is, by itſelf, equally tranſparent and inviſible with common air, except at its firſt production, when it is ſomewhat coloured, owing to a little ſuperfluous nitrous acid, or to ſome earthy particles which are carried up with it. Its ſmell reſembles that of nitrous acid, or, indeed, is the very ſame; becauſe, in paſſing through the common air to our noſtrils, it is decompoſed, and converted into nitrous acid.

Of all the different airs the nitrous ſeems to be the moſt fatal to animal life of any. Even inſects, which can bear phlogiſticated and inflammable air, generally die the moment they are put into it. Frogs, ſnails, and other animals, which do not reſpire very frequently, die in a few minutes, and generally do not recover even when taken out of this noxious fluid before they are dead.

Nitrous air has various ſingular properties, but the moſt remarkable is its diminution with dephlogiſticated air; by which means it becomes a teſt of the quantity of that kind of air contained in the atmoſphere. With pure dephlogiſticated air the diminution is almoſt to nothing, at the ſame time that ſome quantity of nitrous acid is re-produced by the decompoſition of the nitrous air; but as our atmoſphere is always mixed with a conſiderable quantity of phlogiſticated air, on which nitrous air has no effect, the diminution in this caſe is never ſo conſiderable.

Another very remarkable property of nitrous air is its ſtrong antiſeptic power; inſomuch that animal matters may, by its means, be preſerved for many months without corruption.

The ſpecific gravity of nitrous air, as well as of other kinds, has been aſcertained by Mr. Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loſs ſuſtained by the materials which produce it. Thus he found that 14 grains of the materials produced 38.74 inches of nitrous air; and, conſequently, by proper calculation, that the ſpecific gravity of nitrous air is to that of atmoſpheric air as 1195 to 1000.

Dr. Prieſtley made various experiments on nitrous air, ſome of the moſt remarkable of which we ſhall ſtate in his own words. "When nitrous air (ſays he) is decompoſed by iron, or by a mixture of iron and ſulphur, the water, over which the proceſs is conducted, acquires no acidity; but I had ſuppoſed that all the acid was abſorbed by the iron. Having by me a quantity of this iron which had been reduced to perfect ruſt in nitrous air, and which I knew muſt have imbibed more than its weight of this air, I thought that the acid might be obtained from it by diſtillation; but a quantity of this ruſt of iron, diſtilled in an earthen retort, yielded neither nitrous air or nitrous acid, at leaſt in any quantity that could favour the common hypotheſis. I then endeavoured to decompoſe nitrous air by heating iron in it with a burning lens; and in this proceſs I ſucceeded far beyond my expectation: for the air was ſoon diminiſhed in quantity, while the iron became of a darker colour, was ſometimes melted into balls, and gathered conſiderable weight, though it had no appearance of containing any nitrous acid. In the firſt experiment the original quantity of nitrous air was diminiſhed to about one third; and after this it was increaſed."

The Doctor then proceeded to try various experiments on the decompoſition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any ſucceſs, or obtaining the ſmalleſt particle of nitrous acid.

DEFINITION IX.

Dephlogiſticated nitrous air differs from common nitrous air in being able to ſupport flame, though it ſtill continues fatal to animal life. Common nitrous air may be converted into the dephlogiſticated kind by particular proceſſes; though, when zinc is diſſolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the proceſs, will be of this kind; in which it not only ſupports the burning of a candle, but the flame is enlarged (ſometimes to four or five times its original bulk) by the addition of a weaker and bluiſh flame round the former; and this burning is ſometimes accompanied with a crackling noiſe, as if the candle was burning in dephlogiſticated air. It may alſo be obtained in ſome part of the proceſs of procuring nitrous air from iron, though with this metal the ſucceſs is uncertain; but tin yields a conſiderable quantity of it.

By expoſing iron to nitrous air, it may be ſo far dephlogiſticated as to admit a candle to burn in it. Dr. Prieſtley filled an eight ounce phial with nails, and then with mercury; and diſplacing the mercury with nitrous air, left the phial inverted in a quantity of the ſame fluid. Two months after the nitrous air was found to be changed in ſuch a manner as to admit a candle to burn in it with its natural flame; and by continuing ſtill longer in contact with the iron, a candle would burn in it with an enlarged flame. Theſe changes, however, are very irregular, ſo that they ſeldom produce the like effects with the regularity that might be expected. Dr. Prieſtley once found, that by the contact of iron in quickſilver, it was ſo changed as to be fired with an exploſion like a weak inflammable air; whilſt another quantity of nitrous air, which had been treated in like manner for about the ſame length of time, only admitted a candle to burn in it with an enlarged flame.

The diſſolving turnings of iron in a dilute ſolution of copper in nitrous acid (the ſame that remains after the production of nitrous air) mixing it again with an equal quantity of water, produces this kind of air. Without this precaution the Doctor tells us, that though the iron will at firſt be acted upon very ſlowly, yet the mixture will at length grow ſo hot as actually to boil, and the proceſs will be exceedingly troubleſome: however, it will be neceſſary, previous to any attempt to diſſolve the iron, to heat the ſolution of copper, in order to expel all the nitrous air and ſuperfluous nitrous acid, otherwiſe a quantity of common nitrous air will be produced.

Air of this kind is abſorbed by water almoſt as readily as fixed air, and in conſiderable quantity; the liquid taking up about one-half its bulk of air. After being thus ſaturated, the nitrous air may be expelled pure by heat, and is eaſily received in veſſels containing mercury. It was likewiſe obſerved, that as this kind of air much reſembles fixed air in its properties of being imbibed by water, and expelled again by heat, it reſembles it alſo in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the correſponding part of fixed air; it is alſo conſiderably more phlogiſticated. Water impregnated with it very ſoon parts with it again on being expoſed to the atmoſphere.

DEFINITION X.

Acid airs are as follow. 1. *Vitriolic acid Air* is always a combination of vitriolic acid with phlogiſton, conſequently may be procured from any mixture of that acid in its highly concentrated ſtate with phlogiſtic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with ſtrong oil of vitriol. It is alſo procurable from the ſame acid rendered black by any phlogiſtic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heavieſt of all aerial fluids, next to fluor acid air, being to common air as 2265 to 1000.

2. *Nitrous acid air* is procured by heating the ſtrong ſpirit of nitre in a phial, and then receiving the vapour in glaſs veſſels filled with quickſilver. It is, however, extremely difficult, or rather impoſſible, to preſerve it for a length of time by means of any fluid hitherto known. Water abſorbs it immediately, and quickſilver is corroded, and produces nitrous air.

The moſt remarkable property of this vapour is, that it aſſumes a red colour by the mere circumſtance of heat.

3. *Marine acid air*. This is procured by filling a phial, fitted with a glaſs tube and ſtopper, with common ſalt, and then pouring a ſmall quantity of oil of vitriol upon it; which, by the aſſiſtance of heat, will diſengage the acid principle, or the marine acid air, from the ſalt. This air is fatal to all manner of inſects.

4. *Fluor acid air* was diſcovered by Mr. Scheele, who obtained it by diſtilling the ſpar called fluor with vitriolic acid. Its moſt remarkable property is the great attraction it has for ſiliceous earth; ſo that it even corrodes and makes holes in the retorts in which it is diſtilled.

5. *Vegetable acid air* may be produced by heat alone. The concentrated vegetable acid emits a permanently elaſtic and aerial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the reſt of the mineral acid airs, though it agrees with them in its general characters.

DEFINITION XI.

Hepatic air was firſt particularly taken notice of by Mr. Bergman, who obtained it from an ore of zinc called *Pſeudogalena nigra Dannemorenſis*, and which was found to contain 29 parts of ſulphur, one of regulus of arſenic, ſix of water, ſix of lead, nine of iron, 45 of zinc, and four of ſiliceous earth. The hepatic air was produced but in ſmall quantity by pouring oil of vitriol on this mineral; ſpirit of ſalt produced it in much larger quantity; but nitrous acid produced only nitrous air. The moſt proper method of obtaining this air is by pouring marine acid on hepar ſulphuris, which extricates it in vaſt quantities. It is ſaid alſo to be ſometimes produced naturally from putrefying matters. It is the characteriſtic of all livers of ſulphur, whether they be made with alkalis or earths. The ſmell of the pure gas is intolerable; and the vapour has a diſagreeable effect on many metallic ſubſtances, particularly ſilver, lead, copper, &c. deſtroying their colour, and rendering them quite black. It is ſuddenly fatal to animal life, renders ſyrup of violets green, and is inflammable, burning with a very light blue flame.

Its ſpecific gravity, compared with that of atmoſpherical air, is as 1106 to 1000. It combines readily with water, and gives the ſmell to the ſulphurous medicinal waters.

DEFINITION XII.

Atmoſpherical air conſiſts of the two component parts of our atmoſphere, viz. dephlogiſticated and phlogiſticated air, which have been fully treated of under their reſpective definitions, ſo that little remains to be ſaid in this place, excepting to determine the proportion in which they are uſually met with in the common air. The only regular ſet of experiments which have been made on this ſubject are thoſe of Mr. Scheele. He conſtructed an eudiometer, conſiſting of a glaſs receiver, which could contain 34 ounces of water, and a glaſs cup containing a mixture of one pound of iron-filings, and an equal weight of flowers of ſulphur moiſtened; which cup ſtanding upon a glaſs ſupporter, was inſerted in the former receiver, which, when this was in it, could contain 33 ounces of water. To the outſide of the glaſs tube or receiver, was affixed a ſlip of paper, to the height of a third of the tube, containing 11 diviſions, each correſponding to one ounce of water. This paper was varniſhed over with oil varniſh, to prevent its being ſpoiled by water. The whole then was placed in water, which gradually roſe as the air was diminiſhed. This mixture would ſerve four times before the power of diminiſhing air was loſt. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this inſtrument he examined the goodneſs of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{10}{33}$, nor to fall ſhort of $\frac{8}{33}$; ſo that upon a medium it may be eſtimated at $\frac{9}{33}$.

Application of the foregoing DEFINITIONS.

Fixed Air, or Aërial Acid. The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

1. *By Fermentation.* When vegetable or animal ſubſtances, eſpecially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the ſurface of the fermenting liquor, there is always a ſtratum of fixed air reaching as high as the edge of the vats; ſo that if theſe veſſels are deep, and the fermenting liquor much below their edges, the above-mentioned ſtratum may be ſome feet in thickneſs. The ſame phenomenon is obſervable in the fermentation of wines in general; and it is owing to the production and elaſticity of fixed air, that fermenting liquors, when put into cloſe veſſels, often burſt them with great violence. The caſe is the ſame whatever ſubſtance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the ſame in all ſubſtances, nor even in the ſame ſubſtance at different times. From 42 cubic inches of beer Dr. Hales obtained 639 cubic inches of air in 13 days. From a quantity of ſugar undergoing the vinous fermentation, Mr. Cavendiſh obtained ſo much fixed air, that out of 100 parts of the former, 57 appeared to have been volatilized and converted into fixed air.

But though a vaſt quantity of fixed air eſcapes during this proceſs of fermentation, a very conſiderable portion ſtill remains united with the fermented liquor, and to this it owes all its briſkneſs and agreeable pungent acidulous taſte; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence alſo we are furniſhed with a method of reſtoring the briſkneſs to theſe liquors after they have loſt it in conſequence of being expoſed to the atmoſphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

Fixed air is likewiſe produced, though in no great quantity, by putrefaction. In this caſe, however, a great part of the elaſtic fluid conſiſts of inflammable and phlogiſticated air, and the fixed air itſelf ſeems to be intimately connected with a putrid offenſive effluvium.

2. *By Heat.* In every combuſtion, except that of ſulphur or of metals, a quantity of fixed air is generated. This may be obſerved by fixing a lighted candle in an inverted receiver over a baſon of lime-water, for a precipitation of the lime will preſently enſue; and the ſame precipitation will always happen, whether a candle, a burning piece of wood, or, in ſhort, any other combuſtible ſubſtance, except ſulphur or metals, be made uſe of.

Moſt minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr. Krenger, diſtilling a greeniſh fuſible ſpar, which was luminous in the dark, obtained from it ſome permanently elaſtic fluid, which, like fixed air, cryſtallized a ſolution of fixed alkali. Mr. Fontana, in his analyſis of the malachite, finds that that mineral contains a vaſt quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid.

From almoſt every metallic ore and earthy mineral, ſome fixed air may be obtained, as well as from chalk, lime-ſtone, marble, marine ſhells, fixed and volatile alkali, and from magneſia alba, by means of a violent heat.

3. *By Acids.* Calcareous ſubſtances in general produce abundance of fixed air when acted upon by any acid, only the ſtrongeſt acids will expel from them more fixed air than the weakeſt; and it happens to be peculiarly advantageous for thoſe who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapeſt and ſtrongeſt acid, and, upon the whole, the fitteſt for this purpoſe.

To produce Inflammable Air.

The proceſs for making this ſort of gas is the ſame as that for making fixed air; except that iron-filings, or groſsly powdered zinc, muſt be uſed inſtead of chalk; to which muſt be added ſome oil of vitriol and water.

Inſtead of the filings of iron, ſmall nails, or ſmall bits of iron-wire, anſwer equally as well.

The inflammable elaſtic fluid produced by this mixture has a diſpleaſing ſmell, even when mixed with a very large quantity of common air; ſo that if any conſiderable quantity of it comes out of the bottle, before the cork with the bent tube be applied to it, &c. its ſmell may be diſcovered all over the room in which the experiment is made.

Having filled a bottle with this elaſtic fluid, ſtop the mouth of it with your thumb, or any ſtopper, and then bring it near the flame of a candle; and when the mouth of the bottle is very near it, remove the ſtopper, and the elaſtic fluid contained in the bottle will be immediately inflamed; and if the capacity of the bottle is nearly equal to four ounce-meaſures, it will continue burning quietly for about half a minute, the flame gradually deſcending lower and lower, as far as about the middle of the bottle, in proportion as the inflammable gas is conſumed.

It is evident from this experiment, that inflammable air follows the general rule of all other combuſtible ſubſtances, namely, that of burning only when in contact with common air: thus the flame of this gas, whilſt burning, is obſervable only on that ſurface of it which is contiguous to the common air; ſo that if the bottle be cloſed, the flame is put out immediately, becauſe the air is intercepted from it. But if the inflammable air were put in ſuch a ſituation as to expoſe a very great ſurface to the common air, it is plain, that by this means its combuſtion would be accelerated, ſo as to let it burn inſtantly, and go off with an exploſion, cauſed by the ſudden rarefaction of the air. In fact, this effect may be eaſily obſerved in the following manner: When the bottle is to be inverted in order to let it be filled with the inflammable gas, inſtead of filling it entirely with water, let half of it remain filled with common air; then invert it, and let the other half, which is now filled with water, be filled with inflammable air after the uſual manner; and when the bottle is full, remove it to the flame of the candle, by which means the inflammable air takes fire; but now it explodes all at once with a large flame and a conſiderable report, ſometimes breaking the bottle in which it is contained. In this caſe, the bottle being filled with equal parts of inflammable and common air, theſe two elaſtic fluids were mixed together, ſo that almoſt every particle of the one touched every particle of the other, and hence the ſudden combuſtion was occaſioned. The force of this exploſion is ſo very conſiderable, that ſome piſtols have been contrived, which are charged with a mixture of air and inflammable gas, and being fired by means of an electric ſpark, are capable to drive a leaden bullet with great violence. Sometimes thoſe piſtols are made of glaſs, but in this caſe they are not charged with a bullet, and it is very diverting to ſhow that piſtols are charged and explode by the combuſtion of an inviſible ſubſtance.

When a ſlender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, after the manner deſcribed in the preceding experiment, viz. when the bladder was required to be filled with fixed air, two very pleaſing experiments may be performed with it. Firſt, the inflammable gas may be inflamed by applying the flame of the candle to the extremity of the pipe; and ſqueezing at the ſame time the bladder, a ſtream of fire will be formed in the air, which will laſt as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a conſiderable way in the air. Secondly, the extremity of the pipe may be dipped into a ſolution of ſoap, then removing it from the ſolution, and ſqueezing the bladder very gently, a ball of ſoap-water may be formed, including inflammable air: which ball, on account of the inflammable gas being much lighter than common air, as ſoon as it is detached from the pipe will aſcend upwards, and will break by daſhing againſt the ceiling, contrary to thoſe commonly made by children, which in ſtill air go downwards. Whilſt the ball is aſcending, if the flame of the candle be approached to it, the film of ſoap-water will be inſtantly broke, and the inflammable air will take fire; thus a flame may be ſhown to be ſeemingly produced from a ſoap-ball.

In order to obtain the greateſt quantity of inflammable air from iron or zinc, the vitriolic acid muſt be diluted with much water, as about one part of ſtrong oil of vitriol to five or ſix parts of water. Dr. Prieſtley found, that 11 grains of iron yielded 8¼ ounce-meaſures of inflammable air. According to Mr. Cavendiſh, one ounce of zinc, diſſolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, diſſolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

By means of nitrous acid, inflammable air may be obtained from various ſubſtances containing phlogiſton; but it is always mixed with nitrous air, and ſometimes alſo with fixed and common or phlogiſticated air. If two parts of ſpirit of wine, mixed with one part of nitrous acid, are put into a phial with a ground-ſtopple and tube, and the flame of a candle be applied to it, ſo as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little waſhing in water it may be annihilated. In the ſolution of moſt ſubſtances in nitrous acid, it generally happens, that the elaſtic fluid, which is obtained towards the latter end of the proceſs, poſſeſſes the property of being inflammable: thus iron, diſſolved in nitrous acid, yields nitrous air; but when the nitrous air ceaſes to be produced, if the heat of a candle be applied to the ſolution, more elaſtic fluid will be produced which is inflammable. The nitrous acid when mixed with iron-filings in a very diluted ſtate, gives, by the aſſiſtance of a moderate degree of heat, a mixture of different airs, partly fixed, partly common, and partly phlogiſticated.

To produce Nitrous Air.

This permanently elaſtic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial. Either ſilver, copper, braſs, iron, mercury, biſmuth, or nickel, when mixed with nitrous acid, yield nitrous air in great quantities. Some of them, eſpecially mercury, require the aid of heat in order to produce the elaſtic fluid; the flame of a candle applied to the phial is ſufficient; but others, eſpecially copper and iron, do not want the application of any heat. Gold, platina, and the regulus of antimony, when put in aqua regia, yield nitrous air pretty readily.

Among the ſemi-metals, zinc gives the weakeſt nitrous air, when diſſolved in nitrous acid. The elaſtic fluid produced from it is moſtly phlogiſticated air. From four pennyweights and 17 grains of zinc, diſſolved in ſpirit of nitre diluted with an equal quantity of water, Dr. Prieſtley obtained about 12 ounce-meaſures of very weak nitrous air. It occaſioned a very ſlight effervefcence when mixed with common air. The Doctor obtained nitrous air even from ſome flowers of zinc.

Nitrous air is obtained from various kinds of metals, all of which materially differ in their produce. Braſs yields nitrous air of a more uniform nature than iron: copper is ſuperior to braſs; but pure mercury is ſtill ſuperior to copper: and indeed this is the metal which, conſidering its nature, uniformity of ſubſtance, and eaſy ſolution, is upon the whole the moſt uſeful for this purpoſe.

In order to obtain nitrous air from the ſolution of animal and vegetable ſubſtances in nitrous acid, often ſome degree of heat muſt be applied. The acid alſo ſometimes muſt be very concentrated, and in other caſes it muſt be diluted; but it is hardly worth while, or practicable, to determine with exactneſs all thoſe particular caſes.

To produce Dephlogiſticated Air.

This is no other than exceeding pure atmoſpherical air, entirely free from thoſe heterogeneous vapours which contaminate the air we commonly breathe. The eaſieſt method of procuring this air is to put ſome red-lead into the bottle, together with ſome good ſtrong oil of vitriol, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity or very little leſs; then apply the bent tube to the bottle. But it muſt be remarked, that without heat this mixture of red-lead and vitriolic acid will not give any dephlogiſticated air, or it yields an inconſiderable quantity of it; for which reaſon the flame of a candle, that of a wax taper is ſufficient, muſt be applied under the bottom of the bottle; which for this purpoſe muſt be rather thin, otherwiſe it will be eaſily cracked. In this manner the red-lead will yield a good quantity of elaſtic fluid, the greateſt part of which is dephlogiſticated air; but not the whole quantity of it, for a large portion of fixed air comes out with it. In order to ſeparate the fixed from the dephlogiſticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, muſt be ſhook in the baſin for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air by itſelf.

It appears, from every experiment, that dephlogiſticated air, if it could be readily obtained, and at a cheap rate, would be a moſt valuable manufacture. The heat communicated by means of it to burning fuel is incredible.

It has been found by experience, that animals will live much longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed that the breathing of it muſt be much more healthy, and contribute to longevity much more than the common atmoſphere. Nay, there are not wanting ſome who attribute the longevity of the Antediluvians to the great purity of the atmoſphere at that time; the whole maſs being afterwards tainted by the deluge, in ſuch a manner that it could never regain its former purity and ſalubrity. But all this as yet is mere conjecture; and excepting the ſingle fact, that animals live much longer in a quantity of dephlogiſticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr. Prieſtley even throws out a conjecture, that the uſe of dephlogiſticated air might, perhaps, wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. The great quantity, however, even of the pureſt air, which is requiſite to ſupport animal life, and the expence and trouble of the moſt ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philoſophers, conſidering the probability there is of this kind of air being ſalutary in many diſeaſes, have beſtowed ſome pains in attempting to find out methods of procuring it eaſily and in large quantities.

To procure Vitriolic Acid Air.

This conſiſts of the vitriolic acid, united with ſome phlogiſton, which volatilizes and renders it capable of aſſuming the form of a permanently elaſtic fluid. To obtain it, ſome ſtrong concentrated vitriolic acid muſt be put into the uſual bottle, together with ſome ſubſtance capable of furniſhing phlogiſton. Olive oil anſwers very well. The oil of vitriol ſhould be about three or four times as much as the ſweet oil, and both together ſhould fill about one-third or half the bottle. A gentle degree of heat is then required, in order to let theſe materials yield any elaſtic fluid; which may be done by applying the flame of a wax taper, as directed for the production of dephlogiſticated air.

To procure Marine Acid Air.

This is no other than the marine acid itſelf, and which, without any addition, becomes a permanently elaſtic fluid. Put ſome ſea ſalt, or common kitchen ſalt, into the uſual bottle in which the materials for producing elaſtic fluids are generally put, ſo as to fill about a fourth part of it, and upon this ſalt pour a ſmall quantity of good concentrated vitriolic acid; then apply the bent tube to the bottle, and introduce it through the quickſilver into the receiver filled with and inverted in quickſilver after the uſual method, and the elaſtic fluid is copiouſly produced.

To procure Nitrous Acid Air.

This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elaſticity, and it has been found to remain uncondenſed into a viſible fluid by any cold to which it has been hitherto expoſed. The great difficulty is to find a fluid capable of confining this acid air; becauſe it is eaſily and abundantly abſorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quickſilver, and alſo upon oils: hence its examination cannot be made but very imperfectly; for ſubſtances muſt be expoſed to it, or mixed with it, whilſt it is actually changing its nature by acting on the mercury or other fluid that confines it.—*The Engraver has referred the Plates of* Experiments on Air *to the Syſtem of* Aerology, *but as they will come more conſiſtently under* Pneumatics, *we refer our Readers to the deſcriptions of thoſe Plates under that Syſtem.*

AEROMANCY, a ſpecies of divination performed by means of air, wind, &c.

AEROMELI, honey. The word is alſo uſed for manna.

AEROMETRY, a term formerly uſed for the ſcience of meaſuring the air; but has long ſince been generally called Pneumatics.

AERONAUT, a perſon who attends and guides an air balloon.

AERONAUTICA, from αηρ and ναυτικος, derived from ναυς, ſhip: the art of ſailing in a veſſel, or machine, through the atmoſphere, ſuſtained as a ſhip in the ſea.

AEROPHYLACEA, a term uſed by naturaliſts for certain receptacles of air, which have been ſuppoſed to exiſt in the earth. And, according to Kircher, theſe caverns generate the various ſpecies of the mineral kingdom of nature.

AEROSIS denotes the attenuating and converting the blood into aura, for the ſupport of vital ſpirits and the animal flame of life, uſually termed natural vigour.

AEROSTATICA implies that branch of Pneumatics which treats of the weight, preſſure, and balance of the atmoſphere.

A NEW SYSTEM of AEROSTATION.

AEROSTATION, in the modern acceptation of the word, implies aerial navigation, or the art of navigating a machine, called a balloon, through the atmoſphere.

The name of this aeroſtatic vehicle is derived from the globular figure of its conſtruction and contents, being uſually known by the term Air Balloon.

As Aeroſtation has engaged the attention of almoſt all ranks of people in Europe, I ſhall commence its hiſtory from the æra in which the invention of ſuch celebrity took its riſe.

In the year 1782 Meſſrs. Stephen and John Montgolfier, paper-makers of Annonay in France, made the firſt experiment at Avignon, by filling a ſilk bag of a parallelopiped ſhape with the ſmoak of burnt paper, which roſe to the height of 70 feet. But what is moſt extraordinary, thoſe gentlemen took into conſideration the idea of the aſcenſion of ſmoak as rarified air, capable of carrying a covering with it to its congenial region in the atmoſphere, thereby aſſuring themſelves that it muſt aſcend until the confined air, or rather ſmoak, ſhould become condenſed.

From this aſſurance an experiment, on a more enlarged ſcale, was projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and roſe to the height of about 600 feet. Another of 35 feet in diameter roſe about 1000 feet high, and fell to the ground three quarters of a mile from the place where it aſcended.

A public exhibition was next made on the 5th of June 1783, at Annonay, where a vaſt number of ſpectators aſſembled. An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped ſtraw and wool under the aperture of the machine, which immediately began to ſwell; and after being ſet at liberty aſcended into the atmoſphere. In ten minutes it had aſcended 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place from whence it ſet out.

Some time after this experiment had been made, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In conſequence of this invitation he conſtructed, in a garden in the Fauxbourg of St. Germain, a large balloon of an elleptical form. In a preliminary experiment this machine lifted up from the ground eight perſons who held it, and would have carried them all off if more had not quickly come to their aſſiſtance. Next day the experiment was repeated in preſence of the members of the academy; the machine was filled by the combuſtion of 50 pounds of ſtraw made up in ſmall bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The uſual ſucceſs attended this exhibition: the machine ſoon ſwelled; endeavoured to aſcend; and immediately after ſuſtained itſelf in the air, together with the charge of between 4 and 500 pounds weight. It was evident that it would have aſcended to a great height; but as it was deſigned to repeat the experiment before the king and royal family at Verſailles, the cords by which it was tied down were not cut. But in conſequence of a violent rain and wind which happened at this time, the machine was ſo far damaged, that it became neceſſary to prepare a new one for the time that it had been determined to honour the experiment with the royal preſence; and ſuch expedition was uſed, that this vaſt machine, of near 60 feet in height and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than four days and four nights. With this machine was ſent a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent through the atmoſphere. The full ſucceſs of the experiment was prevented by a violent guſt of wind which tore the cloth in two places near the top before it aſcended: however, it roſe to the height of 1440 feet; and, after remaining in the air about eight minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals contained in it did not receive the leaſt injury.

From the great power of theſe aeroſtatic machines, and their very gradual deſcent in falling to the ground, it was reaſonably ſuppoſed that they were capable of conveying people through the air with all imaginable ſafety; and this was further confirmed by the experiment already mentioned.

Encouraged by the ſucceſs of theſe experiments, M. Montgolfier propoſed to make a new aeroſtatic machine of a firmer and better conſtruction than the former; and M. Pilatre de Rozier offered himſelf to be the firſt aerial adventurer.

This new machine was conſtructed in a garden in the Fauxbourg of St. Antoine. It was of an oval ſhape, about 48 feet in diameter and 74 in height; elegantly painted on the outſide with the ſigns of the zodiac, cyphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended; ſo that it was eaſy for the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds.

The experiment was performed on the 15th of October 1783. M. Pilatre having placed himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat for about four minutes and a half; after which it deſcended very gently: and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground.

Two days after, he repeated the experiment with the ſame ſucceſs as before; but the wind being ſtrong, the machine did not ſuſtain itſelf ſo well as formerly. However, on repeating the experiment in calmer weather, he aſcended to the height of 210 feet. His next aſcent was 262 feet; and in the deſcent a guſt of wind having blown the machine over ſome large trees of an adjoining garden, M. Pilatre ſuddenly extricated himſelf from ſo dangerous a ſituation, by throwing ſome ſtraw and chopped wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height by throwing ſtraw on the fire. Some time after he aſcended in company with M. Girond de Villette to the height of 330 feet; hovering over Paris at leaſt nine minutes in ſight of all the inhabitants, the machine, during the time, keeping quite ſtationary.

From theſe experiments it was evident, that the aeroſtatic machines might be raiſed or lowered at the pleaſure of the perſons who aſcended: they had likewiſe diſcovered, that keeping them faſt with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard.

On the 21ſt of November 1783 M. Pilatre determined to undertake an aerial voyage in which the machine ſhould be ſet at full liberty. Every thing being got in readineſs, the balloon was filled in a few minutes; and M. Pilatre placed himſelf in the gallery, counterpoiſed by the Marquis d'Arlandes, who occupied the other ſide. It was intended to make ſome preliminary experiments on the aſcending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon eſſentially; ſo that it would have been entirely deſtroyed had not timely aſſiſtance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers ſet out. They met with no inconvenience during their voyage, which laſted about 25 minutes; during which time they had paſſed over a ſpace of above five miles. From the account given by the Marquis d'Arlandes, it appeared that they met with ſeveral different currents of air, the effect of which was, to give a very ſenſible ſhock to the machine, and the direction of the motion ſeemed to be from the upper part downwards. It appeared alſo that they were in ſome danger of having the balloon burnt altogether; as the Marquis obſerved ſeveral round holes made by the fire in the lower part of it, which alarmed him conſiderably, and, indeed, not without reaſon. However, the progreſs of the fire was eaſily ſtopped by the application of a wet ſponge, and, in a ſhort time, all appearance of danger ceaſed.

This voyage of M. Pilatre and the Marquis d'Arlandes may be ſaid to conclude the hiſtory of thoſe aeroſtatic machines which are elevated by means of fire; for though many other attempts have been made upon the ſame principle, moſt of them have either proved unſucceſsful or of little conſequence. They have therefore given place to the other kind, filled with inflammable air; which, by reaſon of its ſmaller ſpecific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be ſupplied with fuel like the others. This was invented a very ſhort time after the diſcovery made by M. Montgolfier. This gentleman had, indeed, deſigned to keep his method in ſome degree a ſecret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmoſphere would riſe in it, inflammable air was naturally thought of as a proper ſuccedanium for the rarefied air of M. Montgolfier.

The firſt experiment was made by two brothers named Roberts, and M. Charles, a profeſſor of experimental philoſophy. The bag which contained the gas was compoſed of luteſtring, varniſhed over with a ſolution of the elaſtic gum called *caoutchouc*; and that with which they made their firſt eſſay was only about 13 Engliſh feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; inſomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one third part full. Next morning they were ſurpriſed to find that it had fully inflated of itſelf during the night: but, upon enquiry, it was found, that they had inadvertently left open a ſtop-cock connected with the balloon, by which the common air gaining acceſs, had mixed itſelf with the inflammable air; forming a compound ſtill lighter than the common atmoſphere, but not ſufficiently light to anſwer the purpoſes of aeroſtation. Thus they were obliged to renew their operation; and, by ſix o'clock in the evening, of next day, they found the machine conſiderably lighter than the common air; and, in an hour after, it made a ſtrong effort to aſcend. The public exhibition, however, had been announced only for the third day after; ſo that the balloon was allowed to remain in an inflated ſtate for a whole day; during which they found it had loſt a power of aſcent equal to about three pounds, being one ſeventh part of the whole. When it was ſet at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmoſphere only three quarters of an hour, during which it had traverſed 15 miles. It deſcended very ſuddenly, which was ſuppoſed to have been owing to a rupture that had taken place in the balloon.

The ſucceſs of this experiment, and the aerial voyage made by Meſſrs. Rozier and Arlandes, naturally ſuggeſted the idea of undertaking ſomething of the ſame kind with a balloon filled with inflammable air. The machine uſed on this occaſion was formed of gores of ſilk, covered over with a varniſh made of *caoutchouc*, of a ſpherical figure, and meaſuring 27½ feet in diameter. A net was ſpread over the upper hemiſphere, and faſtened to an hoop which paſſed round the middle of the balloon. To this a ſort of car, or rather boat, was ſuſpended by ropes, in ſuch a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the burſting of the machine, a valve was placed in it; by opening of which ſome of the inflammable air might be occaſionally let out. A long ſilken pipe communicated with the balloon, by means of which it was filled. The boat was made of baſket-work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and 3½ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the moſt proper apparatus. But at laſt, all obſtacles being removed, the two adventurers took their ſeats at three quarters after one in the afternoon of the firſt of December 1783. Perſons ſkilled in mathematics were conveniently ſtationed with proper inſtruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be 604¼ pounds, and the power of aſcent when they ſet out was 20 pounds; ſo that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmoſphere diſplaced by the inflammable gas was calculated to be 771 pounds, ſo that there remains 147 for the weight of the latter; and this calculation makes it only 5¼ times lighter than common air.

At the time the balloon left the ground the thermometer ſtood at 9° of Fahrenheit's ſcale, and the quickſilver in the barometer at 30.18 inches; and, by means of the power of aſcent with which they left the ground, the balloon roſe till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballaſt occaſionally as they found the machine deſcending by the eſcape of ſome of the inflammable air, they found it practicable to keep at pretty near the ſame diſtance from the earth during the reſt of their voyage; the quickſilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the ſpace of an hour and three quarters, when they alighted at the diſtance of 27 miles from Paris; having ſuffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Meſſrs. Pilatre and Arlandes. As the balloon ſtill retained a great quantity of inflammable gas, Mr. Charles determined to take another voyage by himſelf. Mr. Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of conſequence the aeroſtatic machine now had nearly as much power of aſcent. Thus he was carried up with ſuch velocity, that in twenty minutes he was almoſt 9000 feet high, and entirely out of ſight of terreſtrial objects. At the moment of his parting with the ground the globe had been rather flaccid; but it ſoon began to ſwell, and the inflammable air eſcaped from it in great quantities through the ſilken tube. He alſo frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from burſting. The inflammable gas being conſiderably warmer than the external air, diffuſed itſelf all round, and was felt like a warm atmoſphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of ſpring and the ordinary cold of winter. His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he aſcribed to the dilatation of the air in theſe organs as well as to the external cold. The beauty of the proſpect which he now enjoyed, however, made amends for theſe inconveniences. At his departure the ſun was ſet on the vallies; but the height to which Mr. Charles was got in the atmoſphere rendered him again viſible, though only for a ſhort time. He ſaw, for a few ſeconds, vapours riſing from the vallies and rivers. The clouds ſeemed to aſcend from the earth, and collect one upon the other, ſtill preſerving their uſual form; only their colour was grey and monotonous for want of ſufficient light in the atmoſphere. By the light of the moon he perceived that the machine was turning round with him in the air; and he obſerved that there were contrary currents which brought him back again. He obſerved alſo, with ſurpriſe, the effects of the wind, and that the ſtreamers of his banners pointed upwards; which, he ſays, could not be the effect either of his aſcent or deſcent, as he was moving horizontally at the time. At laſt, recollecting his promiſe of returning to his friends in half an hour, he pulled the valve, and accelerated his deſcent. When within 200 feet of the earth, he threw out two or three pounds of ballaſt, which rendered the balloon again ſtationary: but, in a little time afterwards, he gently alighted in a field about three miles diſtant from the place whence he ſet out; though, by making allowance for all the turnings and windings of the voyage, he ſuppoſes that he had gone through nine miles at leaſt. By the calculations of M. de Maunier, he roſe at this time not leſs than 10,500 feet high; a height ſomewhat greater than that of Mount Ætna. A ſmall balloon, which had been ſent off before the two brothers ſet out on their voyage, took a direction oppoſite to that of the large one, having met with an oppoſite current of air, probably at a much greater height.

The ſubſequent aerial voyages differ ſo little from that juſt now related, that any particular deſcription of them ſeems to be ſuperfluous. It had occurred to Mr. Charles, however, in his laſt flight, that there might be a poſſibility of directing the machine in the atmoſphere; and this was ſoon attempted by M. Jean-Pierre Blanchard, a gentleman who had, for ſeveral years before, amuſed himſelf with endeavours to fly by mechanical means, though he had never ſucceeded in the undertaking. As ſoon as the diſcovery of the aeroſtatic machines was announced, however, he reſolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himſelf through the air at pleaſure. In his firſt attempt he was fruſtrated by the impetuoſity of a young gentleman, who inſiſted, right or wrong, on aſcending along with him. In the ſcuffle which enſued on this occaſion, the wings and other apparatus were entirely deſtroyed; ſo that M. Blanchard was obliged to commit himſelf to direction of the wind; and in another attempt it was found, that all the ſtrength he could ſupply was ſcarce ſufficient to counteract the impreſſion of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballaſt, he aſcended to a place where he met with the ſame current he had at ſetting out from the earth. His account of the ſenſations he felt during this voyage, was ſomewhat different from that of Mr. Charles; having, in one part of it, found the atmoſphere very warm, in another cold; and having ounce found himſelf very hungry, and at another time almoſt overcome by a propenſity to ſleep. The height to which he aroſe, as meaſured by ſeveral obſervations with mathematical inſtruments, was thought to be very little leſs than 10,000 feet; and he remained in the atmoſphere an hour and a quarter.

The attempts of M. Blanchard to direct his machine through the atmoſphere were repeated in the month of April 1784. Meſſrs. Morveau and Bertrand at Dijon, who raiſed themſelves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; paſſing through a ſpace of 18 miles in an hour and 25 minutes. M. Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a guſt of wind, ſo that only two of them remained ſerviceable; by working theſe, however, they were able to produce a ſenſible effect on the motion of the machine. In a third aerial voyage performed by M. Blanchard, he ſeemed to produce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſidewiſe, and even in ſome meaſure againſt the wind; however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

The ſucceſs of Meſſrs. Charles and Robert in their former experiments, encouraged them ſoon to repeat them, with the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to the ſize of an oblong ſpheroid 46½ feet long and 27½ in diameter, they made it to float with its longeſt parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon obliged to throw out eight pounds more in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder-clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it appeared that they had paſſed ſafely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood only at 23,94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they ſound, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

Having thus related all that has been done with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts that has been made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air.

The firſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Robert, from the Park of St. Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out ſeems to have been very great: as, in three minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky or the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of that ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of hisrays, with the diminiſhed denſity of the atmoſphere had ſuch an effect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that all the attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of the inflammable air; for which purpoſe the Duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of ſeven or eight feet. On this they deſcended with great rapidity; and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

The ſucceſs of the ſcheme for raiſing or lowering aeroſtatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rarefied air under an inflammable air-balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by thecelebrated M. Pilatre de Rozier, and another gentleman named M. Romaine. Their inflammable-air balloon was about 37 feet in diameter, and the power of the rarefied-air one was equivalent to about 60 pounds. They aſcended without any appearance of danger or ſiniſter accident; but had not been long in the atmoſphere when the inflammable-air balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down, and buſied in pulling the valve and opening the appendages to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. A ſhort time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk which compoſed the air balloon continued expanded, and ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and the remains of the apparatus deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. M. Pilatre ſeemed to have been dead before he came to the ground; but M. Romaine was alive when ſome perſons came up to the place where he lay, though he expired immediately after. Theſe are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; though a great number of other expeditions through the atmoſphere have taken place.

But of all the voyages which had been hitherto projected or put in execution, the moſt daring was that of M. Blanchard and Dr. Jeffries acroſs the ſtraits of Dover, which ſeparate Britain from France. This took place on the 7th of January 1785, being a clear froſty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock M. Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpeare in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently, though making very little way on account of there being ſo little wind. At a quarter after one o'clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral veſſels, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and an half of ballaſt; but as they ſaw that it ſtill deſcended, and that with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and, ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were obliged to throw away their proviſions for eating, the wings of their boat, and every other moveable they could poſſibly ſpare. "We threw away, ſays Dr. Jeffries, our only bottle, which, in its deſcent, caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and cords, and at laſt ſtripped off their cloths, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over high lands between Cape Blanc and Calais, the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. In a ſhort time after they deſcended ſafely among ſome trees in the foreſt of Guiennes.

It would be tedious as well as unneceſſary to recount all the other aerial voyages that have been performed in our own or other countries: it appeared ſufficient for the purpoſe of this article to notice thoſe which were moſt remarkable and intereſting; and therefore an account of the ingenious Mr. Baldwin's excurſion from Cheſter, with the particular circumſtances attending it, ſhall now cloſe our enumeration.

On the 8th of September 1785, at forty minutes paſt one P. M. Mr. Baldwin aſcended from Cheſter in Mr. Lunardi's balloon. After traverſing in a variety of different directions, he firſt alighted, at 28 minutes after three, about twelve miles from Cheſter, in the neighbourhood of Frodſham; then re-aſcending and purſuing his excurſion, he finally landed at Rixton moſs, five miles N. N. E. of Wavington, and 25 miles from Cheſter. Mr. Baldwin has publiſhed his Obſervations and Remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many of his obſervations; but the few following are ſome of the moſt important and curious. "The ſenſation of aſcending is compared to that of a ſtrong preſſure from the bottom of the car upwards againſt the ſoles of his feet. At the diſtance of what appeared to him ſeven miles from the earth, though by the barometer ſcarcely a mile and a half, he had a grand and moſt enchanting view of the city of Cheſter and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the higheſt building having no apparent height, but reduced all to the ſame level, and the whole terreſtrial proſpect appeared like a coloured map. Juſt after his firſt aſcent, being in a well-watered and maritime part of the country, he obſerved a remarkable and regular tendency of the balloon towards the ſea; but ſhortly after riſing into another current of air, he eſcaped the danger; this upper current, he ſays, was viſible to him at the time of his aſcent, by a lofty ſound ſtratum of clouds flying in a ſafe direction. The perſpective appearance of things to him was very remarkable. The loweſt bed of vapour that firſt appeared as cloud was pure white, in detached fleeces, increaſing as they roſe: they preſently coaleſced, and formed, as he expreſſes it, a ſea of cotton, tufting here and there by the action of the air in the undiſturbed part of the clouds. The whole became an extended white floor of cloud, the upper ſurface being ſmooth and even. Above this white floor he obſerved, at great and unequal diſtances, a vaſt aſſemblage of thunder-clouds, each parcel conſiſting of whole acres in the denſeſt form: he compares their form and appearance to the ſmoke of pieces of ordnance, which had conſolidated as it were into maſſes of ſnow, and penetrated through the upper ſurface or white floor of common clouds, there remaining viſible and at reſt. Some clouds had motions in ſlow and various directions, forming an appearance truly ſtupendous and majeſtic. He endeavours to convey ſome idea of the ſcene as repreſented in *fig.* 11. *A* repreſents a circular view he had from the car of the balloon, himſelf being over the centre of the view, looking down on the white floor of clouds and ſeeing the city of Cheſter through an opening, which diſcovered the landſcape below, limited by ſurrounding vapour, to leſs than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon, viz. four miles above the white floor of clouds. Mr. Baldwin alſo gives a curious deſcription of his tracing the ſhadow of the balloon over tops of volumes of clouds. At firſt it was ſmall, in ſize and ſhape like an egg; but ſoon encreaſed to the magnitude of the ſun's diſc, ſtill growing larger, and attended with a moſt captivating appearance of an iris encircling the whole ſhadow at ſome diſtance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The ſun was hotteſt to him when the balloon was ſtationary. The diſcharge of a cannon when the balloon was at a conſiderable height, was diſtinctly heard by the aeronaut; and a diſcharge from the ſame piece, when at the height of 30 yards, ſo diſturbed him as to oblige him for ſafety to lay hold firmly of the cords of the balloon. At a conſiderable height he poured down a pint-bottle full of water; and as the air did not oppoſe a reſiſtance ſufficient to break the ſteam into ſmall drops, it moſtly fell down in large drops. In the courſe of the balloon's track it was found much affected by the water, a circumſtance obſerved in former aerial voyages. At one time the direction of the balloon kept continually over the water, going directly towards the ſea, ſo much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes deſcended into an under current blowing from the ſea: he kept deſcending, and landed at Bellair farm in Rinſley, 12 miles from Cheſter. Here he lightened his car by 31 pounds, and inſtantly re-aſcending, was carried into the interior part of the country, performing a number of different manœuvres. At his greateſt altitude he found his reſpiration free and eaſy. Several bladders which he had along with him crackled and expanded very conſiderably. Clouds and land, as before, appeared on the ſame level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being cloſe; and remarked, that the eſcape of the gas was attended with a growling noiſe like mill-ſtones, but not near ſo loud. Again, round the ſhadow of the balloon, on the clouds, he obſerved the iris. A variety of other circumſtances and appearances he met with is fancifully deſcribed; and at 53 minutes paſt three he finally landed.

The frequency of aerial voyages, accompanied with particular details of trifling and unintereſting circumſtances, and apparently made with a view to promote the intereſt of particular perſons, regardleſs of any advancement in knowledge, have now ſunk the ſcience of aeroſtation ſo low in the opinion of moſt people, that before giving any account of the moſt proper method of conſtructing theſe machines, it may ſeem neceſſary to premiſe ſomething concerning the uſes to which they may poſſibly be applied. Theſe, according to Mr. Cavallo, are the following:

" The ſmall balloons, eſpecially thoſe made of paper, and raiſed by means of ſpirit of wine, may ſerve to explore the direction of the winds in the upper regions of the atmoſphere, particularly when there is a calm below: they may ſerve for ſignals in various circumſtances, in which no other means can be uſed; and letters or other ſmall things may be eaſily ſent by them, as for inſtance from ſhips that cannot ſafely land on account of ſtorms, from beſieged places, iſlands, or the like. The larger aeroſtatic machines may anſwer all the abovementioned purpoſes in a better manner; and they may, beſides, be uſed as a help to a perſon who wants to aſcend a mountain, a precipice, or to croſs a river; and perhaps one of thoſe machines tied to a boat by a long rope, may be, in ſome caſes, a better ſort of ſail than any that is uſed at preſent. The largeſt ſort of machines, which can take up one or more men, may evidently be ſubſervient to various œconomical and philoſophical purpoſes. Their conveying people from place to place with great ſwiftneſs, and without trouble, may be of eſſential uſe, even if the art of guiding them in a direction different from that of the wind ſhould never be diſcovered. By means of thoſe machines the ſhape of certain ſeas and lands may be better aſcertained; men may aſcend to the tops of mountains they never viſited before; they may be carried over marſhy and dangerous grounds; they may by that means come out of a beſieged place, or an iſland; and they may, in hot climates, aſcend to a cold region of the atmoſphere, either to refreſh themſelves, or to obſerve the ice, which is never ſeen below; and, in ſhort, they may be thus taken to ſeveral places, to which human art hitherto knew of no conveyance.

" The philoſophical uſes, to which theſe machines may be ſubſervient, are numerous indeed; and it may be ſufficient to ſay, that hardly any thing which paſſes in the atmoſphere is known with preciſion, and that principally for want of a method of aſcending into it. The formation of rain, of thunder-ſtorms, of vapours, hail, ſnow, and meteors in general, require to be attentively examined and aſcertained. The action of the barometer, the refraction and temperature of the air in various regions, the deſcent of bodies, the propagation of ſound, &c. are ſubjects that all require a ſeries of obſervations and experiments, the performance of which could never have been properly expected before the diſcovery of aeroſtatic machines."

To thoſe uſes we may add the gratification of curioſity and pleaſure as very ſtrong inducements to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the ſmalleſt danger. Every one who has tried the experiment teſtifies, that the beauty of the proſpect afforded by an aſcent, or the pleaſure of being conveyed through the atmoſphere, cannot be exceeded. No one has felt the leaſt of that giddineſs conſequent upon looking from the top of a very high building or of a precipice, nor have they any of the ſickneſs ariſing from the motion of a veſſel at ſea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the leaſt inconvenience, or even agitation of the wind; the reaſon of which is, that as the machine moves with nearly the velocity of the wind itſelf, they are always in a calm, and without uneaſineſs. Some have apprehended danger from the electricity of the atmoſphere; and have thought that a ſtroke of lightning, or the ſmalleſt electric ſpark, happening near a balloon, might ſet fire to the inflammable air, and deſtroy both the machine and the adventurers. Mr. Cavallo has ſuggeſted ſeveral conſiderations for diminiſhing apprehenſions of this kind. Balloons have been already raiſed in every ſeaſon of the year, and even when thunder has been heard, without injury. In caſe of danger, the aeronauts may either deſcend to the earth, or aſcend above the region of the clouds and thunder-ſtorms. Beſides, as balloons are formed of materials that are not conductors of electricity, they are not likely to receive ſtrokes, eſpecially as by being encompaſſed with air they ſtand inſulated. Moreover, inflammable air by itſelf, or unmixed with a certain quantity of common air, will not burn; ſo that if an electric ſpark ſhould happen to paſs through the balloon, it would not ſet fire to the inflammable air, unleſs a hole was made in the covering.

The general principles of aeroſtation are ſo little different from thoſe of hydroſtatics, that it may ſeem ſuperfluous to inſiſt much upon them. It is a fact univerſally known, that when a body is immerſed in any fluid, if its weight be leſs than an equal bulk of that fluid, it will riſe to the ſurface; but if heavier, it will ſink; and if equal, it will remain in the place where it is left. For this reaſon ſmoak aſcends into the atmoſphere, and heated air in that which is colder. The aſcent of the latter is ſhown in a very eaſy and ſatisfactory manner by bringing a red-hot iron under one of the ſcales of a balance, by which the latter is inſtantly made to aſcend; for, as ſoon as the red-hot iron is brought under the ſcale, the hot air being lighter than that which is colder, aſcends, and ſtrikes the bottom, which is thus impelled upwards, and the oppoſite ſcale deſcends, as if a weight had been put into it.

Upon this ſimple principle depends the whole theory of areoſtation; for it is the ſame thing whether we render the air lighter by introducing a quantity of heat into it, or incloſing a quantity of gas ſpecifically lighter than the common atmoſphere in a certain ſpace; both will aſcend, and for the ſame reaſon. A cubic foot of air, by the moſt accurate experiments, has been found to weigh about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometor, about one part in 500 of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we will juſt double its bulk when the thermometer ſtands at 54 in the open air, and in the ſame proportion we will diminiſh its weight; and if ſuch a quantity of this hot air be incloſed in a bag, that the exceſs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will riſe into the atmoſphere, and continue to do ſo until they arrive at a place where the external air is naturally ſo much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raiſing weights, or rather that by which it is itſelf impelled upwards, may be ſhown in the following manner: Roll up a ſheet of paper in a conical form, and, by thruſting a pin into it near the apex, prevent it from unrolling. Faſten it then, by its apex, under one of the ſcales of a balance by means of a thread, and, having properly counterpoiſed it by weights, put it into the oppoſite ſcale; apply the flame of a candle underneath, you will inſtantly perceive the cone to ariſe, and it will not be brought into equilibrium with the other, but by a much greater weight than thoſe who have never ſeen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we ſhall find that the power of the heat depends much more on the capacity of the bag which contains it than could well be ſuppoſed. Thus, let a cubical receptacle be made of a ſmall wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raiſed; but a much greater one will be raiſed by having a receptacle of the ſame kind which contains two cubic feet; a ſtill greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very ſame candle be made uſe of; nor is it known to what extent even the power of this ſmall flame might be carried.

From theſe experiments it appears, that in the aeroſtatic machines conſtructed on Montgolfier's plan, it muſt be an advantage to have them as large as poſſible; becauſe a ſmaller quantity of fire will then have a greater effect in raiſing them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great meaſure avoided. On this ſubject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increaſe much more rapidly than their ſurfaces, there muſt ultimately be a degree of magnitude at which the ſmalleſt imaginable heat would raiſe any weight whatever. Thus, ſuppoſing any aeroſtatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmoſphere; the tendency of this machine to riſe, even without the application of artificial heat, would be near an ounce. Let its capacity be increaſed 16 times; and the tendency to ariſe will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aeroſtatic machines have a tendency to produce or preſerve heat within them, which would by no means be imagined by thoſe who have not made the experiment. When Meſſrs. Charles and Roberts made their longeſt aerial voyage of 150 miles, they had the curioſity to try the temperature of the air within their balloon, in compariſon with that of the external atmoſphere; and at this time they found that, when the external atmoſphere was 63°, the thermometer within the balloon ſtood at 104°. Such a difference of temperature muſt have given a machine of the magnitude which carried them a conſiderable aſcending power, independent of any other cauſe, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000 ſuch feet would have been almoſt 200 pounds. Hence we may eaſily account for what happened at Dijon, and is recorded by M. Morveau. "A balloon, intended to be filled with inflammable air, being completed, was, by way of trial, filled with common air, and in that ſtate expoſed to the atmoſphere. Now it was obſerved, and indeed a ſimilar obſervation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former ſtood at 120°; whereas in the latter, even when the ſun ſhone upon it, the thermometer ſtood at 84°. This ſhowed a conſiderable degree of rarefaction within the balloon; and conſequently it was ſuſpected, that, by means of this rarefaction alone, eſpecially if it were to increaſe a little, the balloon might aſcend. On the 30th of May, about noon, the wind being rather ſtrong, agitated the balloon ſo that two men were employed to take care of it; but, notwithſtanding all their endeavours, it eſcaped from its confinement, and, lifting up about 65 pounds weight of cords, equatorial circle, &c. roſe many feet high, and paſſing over ſome houſes, went to the diſtance of 250 yards, where at length it was properly ſecured.

This difference between the external and internal heat being ſo very conſiderable, muſt have a great influence upon aeroſtatic machines, and will undoubtedly influence thoſe filled with inflammable air as well as the other kind. Nor is it unlikely, that the ſhort time which many aerial voyagers have been able to continue in the atmoſphere, may have been owing to the want of a method of preſerving this internal heat. It may naturally be ſuppoſed, and indeed it has always been found, that balloons, in paſſing through the higher regions of the atmoſphere, acquire a very conſiderable quantity of moiſture, not only from the rain or ſnow they ſometimes meet with, but even from the dew and vapour which condenſes upon them. On this an evaporation will inſtantly take place; and, as it is the property of this operation to produce a very violent cold, the internal heat of the balloon muſt be ſoon exhauſted in ſuch a manner as to make it become ſpecifically heavier than the common atmoſphere, and conſequently deſcend in a much ſhorter time than it would have done by the mere loſs of air. To this, in all probability, we are to aſcribe the deſcent of the balloon which carried Meſſrs. Blanchard and Jeffries; and which ſeemed ſo extraordinary to many people, that they were obliged to have recourſe to an imaginary attraction in the waters of the ocean in order to ſolve the phenomenon. This ſuppoſition is rejected by Mr. Cavallo; who explains the matter, by remarking, that in two former voyages made with the ſame machine, it could not long ſupport two men in the atmoſphere; ſo that we had no occaſion to wonder at its weakneſs on this occaſion. "As for its riſing higher, ſays he, juſt when it got over the land, that may be eaſily accounted for. In the firſt place, the two travellers threw out their clothes juſt about that time; ſecondly, in conſequence of the wind's then increaſing, the balloon travelled at a much greater rate than it had done whilſt over the ſea; which increaſe of velocity leſſened its tendency to deſcend: beſides which, the viciſſitudes of heat and cold may produce a very conſiderable effect; for if we ſuppoſe, that the air over the land was colder than that over the ſea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for ſome time after; and conſequently it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the ſea; hence it floated eaſier in the former than in the latter caſe."

It ſeems indeed very probable, that there was ſomething uncommon in the caſe of Mr. Blanchard's balloon while paſſing over the ſea; for, as it roſe higher after reaching the land than in any former period of the voyage, and likewiſe carried them to the diſtance over land more than half of that which they had paſſed over water, we can ſcarce avoid ſuppoſing, that it had a tendency to deſcend when over the water more than when over land, independent of any loſs of air. Now, it does not appear that the air over the ſea is at all warmer than that above land; on the contrary, there is every reaſon to believe, that the ſuperior reflective power of the land renders the atmoſphere above it warmer than the ſea can do; but it is very natural to ſuppoſe, that the air above the ſea is more moiſt than that above land; and conſequently, by letting fall its moiſture upon the balloon, muſt have occaſioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmoſphere over land.

I ſhall now proceed to the conſtruction of aeroſtatic machines; of which the ſmaller are only for amuſement, or ſome ſlight experiments, and are very eaſily made. As in all of them, however, it is of the utmoſt conſequence to have the weight as little as poſſible, the ſhape becomes an object of great conſideration.

For this purpoſe a ſpherical figure has been mathematically demonſtrated to be the beſt; as capable of containing a greater quantity under a ſmaller ſurface than any other. Thus a perfect ſphere contains leſs ſurface in proportion to its ſolidity than a ſpheroid; a ſpheroid leſs than a cylinder; the latter leſs than a cube; and a cube ſtill leſs than a parallelopiped.

In all caſes, therefore, where we can fill the whole capacity of the balloon with air equally light, the ſpherical figure is undoubtedly to be preferred; and this holds good with regard to all inflammable air-balloons, whether their ſize be great or ſmall; but in the rarefied air ones, where the under part muſt neceſſarily be much colder than the upper, the globular ſhape ſeems not ſo proper. An inverted cone, or truncated pyramid, with the ſmaller part undermoſt, ſeems then to be moſt proper, as it allows the heated air, which has a great tendency to expand as well as to aſcend, to collect in the wide part at the top, while the uſeleſs ſurface in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aſide. In fact it has been found, that aeroſtatic machines, raiſed by means of rarefied air, when made of the ſhape of a parallelopiped, or even one deviating ſtill more from the ſhape of a globe, have anſwered the purpoſe as well as they could have been ſuppoſed to do, had ever ſo much care been taken in forming them exactly to that ſhape.

The very firſt machine made by M. Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, ſhowed a very conſiderable power of aſcent. A very large one, 74 feet high, which M. Montgolfier had deſigned to exhibit before the royal family, had the middle part of it priſmatic for about the height of 25 feet; its top was a pyramid of 29 feet; and its lower part was a tuncated cone of near 20 feet. It weighed 1000 pounds; and, notwithſtanding its ſhape, in a very ſhort time manifeſted a power of aſcent equal to 500 pounds.

Another aeroſtatic machine of a ſmall ſize, but of the figure of a parallelopiped, being ſuffered to aſcend with thirty ſheets of oiled paper fixed in a wire frame, and ſet on fire, roſe to a great height, and in 22 minutes could not be ſeen. It ſeems therefore, that, with regard to the ſhape of theſe machines, it is by no means neceſſary to adhere rigidly to that of a ſphere; but that any oblong form anſwers very well.

For experimental purpoſes, both the inflammable and rarefied air-balloons may be made of paper: the former being made of that kind called thin-poſt, varniſhed over with linſeed-oil; the latter either of that or any other kind, without varniſh. In order to avoid the danger of burning, however, it has been propoſed to impregnate the paper of which theſe ſmall rarefied air-balloons are made with ſolution of ſal-ammoniac, alum or ſome other ſalt; but this does not ſeem to be neceſſary. Thoſe filled with inflammable air have been made of gold-beater ſkin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

For aeroſtatic machines of a larger ſize, the material univerſally employed is varniſhed ſilk; and for thoſe of the rarefied air kind, linen painted over with ſome ſize colour, or lined with paper. The beſt varniſh for an inflammable air-balloon is that made with bird-lime, and recommended by M. Faujas de Saint-Fond, in a treatiſe publiſhed on the ſubject. The following is his method of preparing it: "Take one pound of bird-lime, put it into a new proper earthen pot that can reſiſt the fire, and let it boil gently for about one hour, viz. till it ceaſes to crackle; or, which is the ſame thing, till it is ſo far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of ſpirits of turpentine, ſtirring it at the ſame time with a wooden ſpatula, and keeping the pot at a good diſtance from the flame, leſt the vapour of this eſſential oil ſhould take fire. After this, let it boil about ſix minutes longer, then pour upon the whole three pounds of boiling oil of nuts, linſeed or poppy, rendered drying by means of lithrage; ſtir it well, let it boil for a quarter of an hour longer, and the varniſh is made. After it has reſted for 24 hours, and the ſediment has gone to the bottom, decant it into another pot; and when you want to uſe it, warm, and apply it with a flat bruſh upon the ſilk ſtuff, whilſt that is kept well ſtretched. One coat of it may be ſufficient; but if two are neceſſary, it will be proper to give one on each ſide of the ſilk, and to let them dry in the open air while the ſilk remains extended."

Mr. Cavallo gives the following method of preparing this varniſh, which he prefers to that of M. de Saint-Fond. "In order to render linſeed-oil drying, boil it with two ounces of ſaccharum ſaturni and three ounces of lithrage, for every pint of oil, till the oil has diſſolved them, which will be accompliſhed in half an hour; then put a pound of bird-lime and half a pint of the drying oil into a pot, iron or copper pots are the ſafeſt for this purpoſe; the capacity of which may be equal to about one gallon, and let it boil very gently over a charcoal fire till the birdlime ceaſes to crackle, which will be about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, ſtirring it very frequently with an iron or wooden ſpatula. As the varniſh, whilſt boiling, and eſpecially when it is nearly done, ſwells very much, care ſhould be had to remove, in thoſe caſes, the pot from the fire, and to replace it when the varniſh ſubſides, otherwiſe it will boil over. Whilſt the ſtuff is boiling, the operator ſhould, from time to time, examine whether the varniſh has boiled enough; which is thus known. Take ſome of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, ſeparate the knives; and when, on this ſeparation, the varniſh begins to form threads between the two, you may conclude that it is done; and, without loſing time, it muſt be removed from the fire. When it is almoſt, though not quite, cold, add about an equal quantity of ſpirit of terpentine; mix it well together, and let it reſt till the next day; when, having warmed it a little, ſtrain and bottle it. If it is too thick, add ſome more ſpirit of terpentine. When this varniſh is laid upon the ſilk, the ſtuff ſhould be made perfectly dry, and ſtretched; ſo that the varniſh, which ought to be uſed lukewarm, may fill up the pores of the ſtuff. The varniſh ſhould be laid once very thin upon one ſide of the ſtuff; and, about 12 hours after, two other coats ſhould be laid on, one on each ſide; and, 24 hours after, the ſilk may be uſed, though, in cold weather, it may be left to dry ſome time longer."

Much has been ſaid in France of their elaſtic gum-varniſh, and its compoſition kept a ſecret; but Mr. Baldwin, after many expenſive trials, declares to the world what he conſiders as the ſecret; and it is merely this: "Take any quantity of caoutchouc, as two ounces averdupois; cut it into ſmall bits with a pair of ſciſſars; put a ſtrong iron ladle, like that uſed by plumbers, over a common pitcoal or other fire. The fire muſt be gentle, glowing, and without ſmoke. When the ladle is hot, much below a red heat, put a ſingle bit into the ladle. If *black* ſmoke iſſues, it will preſently flame and diſappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is leſs hot, put in a ſecond bit, which will produce a *white* ſmoke. This *white* ſmoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be loſt; but little bits are to be put in, a few at a time, till the whole are melted. It ſhould be continually and gently ſtirred with an iron or braſs ſpoon. Two pounds or one quart of the beſt drying oil, or of raw linſeed-oil, which, together with a few drops of neats-foot oil, has ſtood a month, or not ſo long, on a lump of quick-lime, to make it more or leſs drying, is to be put into the melted caoutchouc, and ſtirred till hot, and the whole poured into a glazed veſſel, through a coarſe gauze or fine ſieve. When ſettled and clear, which will be in a few minutes, it will be fit for uſe either hot or cold." Mr. Baldwin is not at liberty, he obſerves, to publiſh the art of laying on the varniſh: but ſays, that it conſiſts in making no *inteſtine motion* in the varniſh, which would create minute bubbles; that therefore bruſhes are improper. M. Blanchard's method of making elaſtic-gum varniſh for the ſilk of a balloon, is the following: "Diſſolve elaſtic gum, caoutchouc, cut ſmall, in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying linſeed-oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm." The pieces of ſilk for the balloon muſt be cut out of a proper ſize, according to the dimenſions, after the varniſh is ſufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and ſewing them by a double ſtitching. M. Blanchard uſes expeditiouſly the following method. He lays about half an inch of the edge of one piece flat over the edge of the other, and paſſes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the ſilk. The joining may be rendered more ſecure by running it with a ſilk thread, and ſticking a ribband over it. The ribbands laid over ſeams may be ſtuck with common glue, provided the varniſh of the ſilk is properly dried. When the glue is quite dry, the ribbands ſhould be varniſhed over, to prevent their being unglued by the rain.

The beſt method of cutting the pieces of ſilk that are to form a balloon, is to deſcribe a pattern of wood or ſtiff card-paper, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect circles, they cannot be deſcribed by a pair of compaſſes: but the beſt method of drawing them is as follows: Firſt, draw, on a flat ſurface two right lines AE *fig.* 1. and BC, perpendicular to each other. Secondly, find the circumference anſwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, ſo that the whole length AE of the pattern may be equal to half the circumference. Thirdly, divide AD into 18 equal parts; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. Fourthly, divide the whole circumference in twice the given number of pieces, and make DC and BB each equal to the quotient of this diviſion; ſo that the whole, BC, is equal to the greateſt breadth of one of theſe pieces. Fifthly, multiply the above-mentioned quotient by the decimals annexed to *fg*, viz. 099619, and then the product expreſſes the length of *fg*; again multiply the ſame length of DE by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, having found the lengths of all theſe lines, draw by hand a curve-line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to that already found. Suppoſe, for example, that the diameter of the balloon to be conſtructed is 20 feet, and that it is required to make it of 12 pieces: then, in order to draw the pattern for thoſe pieces, find the circumference of the balloon, which is 62.83 feet, and, dividing it by four, the quotient is 15.7 feet; make therefore AD equal to 15.7 feet, and DE likewiſe of the ſame length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of DC and likewiſe of BD; ſo that BC is equal to 5.236 feet. Then, having divided the line AD into 18 equal parts, and having drawn the parallel lines from thoſe points of diviſion, find the length of each of thoſe lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618, multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and ſo of the reſt. In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

To the upper part of the balloon there ſhould be adapted, and well fitted in, a valve opening inwards; to which ſhould be faſtened a ſtring paſſing through a hole made in a ſmall piece of round wood fixed in the loweſt part of the balloon oppoſite to the valve, the end of this ſtring faſtened in the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from *fig.* 2. A round braſs plate AB has a round hole CD, about two or three inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather, which is to cloſe the hole CD; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall ſtring or other ſecurity ſhould be fixed to the ſhutter and the plate, ſo as not to admit the ſhutter to be opened beyond a certain ſafe diſtance. To the lower part of the balloon two pipes ſhould be fixed, made of the ſame ſtuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionably larger for balloons of a greater capacity. They muſt be long enough for the car. For balloons of 18 feet and leſs diameter, one neck or pipe will be ſufficient. Theſe pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is beſt made of wicker-work, covered with leather, and well painted or varniſhed over; and the proper method of ſuſpending it, is by ropes proceeding from the net which goes over the balloon. This net ſhould be formed to the ſhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes ſhould go to the edge of the boat. This circle may be made of wood, or of ſeveral pieces of ſlender cane bound together. The meſhes of the net may be ſmall at top, againſt which part of the balloon the inflammable air exerts the greateſt force; and increaſe in ſize as they recede from the top. A hoop has ſometimes been applied round the middle of the balloon to faſten the net. This, though not abſolutely neceſſary, is beſt made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr. Cavallo recommends firſt to ſoak the cloth in a ſolution of ſal-ammoniac

Representation of Various Baloons, with the methods of constructing and filling them, & the Implements neceſsary for accelarating or retarding their Motion. See System of Aerostation.

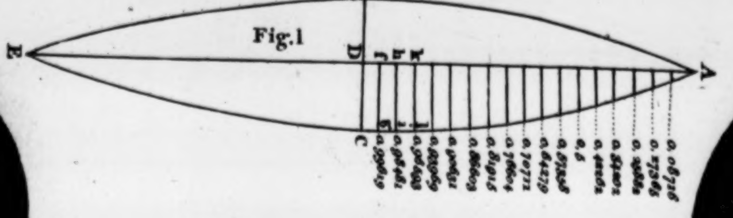


Fig.1
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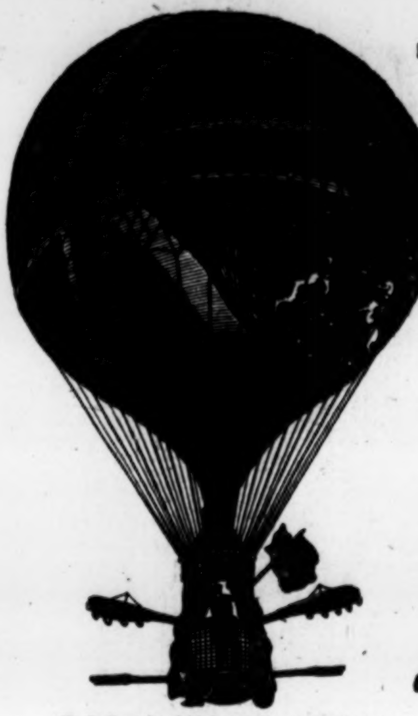
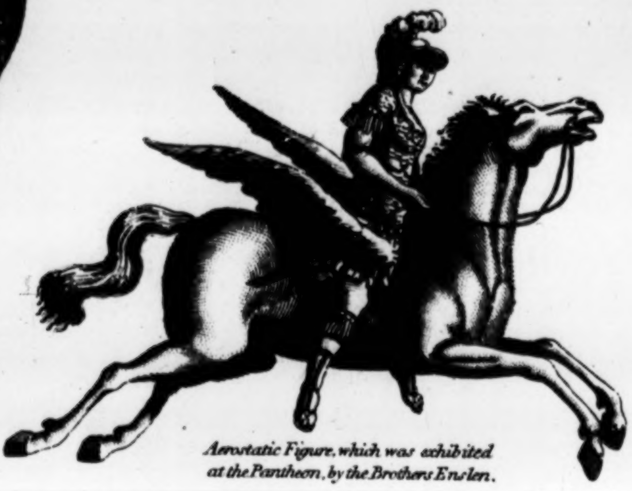

The Balloon in which Lunardi ascended a 2d time from the Artillery ground May 13th 1785.


Aerostatic Figure, which was exhibited at the Pantheon, by the Brothers Enslen.

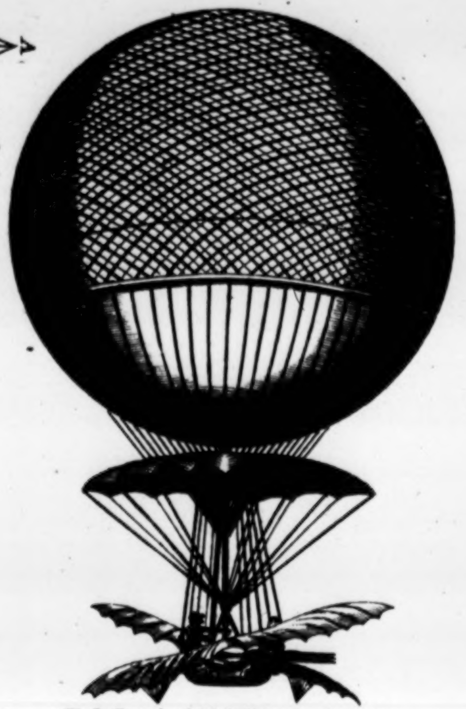
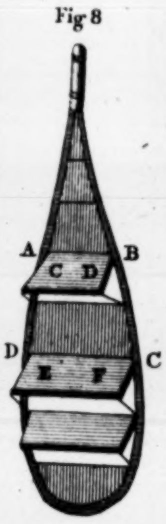

The Balloon in which Mr. Blanchard took his aerial flight from Dover to the Continent.

Fig 8



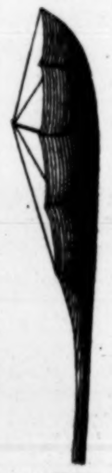


Fig.7

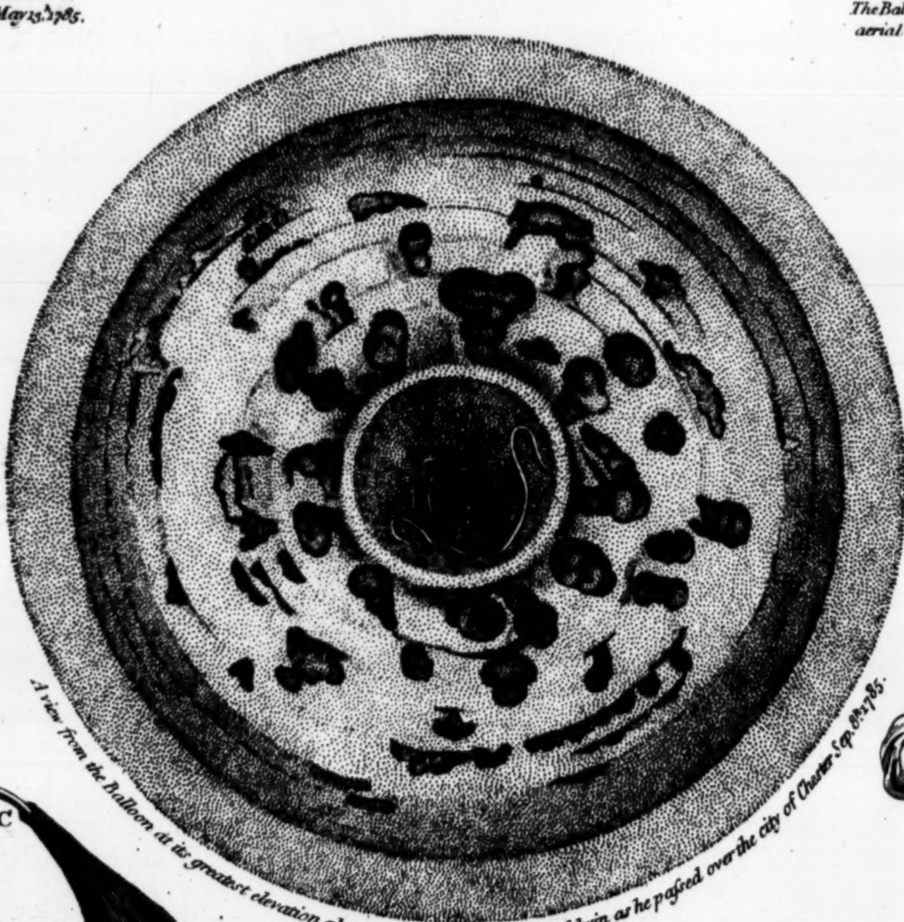
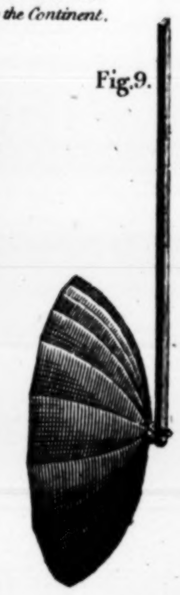

A view from the Balloon at its greatest elevation above the clouds, seen by Mr. Baldwin as he paſsed over the city of Chester Sep. 8th 1785.

Fig:10

Fig.9.



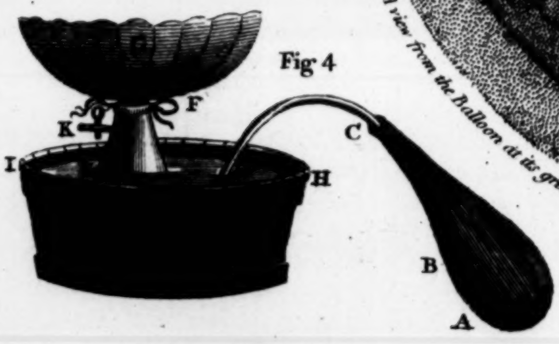


Fig 4
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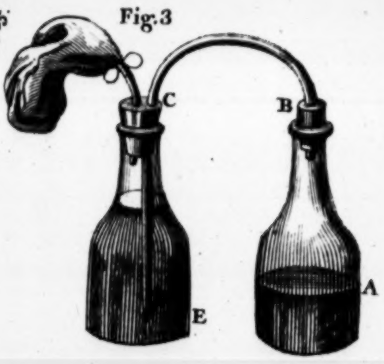

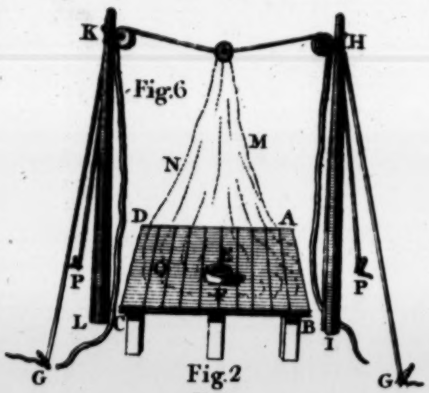
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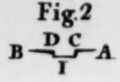
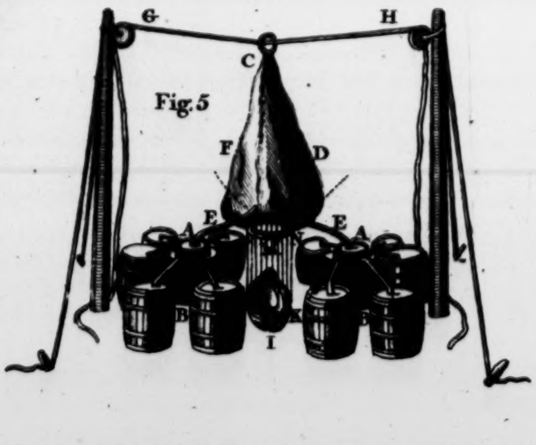
Fig.2

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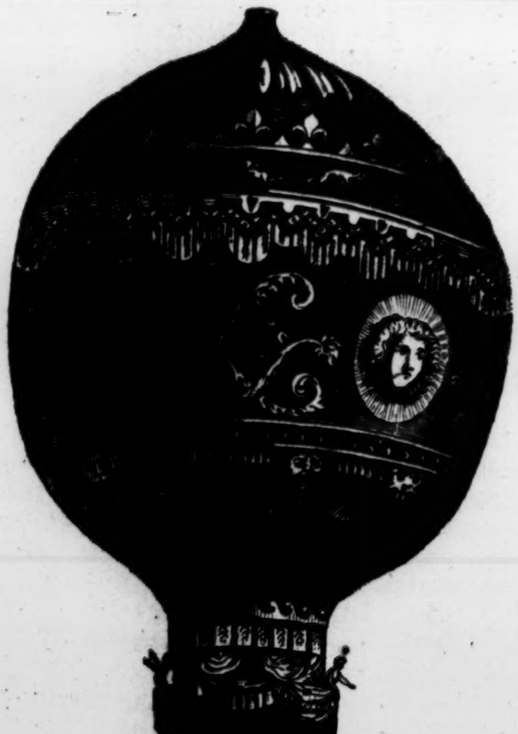
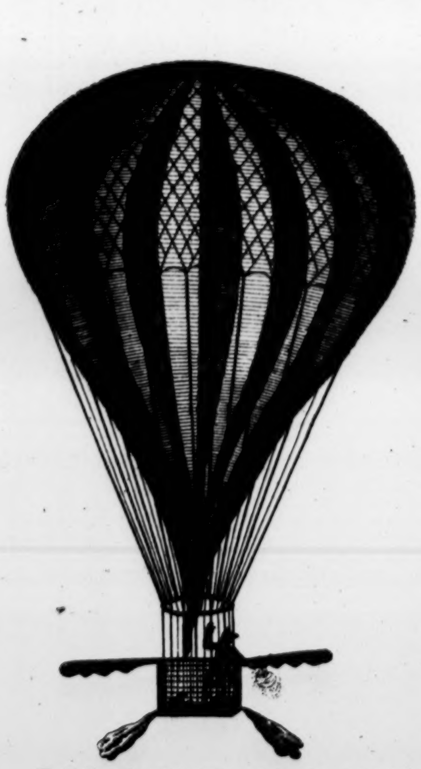

The Fire Balloon in which M. Montgolpher ascended from ſ Faubourg St. Antoine in France.


The Balloon in which M. Lunardi first aſcended from the Artillery ground September 15th 1784.

Published as the Act directs by C. Cooke No. 17 Paternoster Row Feby 5th 1790.

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and common ſize, uſing one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inſide with ſome earthy colour, and ſtrong ſize or glue. When this paint has dried perfectly, it will then be proper to varniſh it with oily varniſh, which might dry before it could penetrate quite through the cloth. Simple drying linſeed oil will anſwer the purpoſe as well as any, provided it be not very fluid.

It now only remains to give ſome account of the method by which aeroſtatic machines may be filled with their proper gas, in order to give them their power of aſcending into the atmoſphere; and here we are enabled to determine with much greater preciſion concerning the inflammable-air balloons than the others. With regard to them, a primary conſideration is, the moſt proper method of procuring the inflammable air. But the moſt advantageous methods are, by applying acids to certain metals; by expoſing animal, vegetable, and ſome mineral ſubſtances, in a cloſe veſſel to a ſtrong fire; or by tranſmitting the vapour of certain fluids through red-hot tubes.

1. In the firſt of theſe methods, iron, zinc, and vitriolic acid, are the materials moſt generally uſed. The vitriolic acid muſt be diluted by five or ſix parts of water. Iron may be expected to yield in the common way 1700 times it own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{2}$ ounces of iron, the like weight of oil of vitriol, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of oil of vitriol, and 30 ounces of water, are neceſſary for producing the ſame quantity of gas. It is more proper to uſe the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, becauſe the heat attending the effervеſcence will be diminiſhed; and the diluted acid will paſs more readily through the interſtices of the turnings when they are heaped together, than through the filings, which ſtick cloſer to one another. The weight of the inflammable air thus obtained by means of acid of vitriol, is, in the common way of procuring it, generally one ſeventh part of the weight of common air; but with the neceſſary precautions for philoſophical experiments, leſs than one-tenth of the weight of common air. Two other ſorts of elaſtic fluids are ſometimes generated with the inflammable air. Theſe may be ſeparated from it by paſſing the inflammable air through water in which quicklime has been diſſolved. The water will abſorb theſe fluids, cool the inflammable air, and prevent its over heating the balloon when introduced into it.

Fig. 3. repreſents an apparatus deſcribed by Mr. Cavallo as proper for filling balloons of the ſize of two or three feet in diameter with inflammable air, after paſſing it through water. A is the bottle with the ingredients; BCD a tube faſtened in the neck at B, and paſſing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will paſs firſt through the water of the bottle E and then into the balloon. Two ſmall caſks may be uſed inſtead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various ſubſtances; but the gas which theſe yield is not ſo light as that produced by the effervеſcence of acids and metals. The ſubſtances proper to be uſed in this way are, pit-coal, aſphaltum, amber, rock-oil, and other minerals; wood, and eſpecially oak, camphor-oil, ſpirits of wine, ether, and animal ſubſtances, which yield air in different degrees, and of various ſpecific gravities: but pit-coal is the preferable ſubſtance. A pound of this expoſed to a red heat, yields about three cubic feet of inflammable air, which, whether it be paſſed through water or not, weighs about one-fourth of the weight of common air. Dr. Prieſtley found, as we have elſewhere noticed, that animal or vegetable ſubſtances will yield ſix or ſeven times more inflammable air when the fire is ſuddenly increaſed than when it is gently raiſed, though it be afterwards made very ſtrong. Mr. Cavallo obſerves, that the various ſubſtances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to incloſe the ſubſtances in iron or earthen veſſels, and thus expoſe them to a ſtrong fire ſufficient to make the veſſels red-hot: the inflammable air proceeding from the aperture of the veſſel is received into a tube or refrigeratory, and, paſſing through the tube or worm, is at laſt collected in a balloon or other veſſel. A gun-barrel has often been uſed for eſſays of this kind. The ſubſtance is put into it ſo as to fill ſix or eight inches of its loweſt part, the remainder filled with dry ſand: a tube, adapted to the mouth of the barrel, is brought into a baſin of water under an inverted receiver; and the part of the barrel containing the ſubſtance being put into the fire and made red-hot, the inflammable air is collected in the inverted receiver. As the gun-barrel cannot ſerve for producing a large quantity of inflammable air, Mr. Cavallo recommends, as the moſt advantageous ſhape, the following contrivance: let the veſſel be made of clay, or rather of iron, in the ſhape of a Florence flaſk, ſomewhat larger, and whoſe neck is longer and larger (as ABC, *fig*. 4.) Put the ſubſtance to be uſed into this veſſel, ſo as to fill about four-fifths or leſs of its cavity AB. If the ſubſtance is of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel; and let the end D of the tube be ſhaped as in the figure, ſo that going into the water of a tube HI, it may terminate under a ſort of inverted veſſel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the veſſel is put into the fire, and made red-hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop-cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop-cock. The dimenſions of ſuch an apparatus Mr. Cavallo gives thus: Diameter of largeſt part of the veſſel ABC ſeven inches, length of whole veſſel 16 inches; diameter of its aperture one inch, diameter of the cavity of tube CD three-fourths of an inch; lower aperture of the veſſel EF ſix inches, leaſt height of the veſſel EF 24 inches; its aperture F about two inches. The aperture of the veſſel EF ſhould be at leaſt one foot below the ſurface of the water in HI. Care muſt be taken that the fire uſed in this proceſs be at a ſufficient diſtance, otherwiſe it may happen to fire the inflammable air which may eſcape out of the veſſel EF.

3. The laſt method of obtaining inflammable air was lately diſcovered by Mr. Lavoiſier, and alſo by Dr. Prieſtley. Mr. Lavoiſier made the ſteam of boiling water paſs through the barrel of a gun, kept red-hot by burning coals. Dr. Prieſtley uſes, inſtead of the gum-barrel, a tube of red-hot braſs, upon which the ſteam of water has no effect, and which he fills with the pieces of iron which are ſeparated in the boring of cannon. By this method he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube, about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or a cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler ſufficient to make the water boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one half more air by this means than by the action of vitriolic acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can, with any certainty of ſucceſs, be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings.

It has indeed been recommended to uſe zinc inſtead of iron filings, becauſe white vitriol, the ſalt produced by the union of the vitriolic acid and zinc, is much more valuable than the green ſort produced by the union of the ſame acid with iron. But though this is undoubtedly the caſe, it will as certainly be found, upon trial, that the ſuperior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol. For a balloon of 30 feet diameter, Mr. Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metal, and too little with reſpect to the water. Oil of vitriol will not exert its power upon iron unleſs it be diluted with five or ſix times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve. Mr. Lunardi, who from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow with about 2000 pounds of iron, as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them, in order to increaſe the ſurface. His apparatus was not materially different from that of Mr. Cavallo, repreſented by *fig*. 5. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about ſeven inches in diameter, and ſeven or eight long. To theſe tubes the ſilken ones of the balloon are to be tied. Round each of the tubs B, five, ſix, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by CDF; and having expelled all the common air from it, let the ſilken tubes be faſtened round the tin ones EE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled, the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the boat IK being placed between the two ſets of caſks, is faſtened to the hoop MN;

and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it. At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Laſtly, the aeronauts being ſeated in the boat, the lateral ropes are ſlipped off, and the machine is abandoned to the air. This apparatus was at laſt reduced by Mr. Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through water. Thus his balloon was filled in leſs than half an hour, when, before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

With regard to the rarefied-air balloons, the method of filling them is as follows: A ſcaffold ABCD, *fig.* 6. the breadth of which is at leaſt two-thirds of the diameter of the machine, is elevated about ſix or eight feet above the ground. From the middle of it deſcends a well E, riſing about two or three feet above it, and reaching to the ground, furniſhed with a door or two, through which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick or of plaſtered wood, and its diameter ſhould be ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts HI, KL, each of which has a pulley at the top, and rendered firm by means of ropes KG, KP, HP, HG. The machine to be filled is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pullies of the two maſts, ſerves, by pulling its two ends, to lift the balloon about 15 feet or more above the ſcaffold; and the reſt of the machine is repreſented by the dotted lines in the figure MNO. The machine is kept ſteady, and held down, whilſt filling, by ropes paſſing through loops or holes about its equator; and theſe ropes may eaſily be diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and not ſmoke, that is required to be introduced into the machine. Small wood and ſtraw have been found to be very fit for this purpoſe. Mr. Cavallo obſerves, as the reſult of many experiments with ſmall machines, that ſpirits of wine are upon the whole the beſt combuſtible; but its price may prevent its being uſed for large machines. As the current of hot air aſcends, the machine will ſoon dilate, and lift itſelf above the ſcaffold and gallery which was covered by it. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, its aperture muſt be brought, by means of the ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fire-place is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off, the machine is abandoned to the air. It has been determined by accurate experiments, that only one-third of the common air can be expelled from theſe large machines; and therefore the aſcending power of the rarefied air in them can be eſtimated as only equal to half an ounce averdupoiſe for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed for elevating or lowering the balloons with rarefied air, has been the increaſe or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been generally raiſed or lowered by diminiſhing the weight in the boat, or by letting out ſome of the gas through the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating; for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the incloſed air, occaſioned by heat and cold. It has been propoſed to aid a balloon in its alternate motion of aſcent and deſcent, by annexing to it a veſſel of common air, which might be condenſed for lowering the machine, and rarefied again, by expelling part of it, for raiſing the machine: but a veſſel adapted to this purpoſe muſt be very ſtrong; and, after all, the aſſiſtance afforded by it would not be very conſiderable. M. Meunier, in order to attain this end, propoſes to incloſe one balloon filled with common air in another filled with inflammable air: as the balloon aſcends, the inflammable air is dilated, and of courſe compreſſes the internal balloon containing the common air; and by diminiſhing its quantity, leſſens its weight. If it ſhould be neceſſary to ſupply this loſs, he ſays it may be eaſily done by a pair of bellows fixed in the gallery. Others have propoſed to annex a ſmall machine with rarefied air to an inflammable-air balloon by ropes, at ſuch a diſtance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raiſed or lowered by merely increaſing or diminiſhing the fire in the lower balloon.

Wings or oars are the only means of this ſort that have been uſed with ſome ſucceſs; and, as Mr. Cavallo obſerves, they ſeem to be capable of conſiderable improvement. Although great effects are not to be expected from them, when the machine goes at a great rate, the beſt methods of moving thoſe wings are by the human ſtrength applied ſimilarly to the oars of a waterman. They may be made in general of ſilk ſtretched between wires, tubes, or ſticks; and when uſed, muſt be turned edgewiſe when they are removed in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. *Fig.* 7. is the repreſentation of one of M. Blanchard's wings. *Fig.* 8. is one of thoſe by M. Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC, opens upon the line AB, DECF opens upon the line DC, &c. In conſequence of this conſtruction, this ſort of oars do not need being turned edgewiſe. *Fig.* 9. repreſents one of the wings uſed by the brothers Roberts in the aerial voyage of the 19th September 1784; and *fig.* 10. repreſents one of the wings conſtructed by Count Zambeccari, which conſiſts of a piece of ſilk ſtretched between two tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe by themſelves when they go on one direction. Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect power upon them as upon a ſhip. It appears, however, that they can have no effect when a machine is only moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it floats ſtands ſtill whilſt the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe contrivances.

ÆRUGINOUS, an epithet given to ſuch things as reſemble or partake of the nature of the ruſt of copper.

ÆRUGINOUS, in ornithology, the trivial name of a ſpecies of the falco.

ÆRUGO, in natural hiſtory, properly ſignifies the ruſt of copper, whether natural or artificial. The former is found about copper mines, and the latter, called verdegris, made by corroding copper-plates with acids.

ÆRUSCATORES, in antiquity, a kind of ſtrolling beggars, not unlike gypſies, who drew money from the credulous by fortune-telling, &c. It was alſo a denomination given to griping exactors, or collectors of the revenue. The Galli, or prieſts of Cybele, were called *æruſcatores magnæ matris*; and μητραγυρται, on account of their being or collecting alms in the ſtreets; to which end they had little bells whereby to draw peoples attention to them, much like ſome orders of mendicants abroad.

AERY, or **AIRY**, among ſportſmen, the neſts or brooding places of birds.

ÆS properly ſignifies copper or money coined of that metal.

ÆS UXORIUM, in antiquity, a ſum paid by bachelors, as a penalty for living ſingle to old age. This tax for not marrying ſeems to have been firſt impoſed in the year of Rome 350, under the cenſorſhip of M. Furius Camillus and M. Poſthumus. At the cenſus, or review of the people, each perſon was aſked, *Et tu ex anima ſententia uxorem habes liberum quærendorum cauſa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium.*

ÆS *per et libram* was a formula in the Roman law, whereby purchaſes and ſales are ratified. Originally the phraſe ſeems to have been only uſed in ſpeaking of things ſold by weight, or by the ſcales; but it afterwards was uſed on other occaſions. Hence even in adoptions, as there was a kind of imaginary purchaſe; the formula whereof expreſſed, that the perſon adopted was bought *per æs et libram.*

ÆS *Flavum*, yellow copper, among the Romans, an appellation given to the coarſer kinds of braſs.

ÆS *Caldarium*, a term uſed by the German mineraliſts, for a ſubſtance which ſometimes occurs to thoſe who work upon cobalt, and is uſed for the making the fine blue colour called ſmalt.

ÆS *Uſtum*, a chemical preparation, made of thin leaves of copper, ſulphur, and nitre, placed ſtratum ſuper ſtratum in a crucible and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder. Some quench the leaves of copper in vinegar, and repeat the calcination. Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as a deterſive, and ſome have given it internally; but it is certainly a very dangerous medicine, and ſhould be avoided.

ÆSALON, in zoology, the name of a ſpecies of the hawk of the long winged kind, called by Engliſh writers the merlin. It is the ſmalleſt of the hawk kind, and formerly much uſed in the diverſion of hawking.

ÆSCH, in zoology, a name by which ſome have called the grayling, or tumbler, a fiſh of the truttaceous kind.

ÆSCHNA, in natural hiſtory, the name of a ſpecies of water-fly, of an aſh colour, with four wings and a long body, hairy near the tail.

ÆSCHYNOMENE, **BASTARD SENSITIVE-PLANT**: A genus of the decandria order, belonging to the diadelphia claſs of plants. For the characters, ſee Syſtem of Botany.

Of this genus there are reckoned ſix ſpecies, 1. The Aſpera. 2. The Americana, 3. The Arborea. 4. The Seſban. 5. The Pumila. 6. The Grandiflora. Theſe plants are propagated by ſeeds, which ſhould be ſown yearly in the ſpring, on a hot bed; and when the plants have ſtrength enough to be removed, they ſhould each be put into a ſeparate pot filled with light earth, and plunged into a hot-bed.

ÆSCHYNOMENOUS, plants among botaniſts, are thoſe properly called ſenſitive plants.

ÆSCULAPII Anguis, an harmleſs ſort of ſnake found in Spain and Italy.

ÆSCULAPIUS, in Heathen mythology, the god of phyſic, was the ſon of Apollo and the nymph Coronis. Alſo the antient name for the conſtellation Ophiucus.

ÆSCULUS, the Horse-chesnut: A genus of the monogynia order, belonging to the heptandria claſs of plants; and ranking, in the natural method, under the 39th order, Trihilatæ. For the characters, ſee Syſtem of Botany.

There are two ſpecies of this plant. 1. The hippocaſtanum, or common horſe-cheſnut. It was brought from the northern parts of Aſia about the year 1550. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine ſpikes of flowers ſpotted with roſe colours, ſo that the whole tree ſeems covered with them.

2. The pavia, or ſcarlet-flowering horſe-cheſnut, a native of Carolina, the Braſils, and the Eaſt. The firſt ſpecies is propagated from the nuts. In autumn, therefore, when they fall, a ſufficient quantity ſhould be gathered. Theſe ſhould be ſown ſoon afterwards in drills, about two inches aſunder. The ſecond ſpecies is propagated by budding it upon the young plants of the horſe-cheſnut.

ÆSNECY, in law, priority of age among copartners.

ÆSPING, in zoology, a ſpecies of coluber.

ÆSTPHARA, incineration or burning of the fleſh, or any part of the body.

ÆSTIMATIO capitis, a term met with in old law-books for a fine anciently ordained to be paid for offences committed againſt perſons of quality, according to their ſeveral degrees.

ÆSTIVAL, in a general ſenſe, denotes ſomething connected with, or belonging to, ſummer. Hence æſtival ſign, æſtival ſolſtice, &c.

ÆSTRUS, a ſpecies of the beetle.

ÆSTUARIA, in geography, denotes an arm of the ſea, which runs a good way within land. Such is the Briſtol channel, and many of the friths of Scotland.

ÆSTUARIES, in ancient baths, were ſecret paſſages from the hypocauſtum into the chambers.

ÆSTUARY, among phyſicians, a vapour-bath, or any other inſtrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by Æſymnus the Megarean. He conſulting the oracle in what manner the Megareans might be moſt happily governed, anſwered, "If they held conſultation with the more numerous:" whom he taking for the dead, built the ſaid monument, and a ſenate-houſe that took within its compaſs the monument: imagining, that thus the dead would aſſiſt at their conſultations.

ÆSYMNETIC *Monarchy*, implies an elective government, the ſame as Germany, Poland, &c.

ÆTATE *Probando*, in law, a writ to enquire the ages of the king's tenants; now diſuſed. Vide Stat. Car. 2. Reg. Orig. 294.

ÆTHALE, ſignifies the ſoot of metallurgic furnaces.

ÆTHER, is uſually underſtood of a thin, ſubtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmoſphere, poſſeſſes the whole heavenly ſpace. The philoſophers cannot conceive that the largeſt part of the creation ſhould be perfectly void; and therefore they fill it with a ſpecies of matter under the denomination of æther. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *ſui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmoſphere. Others ſuppoſe it of ſo ſubtile and penetrating a nature, as to pervade the air, and other bodies, and poſſeſs the pores and other intervals thereof. Others deny the exiſtence of any ſuch ſpecific matter; and think the air itſelf, by that immenſe tenuity and expanſion it is found capable of, may diffuſe itſelf through the interſtellar ſpaces, and be the only matter found therein.

In effect, æther, being no object of our ſenſe, but the mere work of imagination, brought only upon the ſtage for the ſake of hypotheſis, or to ſolve ſome phenomenon, real or imaginary; authors take the liberty to modify it how they pleaſe. Some ſuppoſe it of an elementary nature, like other bodies; and only diſtinguiſhed by its tenuity, and the other affections conſequent thereon: which is the philoſophical æther. Others will have it of another ſpecies, and not elementary; but rather a ſort of fifth element, of a purer, more refined, and ſpirituous nature, than the ſubſtances about our earth; and void of the common affections thereof, as gravity, &c. The heavenly ſpaces being the ſuppoſed region or reſidence of a more exalted claſs of beings, the medium muſt be more exalted in proportion. Such is the ancient and popular idea of æther, or ætherial matter.

The term æther being thus embarraſſed with a variety of ideas, and arbitrarily applied to ſo many different things, the later and ſeverer philoſophers chooſe to ſet it aſide, and in lieu thereof ſubſtitute other more determinate ones. Thus the Carteſians uſe the term *materia ſubtilis*; which is their æther: and Sir Iſaac Newton, ſometime a *ſubtile ſpirit*, as in the cloſe of his *Principia*; and ſometimes a *ſubtile* or *ætherial medium*, as in his *Optics*.

The truth is, there are abundance of conſiderations, which ſeem to evince the exiſtence of ſome matter in the air, much finer than the air itſelf. There is an unknown ſomething, which remains behind when the air is taken away; as appears from certain effects which we ſee produced *in vacuo*. Heat, Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs; and may be very well concluded to permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace which anſwers to the full character of an æther. See Heat.

The exiſtence of ſuch an ætherial medium being ſettled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elaſtic and active: in virtue of which properties, he ſhows, that a great part of the phenomena of nature may be produced by it. To the weight, e. g. of this medium, he attributes gravitation, or the weight of all other bodies; and to its elaſticity, the elaſtic force of the air and of nervous fibres, and the emiſſion, refraction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, this ſame matter ſeems the *primum mobile*, the firſt ſource or ſpring of phyſical action in the modern ſyſtem.

The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an abſolute plenum in the univerſe.

But Sir Iſaac Newton overturns this opinion, from divers conſiderations; by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance: for, hence it follows, that the matter contained therein muſt be immenſely rare, in regard the reſiſtance of bodies is chiefly as their denſity; ſo that if the heavens were thus adequately filled with a medium or matter, how ſubtile ſoever, they would reſiſt the motion of the planets and comets much more than quickſilver or gold.

The late diſcoveries in electricity have thrown great light upon this ſubject, and rendered it extremely probable that the æther ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature.

Æther, in chemiſtry, the lighteſt, moſt volatile, and moſt inflammable of all liquids, is produced by diſtillation of acids with rectified ſpirit of wine.

ÆTHERIAL, Etherius, ſomething that belongs to, or partakes of, the nature of æther. Thus we ſay, the *ætherial ſpace*, *ætherial regions*, &c.

Some of the ancients divided the univerſe, with reſpect to the matter contained therein, into elementary and ætherial.

Under the ætherial world was included all that ſpace above the uppermoſt element, viz. fire. This they ſuppoſed to be perfectly homogeneous, incorruptible, unchangeable, &c. See Corruption. The Chaldees placed an ætherial world between the empyreum and the region of the fixed ſtars. Beſide which, they ſometimes alſo ſpeak of a ſecond ætherial world, meaning by it the ſtarry orb; and a third ætherial world, by which is meant the planetary region.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*, explained under thoſe heads.

ÆTHUSA, in botany, a genus of the pentandria digynia claſs; and, in the natural method, ranking under the 45th order, *Umbellatæ*. For its characters, ſee Syſtem of Botany. There is but one ſpecies, viz. the æthuſa ſynapium, fools-parſley, or leſſer hemlock, a native of Britain, which grows in corn-fields and gardens. This plant, from its reſemblance to common parſley, hath ſometimes been miſtaken for it; and when eaten, it occaſions ſickneſs. If the curled-leaved parſley only was cultivated in our gardens, no ſuch miſtakes would happen in future. Cows, horſes, ſheep, goats, and ſwine, eat it. It is noxious to geeſe.

AETIANS, in church-hiſtory, a branch of Arians who maintained, that the Son and Holy Ghoſt are in all things diſſimilar to the Father.

ÆTIOLOGY, is that part of pathology which is employed in exploring the cauſes of diſeaſes.

ÆTITES, or Eagle-stone, in natural hiſtory, a flinty or cruſtated ſtone, hollow within, and containing a nucleus, which, on ſhaking, rattles within. It was formerly in repute for ſeveral extraordinary magic as well as medical powers; ſuch as preventing abortion, diſcovering thieves, and other ridiculous properties. The word is formed from αετος, "eagle;" the popular tradition being, that it is found in the eagle's neſt, whither it is ſuppoſed to be carried while the female ſits, to prevent her eggs from being rotten. It is found in ſeveral parts: near Trevoux in France, one can ſcarce dig a few feet, without finding conſiderable ſtrata or beds of the coarſer or ferruginous kind. They are originally ſoft, and of the colour of yellow oaker. But the fineſt and moſt valued of all the eagle-ſtones are accidental ſtates of one or other of our common pebbles.

ÆTNA SALT, Sal Ætnæ, a name given by ſome authors to the ſal ammoniac, which is found on the ſurface and ſides of the openings of Mount Ætna, and other burning mountains, after their eruptions; and ſometimes on the ſurface of the ferruginous matter which they throw out. This ſalt makes a various appearance in many caſes: it is ſometimes found in large and thick cakes, ſometimes only in form of a thin powder, ſcattered over the ſurface of the earth and ſtones. Some of this ſalt is yellow, ſome white, and ſome greeniſh. This ſalt is a concrete of nitre, ſulphur, and vitriol, burnt and ſublimed together: Borelli found once a vaſt quantity of this ſalt on Mount Ætna, and tried many experiments on it; from whence he concluded, that this ſalt is ſo far from occaſioning the exploſions of that mountain, as ſome have ſuppoſed, that it does not exiſt in it, but is formed during the burning. Phil. Tranſ. Nº. 100.

AFFA, a weight uſed on the Gold Coaſt of Guinea. It is equal to an ounce, and the half of it is called eggeba. Moſt of the blacks on the Gold Coaſt give theſe names to thoſe weights.

AFFECTIO Bovina, a diſorder incident to cattle, occaſioned by a little worm bred between the fleſh and the ſkin, whick works its way all over the body.

AFFECTION, in a general ſenſe, implies an attribute inſeperable from its ſubject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind.

Affection (ſignifying a ſettled bent of mind toward a particular being or thing) occupies a middle ſpace between diſpoſition on the one hand, and paſſion on the other. It is diſtinguiſhable from Diſpoſition, which being a branch of one's nature, originally, muſt exiſt before there can be an opportunity to exert it upon any particular object; whereas affection can never be original, becauſe, having a ſpecial relation to a particular object, it cannot exiſt till the object has once at leaſt been preſented. It is alſo diſtinguiſhable from Paſſion, which, depending on the real or ideal preſence of its object, vaniſhes with its object: whereas Affection is a laſting connection; and, like other connections, ſubſiſts even when we do not think of the perſon. A familiar example will illuſtrate this. There may be in one perſon's mind a diſpoſition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never diſcovered even by the perſon himſelf. Another, who has the ſame diſpoſition, meets with a kindly office that makes him grateful to his benefactor: an intimate connection is formed between them, termed affection; which, like other connexions, has a permanent exiſtence, though not always in view. The affection, for the moſt part, lies dormant, till an opportunity offers for exerting it: in that circumſtance, it is converted into paſſion of gratitude; and the opportunity is eagerly ſeized of teſtifying gratitude in the warmeſt manner.

Affection, among phyſicians, ſignifies the ſame as diſeaſe. Thus the hyſteric affection is the ſame with the hyſteric diſeaſe.

AFFERERS, or Afferors, in law, perſons appointed in court-leets, court-barons, &c. to ſettle, upon oath, the fines to be impoſed upon thoſe who have been guilty of faults arbitrarily puniſhable.

AFFETUOSO, or Con Affetto, in the Italian muſic, intimates that the part to which it is added ought to be played in a tender moving way, and conſequently rather ſlow than faſt.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDATIO Dominorum ſignifies an oath taken by the lords in parliament.

AFFIDATUS, in law, denotes a tenant by fealty.

AFFIDAVIT, ſignifies an oath in writing, ſworn before ſome perſon who is authoriſed to take the ſame.

AFFILLIATION, ſynonymous with adoption.

AFFINAGE implies the refining of gold or other metals.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradiſtinction to conſanguinity, or relation by blood.—Affinity does not found any real kinſhip; it is no more than a kind of fiction, introduced on account of the cloſe relation between huſband and wife. It is even ſaid to ceaſe when the cauſe of it ceaſes: hence a woman who is not capable of being a witneſs for her huſband's brother during his life-time, is allowed for a witneſs when a widow, by reaſon the affinity is diſſolved. Yet with regard to the contracting marriage, affinity is not diſſolved by death, though it be in every thing elſe.

There are ſeveral degrees of affinity, wherein marriage was prohibited by the law of Moſes: thus, the ſon could not marry his mother, nor his father's wife, Lev. xviii. 7. et ſeq. The brother could not marry his ſiſter, whether ſhe were ſo by the father only or by the mother only, and much leſs if ſhe was his ſiſter both by the ſame father and mother: the grand-father could not marry his grand-daughter, either by his ſon or daughter. No one could marry the daughter of his father's wife; nor the ſiſter of his father or mother. Nor the uncle his niece; nor the aunt her nephew. Nor the nephew the wife of his uncle by the father's ſide. The father-in-law could not marry his daughter-in-law: nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left no children, the ſurviving brother was to raiſe up children to his deceaſed brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's ſon, or the daughter of her daughter, or two ſiſters together. It is true the patriarchs before the law married their ſiſters, as Abraham married Sarah, who was his father's daughter by another mother; and two ſiſters together, as Jacob married Rachel and Leah; and their own ſiſters by both father and mother, as Seth and Cain. But theſe caſes are not to be conſidered as examples: becauſe in ſome they were authoriſed by neceſſity; in others by cuſtom; and the law was not then in being. If ſome other examples may be found, either before or ſince the law, the ſcripture expreſsly diſapproves of them, as Reuben's inceſt with Balah his father's concubine, and the action of Ammon with his ſiſter Tamar; and that of Herod-Antipas, who married Herodias his ſiſter-in-law, his brother Philip's wife, while her huſband was yet living.

Affinity is alſo uſed to denote conformity or agreement: thus we ſay, the affinity of languages, the affinity of words, the affinity of ſounds, &c.

Affinity, or Elective Attraction, are terms uſed by modern chemiſts to expreſs that peculiar propenſity which different ſpecies of matter have to unite and combine with certain other bodies excluſively, or in preference to any other connection.

AFFION, the ſame as opium.

AFFIRMATION, in logic, the aſſerting the truth of any propoſition.

Affirmation, in law, denotes an indulgence allowed to the people called Quakers; who, in caſes where an oath is required from others, may make a ſolemn affirmation that what they ſay is true; and if they make a falſe affirmation, they are ſubject to the penalties of perjury. But this relates only to oaths taken to the government, and on civil occaſions; for Quakers are not permited to give their teſtimony in any criminal caſe, &c.

Affirmation is alſo uſed for the ratifying or confirming the ſentence or decree of ſome inferior court: Thus we ſay, the houſe of lords affirmed the decree of the lord-chancellor, or the decree of the lords of ſeſſion.

AFFIRMATIVE, in grammar. Authors diſtinguiſh affirmative particles; ſuch is, *yes*.—The term *affirmative* is ſometimes alſo uſed ſubſtantively. Thus we ſay, the affirmative is the more probable ſide of the queſtion: there were ſo many votes, or voices, for the affirmative.

AFFIX, in grammar, a particle added at the cloſe of a word, either to diverſify its form, or alter its ſignification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more eſpecially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are ſingle ſyllables, frequently ſingle letters, ſubjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the ſame as to the radicals, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blaſt of wind, breath, or vapour, ſtriking with force againſt another body. The word is Latin, formed from *add* "to," and *flare*, "to blow." Naturaliſts ſometimes ſpeak of the afflatus of ſerpents. Tully uſes the word figuratively, for a divine inſpiration; in which ſenſe he aſcribes all great and eminent accompliſhments to a divine afflatus.

AFFLICTION, in a general ſenſe, ſignifies any thing that cauſes a ſenſation of pain; a diſagreeable circumſtance; a calamity; miſery, adverſity, diſtreſs. "All affliction is naturally grievous." Hooker.

Affliction is not itſelf, in propriety of medical ſpeech, a diſeaſe, but it produces many: for whatever excites envy, anger or hatred, produces diſeaſes from tenſe fibres; as whatever excites fear, grief, joy, or delight, begets diſeaſes from relaxation.

AFFLUX, in electricity, is oppoſed to efflux; and both terms were uſed by the Abbé Nolet, as alſo by Dr. Watſon, previous to the diſcovery of poſitive and negative electrics.

AFFORAGE, in the French cuſtoms, a duty paid to the lord of a diſtrict, for permiſſion to ſell wine, or other liquors, within his ſeignory. Afforage is alſo uſed for the rate or price of proviſions laid and fixed by the provoſt or ſheriffs of Paris.

AFFORCEMENT, in antient fortification, implies a fortified caſtle, or country-houſe well ſecured for defence.

AFFORESTING, Afforestatio, the turning ground into foreſt. William the Conqueror, and his ſucceſſors, continued afforeſting the lands of the ſubject for many reigns; till the grievance became ſo notorious, that people of all degrees and denominations were brought to ſue for relief; which was at length obtained, and commiſſions were granted to ſurvey and perambulate the foreſt, and ſeperate all the new afforeſted lands, and re-convert them to the uſes of their proprietors, under the name and quality of *purlieu* or *pouralle land*.

AFFRA, or Affrayment, in law, formerly ſignified the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. but, at preſent, it denotes a ſkirmiſh or fight between two or more.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an eſcutcheon; a kind of bearing which is otherwiſe called *confrontee*, and ſtands oppoſed to *adoſſee*.

AFFUIAGE, in ancient records, ſignifies the right of fuel from a certain foreſt, a ſtipulation uſual and neceſſary in grants to a leſſee.

AFFUSION, the act of pouring ſome fluid ſubſtance on another body. Dr. Grew gives ſeveral experiments of the luctation ariſing from the affuſion of divers menſtruums on all ſorts of bodies. Divines and church hiſtorians ſpeak of baptiſm by affuſion; which amounts to much the ſame with what we now call ſprinkling.

AFLOAT, in ſea language, ſignifies the ſtate of a ſhip when ſhe is buoyed up by the water from the ground.

AFOBA, in botany, the kidney-bean produced in Guinea, which the natives apply to expel cutaneous foulneſſes. Philoſ. Tranſ. N°. 232.

AFRICAN COMPANY, a ſociety of merchants, eſtabliſhed by king Charles II. for trading to Africa; which trade is now laid open to all his majeſty's ſubjects, paying 10 per cent. for maintaining the forts.

AFRICANUS FLOS, a flower of little or no repute in the botanical ſyſtem.

AFRICTA ſignifies the wafers uſed by the ancients in their ſacrifices.

AFSLAGERS, perſons appointed by the burgomaſters of Amſterdam to preſide over the public ſales made in that city. They muſt always have a clerk of the ſecretary's office with them, to take an account of the ſale. They are much the ſame as our brokers or auctioneers.

AFT, in the ſea language, the ſame with ABAFT.

AFTER-BIRTH, in midwifery, ſignifies the membranes which ſurround the infant in the womb, generally called the ſecundines.

AFTERMATH, in huſbandry, ſignifies the graſs which ſprings or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that ſpace between noon and night.

AFTER-PAINS, in midwifery, exceſſive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER-SWARMS, in the management of bees, are thoſe which leave the hive ſome time after the firſt have ſwarmed.

AFTO, in botany, ſo called by the natives of Guinea in Africa, the ſame as Eryſimum, or hedge-muſtard, uſually adminiſtered by thoſe people for the head-ach. Phil. Tranſ. N°. 232.

AGA, in the Turkiſh language, ſignifies a great lord or commander. Hence the aga of the Janiſſaries is the commander in chief of that corps; as the general of horſe is denominated *ſpahiclar aga*. The aga of the Janiſſaries is an officer of great importance. He is the only perſon who is allowed to appear before the Grand Seignior without his arms acroſs his breaſt in the poſture of a ſlave. Eunuchs at Conſtantinople are in poſſeſſion of moſt of the principal poſts of the ſeraglio. The title *aga* is given to them all, whether in employment or out. This title is alſo given to all ſuch men without employ, and eſpecially to wealthy land-holders.—We find alſo *agas* in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of *agas* choſen from among the *boluk baſhis* (the firſt rank of military officers), and ſent to govern in chief the towns and garriſons of that ſtate. The *aga* of Algiers is the preſident of the divan, or ſenate. For ſome years the *aga* was the ſupreme officer, and governed the ſtate in the place of baſhaw, whoſe power dwindled to a ſhadow. But the ſoldiery riſing againſt the *boluk baſhis*, or *agas*, maſſacred moſt of them, and transferred the ſovereign power to the calif, with the title of Dey, or King.

AGALACTIA, in phyſic, implies an inſufficiency of milk in the breaſts of a nurſe.

AGALLOCHUM, ſynonymous with the wood of aloes.

AGALMATA, in antiquity, a term originally uſed to ſignify any kind of ornaments in a temple; but afterwards for the ſtatutes only, as being moſt conſpicuous.

AGANIPPIDES, in antient poetry, a deſignation given to the muſes, from a fountain of mount Helicon, called Aganippe.

AGANIPPE, in antiquity, a fountain of Bœotia at mount Helicon, on the borders between Phocis and Bœotia, ſacred to the muſes, and running into the river Permeſſeus. Ovid ſeems to make Aganippe and Hippocrene the ſame. Solinus more truly diſtinguiſhes them, and aſcribes the blending them to poetical licence.

AGAPE, in eccleſiaſtical hiſtory, the love-feaſt, or feaſt of charity, in uſe among the primitive Chriſtians; when a liberal contribution was made by the rich to feed the poor. The word is Greek, and ſignifies *love*. St. Chryſoſtom gives the following account of this feaſt, which he derives from the apoſtolical practice. He ſays, "the firſt Chriſtians had all things in common, as we read in the Acts of the Apoſtles; but when that equality of poſſeſſions ceaſed, as it did even in the apoſtles time, the agape, or love-feaſt, was ſubſtituted in the room of it. Upon certain days, after partaking of the Lord's Supper, they met at a common feaſt; the rich bringing proviſions, and the poor who had nothing being invited." It was always attended with receiving the holy ſacrament; but there is ſome difference between the ancient and modern interpreters as to the circumſtance of time, viz. Whether this feaſt was held before or after the communion. St. Chryſoſtom is of the latter opinion; the learned Dr. Cave of the former. Theſe love-feaſts, during the three firſt centuries, were held in the church without ſcandal or offence; but, in after times, the heathens began to tax them with impurity. This gave occaſion to a reformation of theſe *agapæ*. The kiſs of charity, with which the ceremony uſed to end, was no longer given between different ſexes; and it was expreſsly forbidden to have any beds or couches, for the conveniency of thoſe who ſhould be diſpoſed to eat more at their eaſe. Notwithſtanding theſe precautions, the abuſes committed in them became ſo notorious, that the holding of them, in churches at leaſt, was ſolemnly condemned, at the council of Carthage, in the year 397.

AGAPETÆ, in eccleſiaſtical hiſtory, a name given to certain virgins and widows, who, in the ancient church, aſſociated themſelves with, and attended on, eccleſiaſtics, out of a motive of piety and charity.

In the primitive days there were women inſtituted Deaconeſſes; who, devoting themſelves to the ſervice of the church, took up their abode with the miniſters, and aſſiſted them in their functions. In the fervour of primitive piety, there was nothing ſcandalous in theſe ſocieties: but they afterwards degenerated into libertiniſm; inſomuch, that St. Jerome aſks, with indignation, *unde agapetarum peſtis in eccleſias introiit?* This gave occaſion to councils to ſuppreſs them. St. Athanaſius mentions a prieſt, named Leontius, who, to remove all occaſion of ſuſpicion, offered to mutilate himſelf, to preſerve his beloved companion.

AGARIC, in pharmacy, a kind of furious excreſcence, growing on the trunks and large branches of ſeveral trees; but chiefly upon ſome kinds of oak when old and decayed. It was in much eſteem among the ancients as a purge, but has been judiciouſly exploded by the moderns, from its occaſioning inſupportable nauſeas.

Mineral AGARIC, a marley earth reſembling the vegetable of that name in colour and texture. It is found in the fiſſures of rocks, and on the roofs of caverns; and is ſometimes uſed as an aſtringent in fluxes, hemorrhages, &c.

AGARICUS, or MUSHROOM, a genus of the order of fungi, belonging to the cryptogamia claſs of plants.

Botanical writers enumerate 55 ſpecies belonging to this genus; of which the moſt remarkable is the campeſtris, or common muſhroom: it has the top or cap firſt of a dirty cream colour, convex, and, if but juſt expanding, the under part, or what is called the gills, is of a bright fleſh red: this colour laſts but a little time before it turns darker; and when the plant is old, or has been ſome time expanded, the gills become of a dark brown, the cap almoſt flat, of a dirty colour, and often a little ſcaly.

AGASYLLIS, in materia medica, implies the Greek name of gum ammoniac.

AGATE, or ACHAT, among the Greeks and Latins, Αχατης, and *Achates*, from a river in Sicily, on the banks of which it was firſt found, a very extenſive genus of the ſemipellucid gems. Theſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of cryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given, by the fluid they were formed in, to their differently coloured veins or matters.

AGATE, among antiquaries, denotes a ſtone of this kind engraven by art. In this ſenſe, agates make a ſpecies of antique gems; in the workmanſhip whereof we find eminent proofs of the great ſkill and dexterity of the ſculptors. Several agates of exquiſite beauty are preſerved in the cabinets of the curious; but the facts or hiſtories repreſented on theſe antique agates, however well executed, are now become ſo obſcure, and their explications ſo difficult, that ſeveral diverting miſtakes and diſputes have ariſen among thoſe who undertook to give their true meaning.

AGATE is alſo a name of an inſtrument uſed by gold-wire-drawers; ſo called from the agate in the middle of it, which forms its principal part.

AGATY, the name of a mallaber tree of the kidney bean ſpecies.

AGAVE, the common American aloe: a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. For its characters ſee Syſtem of BOTANY.

Of the Americana, or great American aloe, the ſtems generally riſe upwards of 20 feet high, and branch out on every ſide towards the top, ſo as to form a kind of pyramid: the ſlender ſhoots being garniſhed with greeniſh yellow flowers, which ſtand erect, and come out in thick cluſters at every joint: theſe make a fine appearance, and continue long in beauty; a ſucceſſion of new flowers being produced for near three months in favourable ſeaſons, if the plant is protected from the autumnal colds. The ſeeds do not ripen in England. It has been generally thought, that theſe plants do not flower till they are 100 years old: but this is a miſtake; for the time of their flowering depends on their growth: ſo that in hot countries, where they grow faſt, and expand many leaves every ſeaſon, they will flower in a few years; but in colder climates, where their growth is ſlow, it will be much longer before they ſhoot up their ſtem. There is a variety of this ſpecies with ſtriped leaves, which are pretty common in the Engliſh gardens. The other ſorts are ſo tender, that they muſt conſtantly remain in the ſtove.

AGE, in the moſt general ſenſe of the word, ſignifies the duration of any being, from its firſt coming into exiſtence to the time of ſpeaking of it, if it ſtill continues; or to its deſtruction, if it has ceaſed to exiſt ſome time before we happen to mention it.

Among the ancient poets, this word was uſed for the ſpace of thirty years; in which ſenſe, *age* amounts to much the ſame with *generation.* Thus, Neſtor is ſaid to have lived *three ages* when he was 90 years old. By ancient Greek hiſtorians, the time elapſed ſince the beginning of the world is divided into three periods, which they called *ages.* The firſt reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obſcure* or *uncertain* age, becauſe the hiſtory of mankind is altogether uncertain during that period. The ſecond they call the *fabulous* or *heroic* age, becauſe it is the period in which the fabulous exploits of their gods and heroes are ſaid to have been performed. It began with the Ogygian deluge, and continued to the firſt Olympiad; where the third or *hiſtorical* age commenced. This diviſion, however, it muſt be obſerved, holds good only with regard to the Greeks and Romans, who had no hiſtories earlier than the firſt Olympiad; the Jews, Egyptians, Phenicians, and Chaldees, not to mention the Indians and Chineſe, who pretended to much higher antiquity, are not included in it.

The time ſince the firſt formation of man has been divided by the poets into four *ages*, diſtinguiſhed by the epithets of *golden*, *ſilver*, *brazen*, and *iron.* During the *golden* age, Saturn was ſuppoſed to reign in heaven, and juſtice and innocence in this lower world. The earth then yielded her productions without culture; men held all things common, and lived in perfect friendſhip. This period is ſuppoſed to have laſted till the expulſion of Saturn from his kingdom. The *ſilver* age commenced when men began to deviate from the paths of virtue; and in conſequence of this deviation, their lives became leſs happy. The *brazen* age commenced on a farther deviation, and the *iron* age took place in conſequence of one ſtill greater. A late author, however, reflecting on the barbariſm of the firſt ages, will have the order which the poets aſſign to the four ages inverted; the firſt being a time of rudeneſs and ignorence, more properly denominated an *iron* than a *golden* age. When cities and ſtates were founded, the *ſilver* age commenced: and ſince arts and ſciences, navigation and commerce, have been cultivated, the *golden* age has taken place.

In ſome ancient northern monuments, the *rocky* or *ſtony* age correſponds to the *brazen* age of the Greeks. It is called *rocky*, on account of Noah's ark, which reſted on mount Ararat; whence men were ſaid to be deſcended or ſprung from mountains: or from Deucalion and Pyrrha reſtoring the race of mankind, by throwing ſtones over their heads. The northern poets alſo ſtyle the fourth age of the world the *aſhen* age, from a Gothic king Madenis, or Mannus, who on account of his great ſtrength, was ſaid to be made of aſh, or becauſe in his time people began to make uſe of weapons made of that wood.

Among the Jews, the duration of the world is alſo divided into three ages. 1. The *ſeculum inane*, or *void age*, was the ſpace of time from the creation to Moſes. 2. The *preſent* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world.

Various other diviſions of the duration of the world into *ages* have been made by hiſtorians. The Sibyline oracles, wrote according to ſome, by Jews acquainted with the prophecies of the Old Teſtament, divide the duration of the world into ten *ages*; and according to Joſephus, each age contained ſix hundred years. It appears, by Virgil's fourth eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration.

By ſome, the ſpace of time commencing from Conſtantine, and ending with the taking of Conſtantinople by the Turks in the 15th century, is called the *middle age*; but others chooſe rather to date the middle age from the diviſion of the empire made by Theodoſius at the cloſe of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was firſt divided into circles. The *middle* is by ſome denoted the *barbarous* age, and the latter part of it the *loweſt* age. Some divide it into the *non-academical* and *academical* ages. The firſt includes the ſpace of time from the 6th to the 9th centuries, during which ſchools or academies were loſt in Europe. The ſecond from the 9th century, when ſchools were reſtored, and univerſities eſtabliſhed, chiefly by the care of Charlemagne.

The ſeveral *ages* of the world may be reduced to three grand epochas, viz. the *age* of the law of nature, called by the Jews the *void age*, from Adam to Moſes; the *age* of the Jewiſh law, from Moſes to Chriſt; and the *age* of grace, from Chriſt to the preſent year.

AGE is alſo frequently uſed in the ſame ſenſe with *century*, to denominate a duration of 100 years.

AGE likewiſe ſignifies a certain period of the duration of human life; by ſome divided into four ſtages, namely, infancy, youth, manhood, and old age; the firſt extending to the 14th year, the ſecond to the 25th, the third to the 50th, and the fourth to the end of life: by others divided into infancy, childhood, youth, manhood, and old age.

AGE, in law, ſignifies a certain period of life, when perſons of both ſexes are enabled to do certain acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chuſe his guardian, and claim his lands held in ſoccage. Twenty-one is called *full-age*, a man or woman being then capable of acting for themſelves, of managing their affairs, making contracts, diſpoſing of their eſtates, and the like.

AGE *of Trees.* Theſe after a certain age waſte. An oak at an hundred years old ceaſes to grow. The uſual rule for judging of the *age* of wood, is by the number of circles which appear in the ſubſtance of a trunk or ſtock cut perpendicularly, each circle being ſuppoſed the growth of a year: though ſome reject this method as precarious, alledging, that a ſimple circle is ſometimes the produce of ſeveral years; beſides that, after a certain age, no new circles are formed.

AGE-*prier*, in law, is when an action being brought againſt a perſon under age, for lands deſcended to him, he, by motion or petition, ſhews the matter to the court, praying the action may be ſtaid till his full age, which the court generally agrees to.

AGEMA, in Macedonian antiquity, was a body of ſoldiery, not unlike the Roman legion.

AGEMOGLANS, AGIAMOGLANS, or AZAMOGLANS, in the Turkiſh polity, are children purchaſed from the Tartars, or raiſed every third year, by way of tribute, from the Chriſtians tolerated in the Turkiſh empire. Theſe, after being circumciſed and inſtructed in the religion and language of their tyrannical maſters, are learnt the exerciſes of war, till they are of a proper age for carrying arms; and from this corps the Janiſſaries are recruited. With regard to thoſe who are thought unfit for the army, they are employed in the loweſt offices of the ſeraglio. Their appointments alſo are very ſmall, not exceeding ſeven aſpers and a half per day, which amount to about three-pence halfpenny of our money.

AGENDA, among philoſophers and divines, ſignifies the duties which a man lies under an obligation to perform: thus, we meet with the *agenda* of a chriſtian, or the duties he ought to perform; in oppoſition to the *credenda*, or things he is to believe.

AGENDA, among merchants, a term ſometimes uſed for a memorandum-book, in which is ſet down all the buſineſs to be tranſacted during the day, either at home or abroad.

AGENDA, among eccleſiaſtical writers, denotes the ſervice or office of the church. We meet with *agenda matutina & veſpertina*, "morning and evening prayers;" *agendi diei*, "the office of the day," whether feaſt or faſt day; *agenda mortuorum*, called alſo ſimply *agenda*, "the ſervice of the dead."

AGENDA is alſo applied to certain church-books, compiled by public authority, preſcribing the order and manner to be obſerved by the miniſters and people in the principal ceremonies and devotions of the church. In which ſenſe, *agenda* amounts to the ſame with what is otherwiſe called *ritual*, *liturgy*, *acalouthia*, *miſſal*, *formulary*, *directory*, &c.

AGENHINE, in our old writers, ſignifies a gueſt that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his hoſt was anſwerable for him.

AGENORIA, in mythology, the goddeſs of courage and induſtry, as *Vacuna* was of indolence.

AGENT, in a general ſenſe, denotes any active power or cauſe. Agents are either natural or moral. Natural agents are ſuch inanimate bodies as have a power to act upon other bodies in a certain and determinate manner; as, gravity, fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

AGENT is alſo uſed to denote a perſon intruſted with the management of an affair, whether belonging to a ſociety, company, or private perſon.

AGENTES *in rebus*, one of the ranks of officers in the court of the Conſtantinopolitan emperors, whoſe buſineſs was to collect and convey the corn both for the army and houſhold; to carry letters and meſſages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inſpect any motions, diſturbances, or machinations tending that way, and to give early notice thereof to the emperor.

The *agentes in rebus*, are by ſome made ſynonymous with our poſt-maſters, but their functions were of great extent. They correſpond to what the Greeks call ϖυροφοροι, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as, *tribuni, primicerii, ſenatores, ducenarii, biarchi, circitores, equites, tyrones*, &c. through all which they roſe *gradatim*. Their chief, who reſided at Conſtantinople, was denominated *princeps*; which was a poſt of great dignity, being reckoned on a level with that of proconſul. They were ſettled in every part of the empire; and are alſo ſaid to have ſerved as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen.

AGERATUM, BASTARD HEMP-AGRIMONY: a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. For the characters, ſee Syſtem of BOTANY.

AGEROMETRIA, implies a deviation from the two principles of Geometry.

AGGADA, in Jewiſh antiquity, an ingenious tale, or ſtory; of which kind there are many in the Talmud. There are ſeveral books extant among the Jews under this title.

AGGER, in the ancient military art, a work of fortification, uſed both for the defence and the attack of towns, camps, &c. In which ſenſe it is the ſame with what was otherwiſe called *vallum*, and in later times *aggeſtum*: and among the moderns *lines*, ſometimes *cavaliers, terraſſes*, &c.

AGGER, in ancient writers, likewiſe denotes the middle part of a military road, raiſed into a ridge, with a gentle ſlope on either ſide, to make a drain for the water, and keep the way dry. The term is alſo uſed for the whole road, or military way. Where highways were to be made in low grounds, as between two hills, the Romans uſed to raiſe them above the adjacent land, ſo as to make them of a level with the hills. Theſe banks they called *aggeres*. Bergier mentions ſeveral in Gallia Belgica, which were thus raiſed ten, fifteen, or twenty feet above ground. They are ſometimes alſo called *aggeres calceati*; and now generally known by the name *chauſſees*, or *cauſeways*.

AGGLUTINANTS, in pharmacy, a general name for all medicines of a glutinous or viſcid nature; which, by adhering to the ſolids, contribute greatly to repair the loſs.

AGGLUTINATIO PILORUM, reducing the hairs of the eye-lids that grow inwards to their natural order and ſituation. This may be done by maſtic, applied with a probe, which bends the hairs back into their proper order.

AGGLUTINATION, in a general ſenſe, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among phyſicians, implies the action of returning the parts of a body, ſeparated by a wound, cut, &c. It is alſo applied to the action of ſuch internal medicines as are of an agglutinating quality, and which, by giving a glutinous conſiſtance to the animal-fluids, render them more proper for nouriſhing the body.

AGGREGATE, in a general ſenſe, denotes the ſum of ſeveral things added together, or the collection of them into one whole. Thus, a houſe is an aggregate of ſtones, wood, mortar, &c. It differs from a mixed or compound, inaſmuch as the union of theſe laſt is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term uſed to expreſs thoſe flowers, which are compoſed of parts or florets, ſo united by means either of the receptacle or calyx, that no one of them can be taken away without deſtroying the form of the whole. They are oppoſed to ſimple flowers, which have no ſuch common part, and are uſually divided into ſeven kinds, viz. the *aggregate*, properly ſo called, whoſe receptacle is dilated, and whoſe florets are ſupported by foot-ſtalks; ſuch are the blue daiſy, thrift, or ſea-pink, &c. the *compound*; the *umbellati*; the *cymoſe*; the *amentaceus*; the *glumoſe*; and the *ſpadiceous*.

AGGREGATION, in phyſics, a ſpecies of union whereby ſeveral things which have no natural dependence or connection with one another are collected together, ſo as in ſome ſenſe to conſtitute one. Thus a heap of ſand, or a maſs of ruins, are bodies by aggregation.

AGGRESSOR, in law, the firſt offender in any caſe where an action lies, whether civil or criminal.

AGGREVATION, the act of augmenting a crime, or the puniſhment due to it.

AGIADES, in the Turkiſh armies, a kind of pioneers employed in fortifying camps, ſmoothing of roads, and the like offices.

AGIAHALID, the name of an Egyptian tree, called alſo *licio* and *lycium*: it reſembles the wild pear.

AGILD, or AGILDE, in our antient cuſtoms, a perſon ſo vile that whoever killed him was to pay no mulct for his death.

AGILENOZ, in botany, a name uſed, by ſome, for the common hazel.

AGILITY, an aptitude of the ſeveral parts of the body to motion. The improving of agility was one of the chief objects of the inſtitution of games and exerciſes. The athletæ made particular profeſſion of the ſcience of cultivating and improving agility. Agility of body is often ſuppoſed peculiar to ſome people; yet it ſeems leſs owing to any thing peculiar, in their frame and ſtructure, than to practice.

AGILITY, in a grammatical ſenſe, implies a nimbleneſs of action.

AGILLAMIS, in ancient law, implied a herdſman, or keeper of cattle in an open unfenced field.

AGIO, in commerce, is a term chiefly uſed in Holland, and at Venice, to ſignify the difference between the value of bank-ſtock and the current coin. The agio in Holland is generally three or four per cent. and at Rome it is from 15 to 25 per cent. but at Venice the agio is fixed at 20 per cent.

AGIOSYMANDRUM, a wooden inſtrument uſed by the Greek and other churches under the dominion of the Turks, to call together aſſemblies of the people. The *agioſymandrum* was introduced in the place of bells, which the Turks prohibited their Chriſtian ſubjects the uſe of, leſt they ſhould make them ſubſervient to ſedition.

AGISTMENT, AGISTAGE, or AGISTATION, in law, the taking in other people's cattle to graze at ſo much per week. The term is peculiarly uſed for the taking cattle to feed in the king's foreſts, as well as for the profits ariſing from that practice. It is alſo uſed, in a metaphorical ſenſe, for any tax, burden, or change; thus, the tax levied for repairing the banks of Romney-marſh was called *agiſtamentum*.

AGISTOR, or AGISTATOR, an officer belonging to foreſts, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are generally called *queſt-takers*, or *giſt-takers*, and are created by letters-patent. Each royal foreſt has four agiſtors.

AGITATION, the act of ſhaking a body, or toſſing it backwards and forwards.

AGITATION, in phyſics, is often uſed for an inteſtine commotion of the parts of a natural body. Fermentation and efferveſcence are attended with a briſk agitation of the particles.

AGITATION is reputed one of the ſymptoms of inſpiration. Petit informs us, that, in the laſt century, there aroſe in a church in Italy, for the ſpace of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unleſs they got away betimes, ſet them a dancing, with ſtrange contortions and geſticulations. This ſeems to verify what has been related of the temple of Delphi.

AGITATION is alſo uſed in medicine for a ſpecies of exerciſe generally called *ſwinging*. Maurice, prince of Orange, found this method a relief againſt the ſevere pains of the gout and ſtone. Bartholine mentions fits of the tooth-ach, deafneſs, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term ſometimes uſed for a charioteer, eſpecially thoſe who drove in the circus at the curule games.

AGITATORS, in the Engliſh hiſtory, certain officers ſet up by the army in 1647, to take care of its intereſts. Cromwell joined the agitators, only with a view to ſerve his own ends; which being once accompliſhed, he found means to get them aboliſhed.

AGLAIA, the name of the youngeſt of the three graces, eſpouſed to Vulcan.

AGLAOPHOTIS, in botany, the ſame as piony.

AGLECTS, amongſt floriſts, implies the pendants of flowers.

AGLIA, in phyſic, ſignifies a ſpot on the pupil of the eye.

AGME, in ſurgery, implies a fracture.

AGMEN, in antiquity, properly denotes a Roman army in march: in which ſenſe, it ſtands contradiſtinguiſhed from *acies*, which denoted the army in battle array; though, on ſome occaſions, we find the two words uſed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anſwering to our vanguard; *medium agmen*, our main-battle; and *poſtremum agmen*, the rear-guard. The order of their march was thus: After the firſt ſignal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the ſecond ſignal, the baggage was to be loaden on the horſes and carriages; and at the third ſignal, they were to begin their march. Firſt came the *extraordinarii*; then the auxiliaries of the firſt wing, with their baggage; theſe were followed by the legions. The cavalry marched either on each ſide or behind.

AGNATE, in law, any male relation by the father's ſide.

AGNEL, an ancient French gold coin, firſt ſtruck under the reign of St. Louis, worth about twelve ſols ſix deniers. The agnel is alſo called ſometimes *mouton d'or*, and *agnel d'or*. The denomination is ſuppoſed to have ariſen from the figure of a lamb, agnus, or ſheep, ſtruck on one ſide.

AGNOETÆ, from αγνοεω, to be *ignorant* of, in church-hiſtory, a ſect of ancient heretics, who maintained that Chriſt, conſidered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment. Eulogius, patriarch of Alexandria, aſcribes this hereſy to certain ſolitaries in the neighbourhood of Jeruſalem, who built their opinion upon the text Mark xiii. 32. "Of that day and hour knoweth no "man, no not the angels who are in heaven, neither the Son, "but the Father only." The ſame paſſage was made uſe of by the Arians; and hence the orthodox divines of thoſe days were induced to give various explications thereof. Some alledge, that our Saviour here had no regard to his divine nature, but only ſpoke of his human. Others underſtand it thus, That the knowledge of the day of judgment does not concern our Saviour conſidered in his quality of Meſſiah, but God only: which is the moſt natural ſolution.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a perſon on account of ſome extraordinary action, virtue, or other accompliſhment. Thus the agnomen Africanus was beſtowed upon Publius Cornelius Scipio, on account of his great atchievements in Africa. The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the agnomen.

AGNUS, or Lamb, in zoology, the offspring of the ovis or ſheep.

Agnus *Caſtus*, in botany, the trivial name of a ſpecies of the vitex. See Vitex. The Greeks call it *αγνος*, *chaſte*; to which has ſince been added the reduplicative *caſtus*, q. d. chaſte chaſte. It was famous among the ancients as a ſpecific for the preſervation of chaſtity. The Athenian ladies, who made profeſſion of chaſtity, lay upon leaves of *agnus caſtus* during the feaſts of Ceres.

Agnus *Dei*, in the church of Rome, a cake of wax ſtamped with the figure of a lamb ſupporting the banner of the croſs. Theſe being conſecrated by the pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; as, to preſerve thoſe who carry them worthily, and with faith, from all manner of accidents; to expel evil ſpirits, &c. The name literally ſignifies *Lamb of God*; this being ſuppoſed an image or repreſentation of the Lamb of God who took away the ſins of the world. They cover it up with a piece of ſtuff cut in form of a heart, and carry it very devoutly in their proceſſions. The Romiſh prieſts and religious derive conſiderable pecuniary advantage from ſelling theſe *Agnus Dei's* to ſome, and preſenting them to others. The pope provides a regular ſupply, by conſecrating once in ſeven years; they are diſtributed by the maſter of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres. This ceremony they pretend to derive from an ancient cuſtom of the church, wherein part of the paſchal taper conſecrated on Holy Thurſday was diſtributed among the people, to perfume their houſes, fields, &c. in order to drive away devils, and to preſerve them from ſtorms and tempeſts. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *premunire*. See Stat. 13 Eliz. cap. 2.

Aguts *Dei* is alſo a popular name for that part of the maſs wherein the prieſt, ſtriking his breaſt three times, rehearſes, with a loud voice, a prayer beginning with the words *Agnus Dei*. The *Agnus Dei* is ſaid to have been firſt brought into the miſſal by pope Sergius I.

AGOGE, among ancient muſicians, a ſpecies of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any diſpute or conteſt, whether it had regard to bodily exerciſes or the accompliſhments of the mind; and therefore poets, muſicians, painters, &c. had their agones, as well as the athletæ. Games of this kind were celebrated at moſt of the heathen feſtivals, with great ſolemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon nemeus* inſtituted by the Argives in the 53d Olympiad, and the *agon Olympius* inſtituted by Hercules 430 years before the firſt Olympiad. The Romans alſo, in imitation of the Greeks, inſtituted conteſts of this kind. The emperor Aurelian eſtabliſhed one under the name of *agon ſolis*, the conteſt of the ſun; Diocleſian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, inſtead of *luſtra*, are ſometimes numbered by *agones*.

Agon alſo ſignified one of the miniſters employed in the heathen ſacrifices, and whoſe buſineſs it was to ſtrike the victim. The name is ſuppoſed to have been derived from hence, that ſtanding ready to give the ſtroke he aſked, *Agon?* or *Agone?* Shall I ſtrike?

AGONALES, an epithet given to the Salii.

AGONALIA, in Roman antiquity, feſtivals celebrated in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or diſpute.

AGONISTARCHA, from *αγων* "combat," and *αρχος* "chief," in antiquity, ſeems to have been much the ſame with *agonotheta*; though ſome ſuggeſt a difference, making it the office of the former to preſide at and direct the private exerciſes of the athletæ, which they went through by way of practice, before they made their grand appearance on the public theatres or amphitheatres.

AGONISTICI, in church-hiſtory, a name given by Donatus to ſuch of his diſciples as he ſent to fairs, markets, and other public places, to propagate his doctrine; for which reaſon they were alſo called *Circuitores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome *Montenſes*. They were called *Agoniſtici*, from the Greek *αγων*, "combat," in regard they were ſent as it were to fight and ſubdue the people to their opinions.

AGONIUM, in Roman antiquity, was uſed for the day on which the *rex ſacrorum* ſacrificed a victim, as well as for the place where the games were celebrated, otherwiſe called *agon*.

AGNOTHETA, or Agnothetes, in Grecian antiquity, was the preſident or ſuperintendant of the ſacred games; who not only defrayed the expences attending them, but inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is alſo uſed for the pangs of death. Much of the terror of death conſiſts in the pangs and convulſions wherewith the agony ſeems attended; though we have reaſon to believe that the pain in ſuch caſes is ordinarily not extremely acute; a courſe of pain and ſickneſs having uſually ſtupified and indiſpoſed the nerves for any quick ſenſations. However, various means have been thought of for mitigating the agony of death. Lord Bacon conſiders this as part of the province of a phyſician; and that not only when ſuch a mitigation may tend to a recovery, but alſo when, there being no further hopes of a recovery, it can only tend to make the paſſage out of life more calm and eaſy. Complacency in death, which Auguſtus ſo much deſired, is certainly no ſmall part of happineſs. Accordingly the author laſt cited ranks *euthanaſia*, or the art of dying eaſily, among the deſiderata of ſcience; and does not even ſeem to diſapprove of the courſe Epicurus took for that end,

—— *Hinc ſtygias ebrius hauſit aquas.*

Opium has been applied for this purpoſe, with the applauſe of ſome, but the condemnation of more.

AGONYCLITÆ, or Agonyclites, in church-hiſtory, a ſect of chriſtians, in the 7th century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to ſuch deities as had ſtatues in the market-places; particularly Mercury, whoſe ſtatue was to be ſeen in almoſt every public place.

AGORANOMUS, in Grecian antiquity, a magiſtrate of Athens, who had the regulation of weights and meaſures, the prices of proviſions, &c. The *agoranomi*, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them fifteen in all, of whom they aſſign ten to the city. To theſe a certain toll or tribute was paid, by all who brought any thing to ſell in the market.

AGRARIAN Laws, among the Romans, thoſe relating to the diviſion and diſtribution of lands, of which there were a great number; but that called the Agrarian law, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy. The Roman lands were of ſeveral kinds; ſome conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandeſtinely uſurped by private great men; laſtly, others purchaſed with the public money, in order to be divided. Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbances.

Several have pleaded for the neceſſity of Agrarian laws among us: but no author has entered ſo deeply into the ſubject as Mr. Harrington in his *Oceana*; which the reader who chooſes may conſult.

AGREEMENT, in law, the act whereby any two or more parties come to a final concluſion, by determining upon the points in diſpute to the ſatisfaction of each of them.

AGRESSES, in heraldry, the ſame as pellets.

AGRESSTA, in medicine, ſignifies an unripe or green grape, when applied as a cooler to the animal ſyſtem.

AGRIÆ, in natural hiſtory, implies the quadruped race which have no teeth, but have a very long cylindrical tongue.

AGRIAMPELOS, the wild vine, the production of the Aſiatic iſlands.

AGRICULTURE, in a general ſenſe, implies the art of tilling the ground, ſo as to render it fruitful; whether manuring, fallowing, ſowing, harrowing, reaping, mowing, &c. the management of the productions of different ſoils, and planting; together with the culture of foreſts, timber, &c.

The following Syſtem of Agriculture is the production of a gentleman, a practical farmer of Oxfordſhire, which I have peruſed with great attention, and conſider myſelf as highly indebted to him for his judicious treatiſe. It is a production which, I am convinced, will afford both entertainment and utility to the public, it being abridged of all that ſuperfluous theory and redundancy, which cannot be reduced to practice; and, from the preſcribed compaſs in which it is confined, from the nature of the work, I will preſume to denounce it the moſt complete Syſtem of Agriculture ever yet preſented to the public.

W. H. HALL.

A NEW SYSTEM of AGRICULTURE.

AS we commenced our undertaking with the intention of pruning Art and Science of that burthen of uſeleſs theory, with which other ſimilar publications have been loaded, we ſhall endeavour to collect, from the beſt information, ſuch theory as is conſiſtent with practice, and ſuch practice as we have known tried and approved.

In the important Art of Agriculture, now before us, moſt writers on the ſubject have been men of independent fortunes, making experiments in gardens and other ſmall, rich incloſures; and, on a favourable reſult, have committed their thoughts to the public as unerring maxims; not conſidering the expence, or the practicability of their ſchemes on a larger ſcale or inferior ſoil.

The more ſimple the plan of huſbandry, the more certain will be the farmer's ſucceſs; it being almoſt without a precedent that a book-learned farmer ever became wealthy; for which we can aſſign no other reaſon, than that former theories, being compoſed of undigeſted, ſpeculative materials, ſerve only to perplex, inſtead of inſtruct, the practitioner, who depends on them for knowledge.

Theſe are not the only defects to which lettered huſbandmen have been ſubject, and the compilers of dictionaries have copied, from whence every modern treatiſe on the ſubject is rendered unintelligible to a majority of thoſe whom it materially concerns, by being filled with pedantic terms of art, or, on the other hand, with provincial dialect.

We ſhall not fill page after page with the errors and inconſiſtencies of other writers, thinking it ſufficient to paſs them over with that diſregard they deſerve; and that our readers are entitled to ſomething of more intrinſic value, than Mr. Young's account of "feeding a lean hog fat in ten days with carrots;" and other miracles ſo frequently to be met with in the works of thoſe ſcientific writers. Where we meet with ingenious theory that claſhes with practice, we beg leave, with all ſubmiſſion, to adopt the idea, at the ſame time making due acknowledgment to whom we are indebted; and occaſionally we ſhall take the liberty to expoſe abſurdities, as we think the labours of others, as well as our own, lie open to candid criticiſm.

Hiſtory and Progreſs of Agriculture.

Agriculture unqueſtionably has been practiſed in the moſt remote ages of the world. As mankind advanced from a ſtate of nature their neceſſities increaſed, and invention made improvements on ſpontaneous vegetation.

The mode of cultivation uſed in the antediluvian world we muſt leave to the inveſtigation of thoſe who are reſolved to ſay ſomething on every ſubject, and, rather than be ſilent, fill up the chaſm with idle conjecture. The works of Heſiod and Virgil can add nothing to a ſyſtem of Britiſh huſbandry, although they abound with fine imagery, and, perhaps, the firſt information, the ſubject was capable of receiving, when practiſed in the warm luxuriant climate of Italy, where oil and wine are produced without human aid.

Leaving this unintereſting detail to thoſe we endeavour to amuſe, inſtead of inſtruct, we proceed to give a conciſe narrative of the progreſs of agriculture in our own country, where the hand of nature has been very ſparing of her gifts, as few of the neceſſaries of life flouriſh without the moſt unremitted induſtry. By nature our apples are crabs, and our plums, ſloes; but art and labour have changed the ſcene, and health-giving exerciſe has brought this kingdom to an unequalled ſituation of plenty and ſplendor.

The æra when the yeomanry of England, in a great meaſure, began to feel the benign effects of freedom, was in the reign of Henry VIII. after the diſſolution of the monaſteries; the heavy yoke of church tyranny being removed, all degrees of people, from the peaſant to the peer, began to ſee the happy effects of cultivation. Several acts of parliament were then paſſed for incloſing of waſte lands, improving the breed of cattle, and other good purpoſes, all which ſhew how highly, and of what importance, the legiſlature thought Agriculture.

It is evident that at this time tillage was extended as wide as it poſſibly could be, and manures, except the produce of the fold and ſtable, but little known, or, from the badneſs of roads, were but ſeldom applied. Moſt of the wood lands in the inland parts of the kingdom bear evident traces of the plough, which are now occupied by venerable decaying oaks, in all probability of three or four hundred years ſtanding. There are but few downs or ſheep walks that have not the marks of cultivation; but neither memory or tradition account for the time when they were in that ſtate. The grain produced at that time was the ſame as the preſent, except a much greater portion of rye, then almoſt in general uſe for bread, either alone or mixed with wheat. Saintfoin was introduced into England previous to this period, as alſo clover; but the value of artificial graſſes, or roots, for the ſupport of cattle, and improvement of land, were not in practice. Implements of huſbandry were very heavy and cumbrous, but nearly of the ſame principle as at preſent.

Dividing and incloſing waſte and commonable lands continued till the reign of Edward VI. when improvement received a very ſevere check; a number of perſons riotouſly aſſembled in various parts of the kingdom, and, by pulling up the fences, laid waſte, and deſpoiled, what induſtry and judicious management had effected. We may, from this circumſtance, infer, that incloſures were not conducted in that equitable and juſt manner as they are at the preſent day. A mob have generally ſome pretence for their conduct, and in the preſent inſtance the lower order of people, finding their property invaded, had recourſe to thoſe violent means for redreſs. This and the troubled ſtate of the nation rendered improvements in agriculture very ſlow in their progreſs during the troubleſome reign of Queen Mary and the former part of that of Elizabeth.

Fitzherbert, judge of the Common Pleas in the year 1525, was the firſt perſon who wrote on the ſubject of Agriculture in England, and whoſe familiar ſtile is a proof that he meant to ſerve the cauſe. His excellent inſtructions reſpecting the management of land and of cattle render him one of the greateſt ornaments of the age in which he lived. For the entertainment and information of our readers we give them a ſpecimen of his works in their native dreſs.

Directions to be obſerved in the choice of lean cattle for feeding, as well as thoſe which are already fat.

> " Theſe huſbandes and they that wyl thryve they
> " muſt have both kie, oxen, horſes, mares, and yong
> " cattel, and to reyre and brede every yere ſome calves
> " and foles, or els ſhal he be a byer. And if thou ſhalt
> " bie oxen for the plough, ſe that they be yonge and
> " nat gouty, nor broken of heare nother of tayle, nor
> " of pyſel. And if thou bye kye to the payle, ſe that
> " they be yong and good to mylke, and fede her calfes
> " wel. And yf thou bye keye or oxen to fede, the
> " yonger they be the rather they wyl fede, but loke wel
> " that the heare ſtare nat, and that he lycke him ſelfe,
> " and be whole mouthed, and want no teth. And
> " though he haue the goute, and be broken both of
> " tayle and pyſel, yet wyl he fede. But the gouty oxe
> " wyl nat be driuen far, and ſe that he haue a brode
> " ribbe and a thicke hyde, and to be louſe ſkinned, that
> " it ſticke nat harde nor ſtrait to his ribbes, for then he
> " will nat fede.
>
> " And yf thou ſhalt bye fat oxen or kye, handle them
> " and ſe that they be ſofte on the fore crop behynde the
> " ſhoulder and upon the hyndermoſt ryb and vpon the
> " hucklebone, and the nach by the tayle. And ſe the
> " oxe haue a great cod and the cowe a great nauyl, for
> " then it ſhulde ſeme that they ſhuld be wel talowed.
> " And take hede wher thou byeſt any leane cattel or fat,
> " and of whom, and wher it was bred; for yf thou bye
> " out of a better grounde then thou haſt thy ſelfe, that
> " cattel wyl nat lyke with the. Alſo loke that there be
> " no mener of ſicknes among the cattel in that towneſhyp
> " or paſture that thou byeſt thy cattel out of. For
> " if there be any murren or longſought, it is great
> " ieopardy, for a beaſt may take ſicknes ten or twelve
> " dayes or more, or it appere on him."

The practical directions given in this ſhort extract are alone ſufficient to prepoſſeſs every huſbandman in this good judge's favour. What grazier would wiſh for more wholeſome advice?

Sir Francis Bacon threw in his mine of philoſophy at this period. What art or ſcience was there this great genius did not illuminate?

A north-countryman of the name of Lawſon alſo employed his ruſtic pen, and although his writings contain a number of abſurdities, yet he frequently acquits himſelf like a farmer.

Several tranſlations from the French and other languages made their appearance about this time, containing ſo little to the purpoſe that it is obvious this country poſſeſſed a ſuperiority in Agriculture even at this period.

The celebrated botaniſt Gerrard publiſhed his great work about the latter end of the reign of Elizabeth, and was the firſt who taught the culture of potatoes. If we conſider the period at which Gerrard wrote, his voluminous publication, with the correctneſs and beauty of his work, we cannot withhold our aſtoniſhment at his unrivalled merits and induſtry.

From the beginning of James I. to the end of Charles I. little reſpecting huſbandry can be collected, every manœuvre was uſed and every opportunity taken by thoſe kings and their adherents to increaſe the prerogative of the crown: the event that followed need not be mentioned here; but we cannot help remarking, that when monarchial government ceaſed, art and induſtry rapidly improved, particularly ſcientific and practical Agriculture.

The writings of Sir Hugh Platt deſerve every praiſe, and prove him a man actuated by the pureſt of motives, the good of his country. Gabriel Plattes muſt likewiſe have made cultivation his principal ſtudy, as his writings conſiſt of ſeveral digreſſions, and good practical information.

But of all the writers on huſbandry, Captain Blyth ſtands foremoſt. His works in 4to are dedicated to Oliver Cromwell, and furniſh as complete a ſyſtem of practice as ever was produced by an individual. He treats largely on ſoils, and their different management; manures, and how to apply them to the beſt advantage. On the culture of various graſſes now in uſe, (which are generally thought to have been unknown at the period he wrote) alſo on turnips and other roots for the uſe of cattle. The improvement of meadow and paſture lands are, with very few exceptions, the beſt committed to print. Under-draining and cleanſing ſwampy ground were well known to this writer; and altho' the great improvement in draining fens has been ſo recently adopted, Captain Blyth gave a plate and accurate deſcription of engines for that purpoſe, nearly the ſame as thoſe now in uſe. He ſtrongly recommends incloſures, and the planting of coppices and timber, and frequently in a manner that proves him a complete maſter of his ſubject.

Samuel Hartlib lived in intimacy, and correſponded with, the writer before-mentioned, as did the immortal Milton,

During the common-wealth Agriculture flouriſhed, and the huſbandman met with every encouragement a wiſe government could beſtow; and however hiſtorians may brand the rulers of the day with puritanical fanatics, or fanaticiſm, and other opprobrious epithets, it is certain Art and Science flouriſhed, and thoſe who directed the helm of ſtate did not number the acquiſition of wealth among their ambitious purſuits. But this wiſe turn was not of long continuance. At the Reſtoration they generally became infected with that intoxication and love of pleaſure which ſucceeded. All their induſtry and knowledge were exchanged for neglect and diſſipation; and huſbandry deſcended as rapidly as it had lately improved.

Jethro Tull next followed, and endeavoured to cut up the old ſyſtem root and branch, and to introduce in its ſtead drilling and horſe-hoeing, without the uſe of manure. This novel mode has had many advocates, who, with too much credulity, taking Mr. Tull's *ipſe dixit* for matter of fact, have always relinquiſhed the plan, and on conſulting their pockets have found the idea mere quackery. Not that drilling is, in every reſpect, inconſiſtent with practical huſbandry. In many inſtances great good may accrue from the practice, when judiciouſly uſed, on ſome kinds of ſoil; but Mr. Tull and his diſciples, by attempting to make drilling general, have brought it into diſgrace with a great majority of thoſe who have given credit to their aſſertions.

Since the Revolution Agriculture has been materially improved, particularly the culture of graſſes and roots for the uſe of cattle in the winter, and early in the ſpring. Mr. Bradley, profeſſor of Botany in the univerſity of Cambridge, took up the cauſe of agriculture, and his writings on the ſubject do him great credit as a ſcientific and practical author. Mr. William Ellis, of Gadſden in Hertfordſhire, by his writings diſplayed conſiderable knowledge in Agriculture, and was the perſon who firſt made known without reward what Mr. Vagg has lately delivered to the public as his own invention,

Several others of leſs note have wrote on Agriculture; and ſeveral ſocieties have been pompouſly eſtabliſhed, to promote the art; but to writers and ſocieties we will venture to aſſert, a ſmall ſhare of praiſe is due. Improved roads and incloſures are the great ſource of agricultural improvement, and thoſe incloſures particularly which are exonerated from tythes.

The clergy in general are fickle, perhaps more ſo than any other order of ſociety, and nothing but a commutation in lieu of tythes can ſecure a farmer from that moſt unwelcome of all viſitants the tytheman. To toil, invent, and uſe expenſive means to improve land; to improve live ſtock at a great expence, and your neighbour to come and claim a tenth of your induſtry, is, of all taxes, the moſt cruel. Let our readers only weigh the matter one minute. We will ſuppoſe a farmer to cultivate his land nine ſucceſſive years, and to take the produce to his own uſe and benefit, and on the tenth plough and ſow as uſual, increaſe his live ſtock, make the beſt of the dairy, reap and mow, pay ſervants their wages, and every conſequent expence whatever; then comes the clergyman, and takes all the produce, leaving neither hay or corn for cattle, nor any thing to make manure for the ſucceeding years. This is eventually the caſe, by which the farmer is greatly injured, and the proprietor of tythes proportionably benefited.

When tythes are commuted and conſumed on the land where they grow, the farmer collects them without an additional expence, and what is of equal importance his land is not impoveriſhed, by loſing annually one tenth of its produce. The collector of tythes finds himſelf in quite a different predicament, being obliged to keep a team of horſes, and ſervants, to collect tythes over an extenſive pariſh, and when they are collected to draw the corn, &c. to market, and, except there are ſome glebe lands annexed to the living (which is frequently not the caſe, and the quantity always very ſmall) he has no place but a fold yard for the cattle, kept to eat the hay and ſtraw, and cannot diſpoſe of the manure to a proper advantage. Theſe are but few of the diſagreeable circumſtances which attend the collecting of tythes, and which every perſon acquainted with the buſineſs muſt be ſenſible of. The great national importance we conceive of agriculture led us to theſe conciſe obſervations reſpecting incloſures, and the commutation of tythes; being well convinced that was the plan generally adopted, all ranks of people would participate in the advantages; the clergy would become more eſteemed and reſpected, and inſtead of being the authors of feuds and law-ſuits, would have ſeldom reaſon to deviate from thoſe fine examples of their maſter the "MINISTER OF PEACE!"

Within theſe few years it has become a very prevailing idea with gentlemen of large landed property to refuſe leaſes to their tenants, particularly of any long continuance; under the notion that during the term of a leaſe the proprietor is not maſter of his property. If a landlord will aſſiſt his tenants in making improvements, lands may be rendered more fertile without being let on long leaſes, but admitting that to be the caſe, a farmer cannot exerciſe his ſkill and induſtry with that ſpirit which is requiſite in all important undertakings, without ſome probable ſecurity for the enjoyment of the fruits of his labour. In the inſtance before us, where can the tenant fix any hopes of reward! death may perhaps take from him a landlord on whom he could depend, and whoſe word was equal to his bond, and the eſtate devolve to another, who, regardleſs of the promiſe of his predeceſſor, gives his tenant notice to quit, or cruelly raiſes his rent. There is a variety of other cauſes by which a man may be turned out of his farm, before he has reaped any benefit from expenſive improvements—his dog may unfortunately kill a hare which has been bred and nouriſhed on the farm; or the ſame maſtiff may cruelly fall upon and beat a pointer or ſpaniel, when the gentleman his keeper, or ſteward was ſporting on the premiſes. On ſuch accidents as theſe, and others of equal conſequence, we have known gentlemen diſcard their tenants; we have likewiſe known tenants extremely impertinent and overbearing, knowing themſelves ſecure from their landlords reſentment, by having a leaſe of many years unexpired. On briefly conſidering and weighing matters between the leſſor and leſſee, we are well convinced, that a leaſe of not leſs than fourteen years will be of mutual benefit to both parties. And if at the commencement of a new incloſure, or where conſiderable improvements are neceſſary, ſuch leaſe ſhould extend to twenty-one years, otherwiſe the proprietor cannot expect his eſtate will be properly managed and improved, or the tenant will riſque his property and induſtry without a hope on which he can depend of making a return. Preſcribing a ſyſtem of management by leaſe to a tenant is curbing genius and tying the hands of induſtry; the reſult of various ſeaſons, and local circumſtances often require different modes of cultivation: we are ſorry to obſerve ſo impolitic a meaſure, ſo much in vogue amongſt landed gentlemen, being convinced improvements in agriculture are greatly impeded by ſuch means. Some reſtraints are certainly neceſſary, particularly the management of fences, not ſelling manure, or ſuch produce of the land which makes manure, and other ſimilar covenants; but always to enforce one unalterable round of cultivation is making an attorney the practical huſbandman, and the huſbandman of no more conſequence than a horſe in a mill. The three or four laſt years of a leaſe, it is neceſſary for the leſſor to bind the tenant in a particular manner for the benefit of the ſucceeding tenant provided he ſhould change, but enforcing a general ſeries of huſbandry will not improve an ignorant and ſlovenly man, and is ſure to injure him who is ingenious and aſſiduous.

In the choice of a tenant a gentleman ſhould look for a perſon of plain unaffected manners, by no means of a whimſical turn of mind, an early riſer, perſevering, induſtrious and honeſt, bred to and capable of performing all parts of the buſineſs, and poſſeſſed of property equal to the undertaking. Farms ſhould be rented in ſuch a manner, as the cultivator, by hazarding his property and exerciſing his induſtry, ſhould acquire a comfortable ſubſiſtence, and ſomething to render the decline of life pleaſant and happy. When this is the caſe, the landlord and tenant are generally pleaſed to meet each other, whereas on the contrary, a gentleman reluctantly views his own eſtate, as it neither yields him his income at the proper ſeaſon, nor receives that cultivation which he can ſee with pleaſure; for nothing reſtrains aſſiduity ſo much as labouring without a proſpect of gain. You will always perceive a farmer who rents his farm too high, inert and melancholy as a careleſs drunkard.

Mr. Young very juſtly obſerves, "that the cultivation of ſmall farms by their owners is generally productive of the beſt and moſt improveable mode of agriculture, as the farmer finds himſelf doubly encouraged by intereſt." In this, as in a number of other ideas, we perfectly agree with him, and think ourſelves juſtified on the ſame principle, to recommend leaſes to gentlemen inſtead of agreements from year to year, as intereſt will add vigour to improvements in one inſtance as well as the other.

As Arthur Young, eſq. has been a labourer in the field of agricultural improvements the greateſt part of his life, we cannot quit this part of the ſubject without taking ſome notice of ſuch of his works which we have had the pleaſure to ſee. When Mr. Young firſt ſtarted as a public man, whether profit or amuſement were his purſuits, we know not, or whether he entered himſelf for the public good; the high flattering manner in which he ſpeaks of the various noblemen and gentlemen he viſited, his inflated and poetic deſcription of their manſions and agriculture, and, above all, his conſtant advice to them to raiſe their rents, in order to make their tenants induſtrious and thrifty. Theſe are maxims which ſeem to indicate that Mr. Young wanted to curry favour with thoſe who were able to beſtow it; for we cannot believe oppreſſion can be exerciſed with ſucceſs, to ſtimulate induſtry. Indeed the fruitful manner in which Mr. Young delivers himſelf at the concluſion of the firſt volume of his annals, and in other places, are plain proofs that he is a diſappointed man. We hope experience and extenſive travelling have given him a better opinion of Engliſh huſbandmen than he entertained when firſt they were honoured with his viſits, and that he is convinced of the wide difference between ſpeculative theory and rational profitable practice. The variety of academic honours this author is enabled to annex to his name may be food for ambition, and add conſequence to a title page, but liberality of ſentiment, and a juſt record of events, are certainly of more value to the community. That the annals are in many inſtances a candid ſtatement of facts, elucidated with fair and liberal digreſſion, by Mr. Young the editor, we acknowledge with pleaſure, and admire the open manner in which he frequently delivers his ſentiments on agricultural improvements. We hope, likewiſe, Mr. Young has experienced the ſweets of his preſent publication, and could wiſh him to have ſome mercy on the purſes of his ſubſcribers, and only admit ſuch correſpondence as conveys ſome new idea, or to add to ſuch ſubjects as have been before ſlightly touched upon. By this time we ſhould ſuppoſe him ſufficiently experienced in theory and practice to be competent to the taſk of ſelecting the uſeful from the uſeleſs; as inconſiſtencies, and tedious repetition, are poor amuſement, and convey no inſtruction, however learned or high in life the author may be. Anonymous correſpondence being contrary to Mr. Young's plan, what can be his motive for ſo frequently admitting ſuch effuſions of uncertain experiments from unknown authors?

George Winter, eſq. a gentleman of independent fortune, who cultivates the land for health, amuſement, and to ſerve his unenlightened neighbours, has recently publiſhed a *compendious Syſtem of Huſbandry*, particularly recommending the drilling of grain and all kind of ſeeds. Mr. Winter has likewiſe had the good fortune to invent a new drill plough, for which he has obtained *his Majeſty's Letters Patent*. Had the inventor of the machine made the public good his ſtudy, we ſhould have given him credit for a ſhare of diſintereſted patriotiſm; but to publiſh information, and to ſell ſuch publication for nearly double the price he could have afforded it at, is not accomodating himſelf to thoſe who are in need of inſtruction. This compendious ſyſtem contains ſome ingenious and learned obſervations. But at the ſame time it has many diſtinguiſhed ſingularities in which we cannot agree with the writer, eſpecially in his treatment of pigs; in which he recommends, before they are turned out to graze, the uſe of ſpirits of hartſhorn, the uſual application to thoſe who are troubled with hyſterics. We do not wiſh to depreciate Mr. Winter's very novel improvements, but cannot help ſuggeſting, that beans, peas, or barley meal will anſwer the medical purpoſe, and are articles eaſier procured and better adapted to the conſtitution of the animal. There is very little public ſpirit in gentlemen procuring patents: ſuch monopolies are, in ſome inſtances, excuſable in mechanics; but a man who ſtiles himſelf independent in circumſtances and mind, muſt ſurely forget himſelf when he procures a patent, on purpoſe to enhance the price of a uſeful machine three times above its real value. Without an intention of giving offence to any individual, we are determined to ſpeak with the ſame freedom reſpecting our cotemporaries, as we ſhall of thoſe whoſe works are only left to anſwer for themſelves: and we are ſorry to obſerve, ſeveral gentlemen, profeſſors of agriculture, have obtained patents for inventions not their own, thereby injuring the working mechanic; and if any benefit would acrue to the public from ſuch inventions, thoſe who ſhould reap the advantage are precluded from their ſhare by the enormous price of thoſe experimental machines. This conduct may be conſiſtent with the old adage of "every man for himſelf," but there is very little fellow-feeling, or genuine philanthrophy, in the meaſure.

Thus having prefaced our ſyſtem of huſbandry in as conciſe a manner as poſſible, we ſhall proceed to the theory and practice of the art, thinking it will be moſt acceptable to our readers to blend them in the ſame ſection under the reſpective heads of

1. The various kinds of ſoils and obſervations.
2. Manures, and to what ſoil beſt adapted.
3. Wheat, and its cultivation.
4. Barley, ditto.
5. Oats, ditto.
6. Beans and peas, ditto.
7. Vetches, rye, buckwheat, and lentils or tills, ditto.
8. Clover, rye graſs, and trefoil, ditto.
9. Saintfoin and lucerne, ditto.
10. Other graſſes not generally in uſe, ditto.
11. Cabbage, turnip cabbage, and rape, ditto.
12. Turnips, ditto.
13. Potatoes, ditto.
14. Carrots, ditto.
15. Mangel Wuzzel, and other roots generally in uſe, ditto.
16. Hops, ditto.
17. Flax and hemp, ditto.
18. Madder, woad, &c.
19. Meadow and paſture overflowing, draining, and cleanſing, ditto.
20. Hay, its management.
21. Dividing and incloſing, with the management of fences.
22. Horſes and oxen, as uſed for huſbandry.
23. Cows and dairy.
24. Sheep.
25. Pigs.
26. Apples, pears, and the making of cyder.
27. Such timber and other trees as are connected with agriculture.
28. Implements in huſbandry.
29. Ploughing, harrowing, and cleaning land.
30. Sowing, drilling, and other means of depoſiting ſeed in the earth.

I. *The various kinds of Soil.*

Soils are generally diſtinguiſhed by loam, clay, ſand, and chalk, each of which has its reſpective kinds. As we do not purpoſe to enter into a chemical analyſis of their nature and quality, we mean to give a ſimple and plain deſcription of them, ſo far as we think conducive to vegetation. Whether phlogiſticated or dephlogiſticated air is the food of plants, it is not for the practical farmer to conſider, nor has every thing that art and ſophiſtry could invent and ſay on the ſubject had the leaſt tendency to the improvement of agriculture, but has frequently diſguſted and tired the reader, and driven him from a purſuit which he had previouſly followed with pleaſure.

The food of plants is earth or ſoil, which to manure and cultivate ſhould be the farmer's care: ſome kinds of ſoil cannot be ploughed and pulverized too much, others the leſs they are ſtirred the better, as frequently ploughing is found by experience to produce thiſtles, and a variety of other weeds, in much larger quantities than when the plough has been more ſparingly uſed. Soil is made fine or reduced, and is much improved by a courſe of drilling occaſionally: but more of this when the ſubject is before us.

Loam, or native mould, is the ſoil beſt adapted for vegetation; this in its higheſt or moſt pure ſtate is from decayed vegetables and other periſhable ſubſtances, and when acted upon by the ſun and air is rendered fertile. All other ſoils capable of nouriſhing plants are compoſed more or leſs of this mould, and other leſs fertile ingredients, as clay, ſand, chalk ſtones and the like; and according to this mixture, the ſoil is prolific or barren. The ſoil thus blended by nature ſhould be the farmer's firſt conſideration, for on that depends what is called the goodneſs of the land, or the eſſential matter to the growth of crops of corn, and other vegetables. This pure mould being the lighteſt of thoſe ſeveral ſubſtances which compoſe the earth, naturally lies on the ſurface or above the others, in various thickneſſes according to the nature of the ſoil; which mixed with the under layer, bed, or as ſome term it the pan (by too deep ploughing) generally injures the fertility of the lands. The loamy ſoil in the greateſt eſtimation is known by its tender ſoftneſs and blackiſh colour, being with eaſe crumbled to pieces; it is juſtly called the heart of the land, or principal nouriſhment to herbage.

When the greateſt part of the ſoil is compoſed of this rich or vegetable mould, it is likewiſe termed loam, or loamy earth, whether the admixture be clay, ſand, or other earthy ſubſtances; for this reaſon, loamy ſoils differ in colour and quality. When a reddiſh ſand makes a part with or without a ſmall portion of clay, it is called a yellow loam; and is land well adapted for all kinds of corn, roots, and moſt kinds of graſſes: it is eaſily worked, not ſo liable to touch graſs and other kinds of running weeds, therefore eaſily kept clean. There is likewiſe another kind of ſoil generally called a tough, ſour black loam. This is compoſed of a black or blue clay, and native or vegetable mould, and is fertile in proportion to the quantity of the latter. If this ſoil is without ſmall ſtones or gravel, it requires much ploughing, and occaſionally to be expoſed to winter's froſt and ſummer's ſun; for however ſpeculative theoriſts, and thoſe determined friends to the drilling ſyſtem, who figure away in Mr. Young's annals, may argue and attempt to prove to the contrary, we will venture to pronounce that no perſon can manage this kind of land, and a ſtiff clay, to a proper advantage, unleſs he ſometimes turns it up to the froſt and ſun; but this comes more properly under *the article following*. This ſoil is ſubject to a variety of weeds, as couch graſs, docks and others equally difficult to deſtroy, which renders frequent ploughing, and careful weeding the more neceſſary; wheat, oats and beans are the grain beſt ſuited to this kind of ſoil, and turnips, if cattle can eat them off in the winter, without injuring themſelves or the land by treading it;

or turnips may be drawn and carted off the land for cattle in houſes or on paſture. This method renders the crop of turnips very uſeful, but does not enrich the ground on which they grew. Clover and rye graſs, with a ſmall mixture of trefoil, are the beſt graſſes to ſow on a ſtrong loam; if it is continued graſs no more than one year, clover alone is preferable.

A loamy ſoil with a mixture of ſmall round ſtones is, beyond a doubt, the moſt pleaſant land a man can cultivate, and although not poſſeſſed of ſtrength equal to the land we have been juſt taking notice of, is, for general culture, ſuperior. All kinds of grain, graſſes of all ſorts, turnips, and potatoes, may be cultivated with advantage, and if the farmer does not covetouſly crop it too much, it will prove the moſt profitable land he can plough. Loam mixed with pebbles, or flints, is generally called a gravel loam; it works eaſy and may be cropped like a ſtoney loam, but requires more manure, and is not ſo certain.

Clays are of various colours, as red, blue and white, darker, or lighter, according to the ſort which is predominant: they all agree in their general nature, and may properly be treated of together. Clays are cold and tough, retain a great deal of moiſture; or, on the contrary, when completely dried, the ſurface becomes ſo very hard, that the rains do not eaſily penetrate. In proportion as clays are united with natural or vegetable earth, ſo is their fertility to be eſtimated, their colour is not to be regarded, but their quality. The ſun and froſt are friendly to all kinds of clay ſoil, and lying wet in winter is particularly injurious. The plough ſhould not be ſparingly uſed on clay in dry weather, and the rougher you lay it expoſed to the froſt or ſun the better. Cattle lying on clay in winter materially hurt the land, and it ſeldom benefits the cattle. Buck wheat, or tetches, ſowed and ploughed in, is a good and cheap improvement, which will be conſidered under the article *manures*. Wheat, rye, beans, and clover, ſeem beſt adapted to grow on clay.

There are ſeveral kinds of ſand diſtinguiſhed by their colours, as brown, red, yellow, and white; theſe ſands without a mixture of earth, or clay, are barren, being only the ſport of winds not ſufficiently adheſive to afford any nouriſhment to the roots of plants. Sand, when it thus forms the covering or ſurface of the earth, muſt be called the ſoil; but being ſo uſeleſs in its nature is ſeldom cultivated to any advantage. If clay, or marle, can be eaſily obtained it may be improved, but at too great an expence to fall upon a tenant; therefore, this kind of ſoil is not what we would wiſh the huſbandman to underſtand as a ſandy ſoil. We mean a ſoil in which ſand is predominant, although there are other kinds of earth in the mixture.

Sandy ſoil, when the ſand does not make too great a part, are cultivated with profit and eaſe, as they are worked in all ſeaſons with leſs difficulty than any other kind of land. Sandy ſoils are warm, or cold, according to the ſubſtances with which they are incorporated; thus, when mixed with pebbles, or flint, it yields its produce more early, and is ſubject, if paſture, to be burned up by a continuance of dry weather; and if arable, is rendered almoſt barren by what is called a dry ſummer. This is enriched by turnips, if cattle eat them off in a proper manner; crops of ruſk wheat, or other juicy vegetables, ploughed in before they bloſſom, alſo add much to its fertility, perhaps more ſo than on any other kind of ſoil. Wheat, barley, peas, and all kinds of graſſes, are adapted to the gravelly ſand; and ſtrong manures will always meet a welcome reception, and quickly loſe their virtue.

A ſandy ſoil with a mixture of red mortary earth, which runs to a conſiderable depth, is generally backward in yielding its produce, and not ſubject to burn, or feel the effects of a continuance of dry weather; this, although light in its nature, is ſuperior to the former, and is particularly adapted to oats, rye, and peas, as it ſeldom produces wheat, or barley, of a good colour, or quality. Turnips, potatoes, and particularly carrots, grow to great advantage on this kind of ſandy land: rye, graſs, trefoil, and clover, generally give good crops, and it is likewiſe well ſuited to natural graſs. On this ſoil the drill, or, what the ſpeculiſts call the new huſbandry, will be found a great improvement, as no more ploughing than juſt to keep it clean is the beſt management.

Without a mixture of other kinds of earth ſand is almoſt barren; but with a due proportion of other earthy ſubſtances it is fertile, requiring little labour and that performed with eaſe, except tough clay forms a part, in which caſe there is no ſoil more binding.

Chalk is of different kinds, ſome being hard as a ſtone, and others ſoft like marle: this renders a different mode of management neceſſary. One kind of chalky ſoil will be little benefited by what would improve the other. It is generally eſteemed the harder the chalk which makes part of the ſoil, of leſs value the land; and the ſofter the chalk, of greater value. It is much in favour of chalky ſoils, that they are the leaſt of any over-run with weeds, except ſome few of the annual kind which are eaſily kept under with little difficulty. The light, looſe, chalky ſoil, requires little ploughing, and too much is ſure to be an injury, by rendering it too fine and light to ſupport and nouriſh the roots of plants.

Folding of ſheep on this kind of ſoil is particularly ſerviceable, as, beſides the benefits which accrue from the manure, the treading of the ſheep gives it a firmneſs, which, by nature, it is much in need of; ſo ſaintfoin and rye graſs are uſeful. The ſoft kind of chalk requires more ploughing, and is naturally more fertile. Wheat, barley, and peas, are generally produced in good quantities, and of the beſt quality on the ſoft as marly chalk. It ſometimes happens unfortunate, when heavy rains immediately ſucceed the ſeeding, as by that means the ſurface is ſo firmly united that the plants cannot make their paſſage through the ſoil, conſequently the ſeed and labour are loſt: this may in ſome degree be prevented, at leaſt guarded againſt, by not harrowing too fine.

As we have ſhortly treated on the kinds of ſoil, which are in general cultivation in this country; if it ſhould be alledged, that there are ſome ſorts which we have not particularly noticed, we acknowledge there are; and at the ſame time are perſuaded, that if thoſe we have omitted are not exactly the ſame, yet they bear ſuch a ſimilarity in their nature, as their culture and produce will be nearly the ſame, and under the articles manures, or ploughing, &c. will be mentioned. To give or propoſe directions to any perſon for their choice in land, would be arrogantly aſſuming a province to which we by no means think ourſelves intitled, as we hope every farmer, before he changes his ſituation will be particular in eſtimating the goodneſs of the land, with the price per acre; what ſituation it has been in, in what manner managed, and the probable improvements that can be made, with the expences that will attend ſuch improvements, and particularly to conſider the term of his leaſe, that he may have it in his power to reap the profits of his induſtry. Mr. Wiſhaw, Mr. Black, and ſeveral other perſons who are employed by gentlemen of landed property, to put a value on their eſtates, have ſcientifically obtained the appellation of land taſters, by eſtimating the degrees of fertility which belonged to the ſoil and its quality, according to their palate. On what criterion theſe gentlemen found their ſkill, we cannot determine; but we can inform them and the public, that many induſtrious huſbandmen think their mouths muſt have been out of taſte, at the time the farms they rented were under their inſpection; for induſtry can ſeldom meet its reward, where thoſe ſpeculative appraiſers have made their appearance.

Strange as this may ſeem, it is really true, that it is at this time a prevailing cuſtom for gentlemen, when they think proper to raiſe their rents, to apply to an eminent *Land Taſter*, who perhaps reſides an hundred miles or upwards from the place where he is employed, and never ſaw the lands before, and whoſe reputation is in proportion to the oppreſſion he has been the cauſe of. When this important regulator arrives, his firſt buſineſs is to examine the *rent roll*, and make ſuch minutes as are neceſſary, to prevent his running into error: thus equipped he takes the field, and ſacrifices the ſucceſs and happineſs of thoſe individuals and their families, who are ſo unfortunate as to have their farms ſubſtituted to the teſt of this pretender's *taſte* and judgment.

It may be ſaid, if the tenant does not approve of the alteration, it is at his option to provide for himſelf in another place; he may ſo, but let it be recollected that thoſe advances are generally made at the time when a tenant has made expenſive improvements; which, with the difficulty and expence of removing, and the uncertainty attending agricultural concerns, frequently induce a man to endure an evil he knows ſomething of, than to hazard his property, where he is a ſtranger; beſides, *land taſters*, ſurveyors, and mercileſs landlords, are become ſo numerous, and taxation ſo high, that a tolerable farm is rare to be met with.

In oppoſition to thoſe gentlemen, and as friends to humanity and induſtry, we with reſpect mention the names of Mr. WILLIAM MARCO, Barrow, R. LEGRAND, Eſq. of Guilton houſe, WILLIAM HALL, Eſq. of Elmſtone, and ſome few others who correſpond with Mr. Young in his Annals. The writings of theſe gentlemen are evident proofs that they are friends to their country, to induſtry and agriculture; not judging as theoriſts, but as ingenious and liberal practitioners, who highly deſerve the farmer's moſt cordial thanks for their communications. As a contraſt to theſe characters, we cannot omit the reverend Mr. Fiſke, of Shimpling, near Bury, Suffolk. The following appears in one of his letters to Mr. Young, publiſhed in the 5th volume of his Annals, "Small farmers are obliged always to have ſome crop on their land, or they could not live, therefore, ſubſtitute clover, beans, peas, or ſomething inſtead of fallowing. Here is a ſtriking inſtance, that large rents encourage induſtry, and I believe nine times in ten advance in rent will be found of ſervice. For no ſooner is a farm raiſed but the farmer rouſes from his lethargy, opens his eyes, and contrives ſome method to pay the additional ſum." True, Reverend Sir! Otherwiſe he muſt go to gaol, and his family into the work-houſe, except, indeed, he turns his own executioner, and puts an end to a miſerable life; or another expedient, he might "contrive a method" to rob his neighbours; and then the law would find an executioner, and alſo a parſon to take care of his ſoul. Suppoſe we aſk the Reverend Mr. Fiſke, if a poor unfortunate curate who with the utmoſt ifficulty procures a neceſſary ſuſtenance for himſelf and family, s not a greater object of compaſſion than the fat and haughty ector who rolls in plenty, takes his tythes in kind, and tyrannizes n a truly Nabob ſtyle as far as his authority extends? If this is nſwered in the affirmative, ſuppoſe we transfer the analogy to poor hard working tenant, who labours hard, and fares badly; nd his wealthy landlord, who knows no want, but that of a ood appetite, and who, inſtead of feeling the excruciating pains ttendant on a poor *half-ſtarved rheumatiſm*, enjoys himſelf with *fine luxurious gout*.

The caſe being thus briefly drawn, do, Mr. **Fiske**, tell us in what manner this rich man, who lives in plenty and idleneſs, can beſt ſerve the poor man who owes his exiſtence to hard labour and active induſtry? Would it be charitable, or juſt, in either caſe, to rob the indigent man, and give to him that is opulent? This ſeems to be your opinion.

As you have already anſwered the queſtion, by aſſerting, that the way to make the farmer thrive, is to raiſe his rent. This, we think, needs no comment, as it ſufficiently ſpeaks for itſelf; we, therefore, take our leave of you for the preſent, in a few words. If thoſe, reverend ſir, are your ideas, as a man and citizen of the world, we deſpiſe your deſpotic notions, and feel for your dependents. If, as a chriſtian and a divine, we are apprehenſive you do not inculcate or practice thoſe fine morals which your religion teaches.

Being led from the obſervations which commenced this ſection, by accidentally meeting with the truly charitable opinion of this reverend gentleman, we return to the ſubject; and, although our opinion is in oppoſition to the whole *land taſting* fraternity, yet we take the liberty to recommend to the gentleman or farmer's notice, the general appearance of herbage and vegetation, in preference to the taſte or colour of the ſoil.

If winter happens to be the ſeaſon, the ſtrength and appearance of ſtubbles, with the dry or wet ſituation land appears in, and whether the land will endure treading by cattle or not: and if paſture, whether graſs appears thick or thin, if over grown with a ſtrong courſe of moſs; or if its general appearance is green, or of a whitiſh caſt; likewiſe what improvement can be made by draining, cleaning, and other operations?

In ſummer, if the ſeaſon has been regular and kind, the appearance of land ſpeaks for itſelf, nature has then clothed it in its beſt garment; whether good, bad, or indifferent, is the queſtion which the enquirer ſhould make himſelf acquainted with. Meadow and paſture are ſometimes very deceiving, when in the moſt luxuriant ſtate, as frequently the white bloſſomed clover and other delicate plants appear, in the greateſt plenty, on account of a friendly ſeaſon to this ſweet herbage, when on other ſeaſons nothing of the kind ſhews itſelf. Theſe circumſtances require a perſon ſhould conſult ſome one acquainted with the land. The beſt arable land may, indeed it does very often, bear an unkind aſpect from bad management, which a perſon with a ſlight knowledge of buſineſs will eaſily diſtinguiſh. For inſtance, if the growth of grain carries with it the appearance of poverty; the nature and ſituation of the weeds are evidences ſufficient with a diſcerning practical farmer; and as every country has ſuch uſeful men, we recommend the young and unſkilful to adviſe with ſome *ſage experienced neighbour*. It is a cuſtom with ſome perſons to take the growth of timber and other trees, and the favourable appearance of hedges, as a never failing rule to judge of the quality of the land; but this we can from experience refute; as very often trees and fences grow in the moſt luxuriant manner, and corn and graſs very indifferently; and on the contrary, good corn land frequently bears wood very badly. Beſides, one half of the hedges are ſpoiled by bad planting; or, perhaps, worſe management; of courſe, little information can be expected from ſuch a theory. By this we mean to guard the huſbandman againſt a too haſty determination; for deliberation on cauſes and effects, in general, amply pays thoſe who apply with careful caution.

SECT. II.

MANURES,

AND TO WHAT SOIL EACH IS BEST ADAPTED.

As we have conſidered the nature and cultivation of ſoils, and made ſome obſervations on their uſes; manures, the great ſupport and ſtamina of continued cultivation, come next before us. Pulverizing the land with the plough, and other implements adapted for the purpoſe, and the enriching it by natural and artificial compoſts and manures, are circumſtances on which good huſbandry chiefly depends.

We purpoſe treating of manures under the diſtinct heads, Animal, Artificial, and Natural Manures. To ſpeak of the dung of animals, as chymiſts, we do not conceive neceſſary: Why ſhould a farm yard be converted to a labaratory?

We cannot help taking notice of the **Encyclopædia**, publiſhed in Scotland; ſeveral numbers are taken up with a Syſtem of Agriculture. We ſhould have been happy to have improved our reading and experience, by conſulting that voluminous work occaſionally; but, on peruſal, we find a ſelection from Dr. Prieſtley's Philoſophical Labours, the Practice and Theory of Lord Kames and Mr. Anderſon, and a few of the Bath ſocieties papers, make a great part of their ſyſtem. However learned the editors of that great undertaking; in agriculture they are notoriouſly deficient; ſome few glaring errors we ſhall mention in the courſe of our ſyſtem; for ſhould any perſon be weak enough to follow their directions, in ſome matters, they would be inevitably miſled.

ANIMAL MANURE IN GENERAL.

As vegetation naturally exhauſts the land, ſo cattle which depaſture, by leaving the dung and urine, ſupply the defect, by returning from whence it came, what they had previouſly taken from the ſoil. If land is mowed and loſes its produce every year, and never receives any aſſiſtance from manures of any kind; ſuch land is greatly injured, and in proceſs of time the beſt ſoil may be reduced low and impoveriſhed. Animal manures ſtand foremoſt, and thoſe animals which feed the higheſt produce manure of the greateſt value; in fact, the virtue of animal manures may be eſtimated by the food which is given to the animal. Cattle of the cow kind, kept in a ſtraw yard, without any thing but ſtraw for their ſuſtenance, yield a poor light manure, little ſuperior to natural ſoil; when cows or oxen feeding on good hay, aſſiſted by corn, oil cake, or other envigorating food, yield a manure little inferior to the beſt horſe dung. Thus, the ſtronger manures are impregnated with animal ſalts, of more value they are; to preſerve ſuch ſalts requires the utmoſt care; and of all careleſs neglects in farmers this is the greateſt, it being deemed an object worth notice with but few.

Every huſbandman will tell you that one load of ſtable dung is worth five from the ſtraw yard, and yet, at the ſame time, permits his yards and dunghills to drain themſelves of their virtue, unnoticed and diſregarded. We will not comment on this miſmanagement, any further than by obſerving, that many gentlemen and experimental farmers have taken this matter into conſideration and practice, much to their credit and judicious diſcernment; while farmers who pay heavy rents, and ſhould let no opportunity of enriching their land eſcape, ſuffer the moſt eſſential part of their manure to paſs away as uſeleſs, and to anſwer no good purpoſe whatever. It is a cuſtom to turn dung and expoſe it to the air and weather in the yard; this is certainly founded in error; by ſuch means all fermentation is ſtopped, and its ſtrength is evaporated by wind and ſun; therefore let it be avoided. Should a leiſure time preſent itſelf, it is by all means to be recommended to the farmer to take the dung from his yard in its crude and undigeſted ſtate, near to the place he intends to uſe it, and mix it with earth taken from waſte roads, or if that is not in his power, from a headland or other part of the field which preſents itſelf.

It ſhould be obſerved, that in general the ſoil throwed up, and carted off with the manure, is amply reinſtated by the natural and unavoidable drainings from the compoſt heap. More on the preſervation of the virtues of manure we ſhall obſerve as we proceed.

The dung of animals, as we have obſerved before, poſſeſſes a fertilizing quality in proportion to the quantity of animal ſalts it contains: we ſhall rank them according to their quality, and the quantity of each, which can be procured to make it generally uſeful; as we deem it uſeleſs and unneceſſary to deſcribe every minutiæ of an article, which, from the nature of things, it is impoſſible to procure a ſufficient quantity to be of general uſe.

OF HORSE DUNG.

The Dung of Horſes, we mean thoſe which are kept in ſtables, is firſt in general utility, and improves all kinds of ſoil. Sir Hugh Platt ſays, that from experience he knows that "one load of grain or fruit well conſumed, and laid on a ſpot of ground, will enrich it more than ten load of common horſe dung." To give implicit credit to this circumſtance is more than we can readily aſſent to, although Sir Hugh's authority is very great; yet this may remove the doubts (if there are any) of thoſe who do not ſufficiently eſteem the dung from animals highly fed. Horſe dung ſhould be well fermented and decayed before it is laid upon the land; otherwiſe mixed in a freſh ſtate, with earth, which ſhould lie together until they are incorporated. This valuable manure laid on land too green or new, beyond a doubt encourages weeds, which we attribute to its ſuperior ſtrength or ſpirit; as what makes weeds grow luxuriant and ſtrong, will alſo make more valuable plants flouriſh with greater vigour.

As a Horſe chews his food but once, oats are ſeen frequently to paſs through them undigeſted; this often prevents thoſe who are curious in preſerving their corn for ſeed, from manuring their land intended for barley or wheat with the produce of the ſtadle: this obſtacle is entirely removed by letting it become rotten before it is uſed.

The dung of Horſes and all others of a warm kind, particularly benefit poor barren land; and on theſe we need give no caution reſpecting quantity, as people generally diſtribute their manure according to the land which wants it. It is certainly much the beſt way to manure land well when it is attempted, provided you do the leſs quantity.

Of good Horſe Dung, twenty cart loads upon an acre is thought a tolerable good dreſſing, each cart load a ſmart draft for three ſtrong horſes on level ground, perhaps thirty hundred weight.

On rich loamy land you may run into an error by too much kindneſs in manuring; ſhould that happen, we know of no better remedy in ſuch caſe, than a crop of flax or hemp, which will ſoon reduce it to the ſtandard for corn.

Every horſe dunghill is not of the ſame richneſs, although the horſes may feed the ſame; for there is much to be ſaid reſpecting the quantity of litter that has been uſed.

COW DUNG.

By Cow Dung is meant that of all horned or neat cattle. In treating on Horſe Dung, we have attempted to explain the occaſion of heat and cold in the effects of dung in general. As the higheſt fed cattle produce the ſtrongeſt manure from the goodneſs of their food, it follows by the ſame rule, that cow dung ſhould be cold and ſpiritleſs in proportion to the virtue of its feed.

Cow dung, eſpecially when the animal has good hay given, is an excellent manure, although not ſo ſtimulative as horſe dung; its nature is particularly adapted to promote vegetation. This animal manure deſerves more eſtimation than it really has; particularly that made in yards, and not lying in a ſituation to receive too much rain, nor to drain itſelf dry from urine and other moiſture.

The dung of horned cattle does not ferment ſo ſpeedily as that of horſes or pigs, provided the animal feeds equally high; perhaps this may be accounted for by the additional fermentation it receives in the ſtomach, by chewing its food a ſecond time.

On cold ſtiff clays, or loams approaching to the ſame nature, cow dung does not ſhew itſelf with equal advantage to thoſe of a warmer kind; but on warm gravel, or ſand, provided it has been carefully preſerved, it will not be found materially inferior.

The utmoſt care is neceſſary to keep this manure from being expoſed to the ſun and wind, and (indeed as you ſhould with all others) plough it in immediately as it is laid on the land; mixing it as ſoon as poſſible with earth, is good management.

HOGS DUNG.

Some of the old writers on Huſbandry diſcarded the manure made from pigs, which erroneous prejudice has been followed by ſome of a later date; but we will take the liberty to obſerve, that ſuch perſons could only write to increaſe the number of books.

The principal faults they diſcovered in the dung of hogs, was, that it "was poiſon to land, and produced nothing but weeds." Curious as this may appear, it is really a fact, that ſo fooliſh and abſurd a notion is not yet entirely exploded.

To any perſon of experience and obſervation, ſuch cenſure as this muſt be diſregarded; for it is rational, that what forwards the growth of one plant, will promote that of another.

The dung of pigs, particularly thoſe that are feeding, is unqueſtionably of the firſt quality, and laid on ploughed land in too large quantities, freſh from the PIGS COT, will cauſe weeds to grow; but reaſon ſhould direct every perſon in all their purſuits; and an error committed, is generally an ample leſſon to a circumſpect man.

It is rather foreign to our plan, to lay experiments before our readers, as we derive our information from a truly practical ſource, which we are of opinion, may be depended upon: but as an inſtance lately preſented itſelf much in favour of the manure now under our conſideration, we will preſent it to the public.

Mr. JOHN DAVIS, an ingenious practical farmer of LITTLE ROLLRIGHT, in the county of OXFORD, being led by curioſity to try the effects of pig dung, unmixed with any other, on a light ſtony loam mixed with ſand, manured about an acre with four cart loads of pig dung, not in a rotten and decayed ſtate. The acre on which this manure was laid, run acroſs the middle of a piece of about twenty acres which was under preparation for turnips, according to the uſuage of the country; or, more properly ſpeaking, a ſpring fallow, which generally happens in theſe hilly countries on oat ſtubble, after the land has been exhauſted by three preceding crops.

The lands on each ſide that we are mentioning, which was manured with pig dung, were dreſſed with about twelve or fourteen loads of good horſe dung to an acre, and all received the ſame plowing, harrowing, and other management. The reſult was, the acre on which the pig dung was laid, looked in a more kind and promiſing manner as ſoon as the turnips appeared; they were leſs annoyed by the fly or ſlug; and when at their full growth it was imagined produced double the quantity to any other part of the field of the ſame meaſurement.

The ſucceeding crop of barley bore a manifeſt ſuperiority on the pig dung manure; and the rye graſs and clover, ſowed among the barley, in order to lay the land down for two years, appears at this time more luxuriant, and of a darker colour than the lands manured with horſe dung on each ſide.

This circumſtance is evidently in favour of the dung made from pigs, as ſuch we think it worthy of notice; but it ſhould be conſidered, that it is the cuſtom in thoſe parts of OXFORDSHIRE, GLOCESTERSHIRE, and the adjacent country, not to litter their feeding pigs; of courſe the dung is entire, and free from any mixture of ſtraw or other ſubſtance. Neither do we ſuppoſe any fermentation has ever taken place, which renders the ferment more powerful with the ſoil: horſe dung uſed in the ſame manner, would in all probability be equal in virtue; the experiment might be eaſily proved.

Pigs in their nature are a very cleanly animal; this may, perhaps, be objected to by thoſe who are unacquainted with them particularly; although nature has not endowed them with thoſe ſenſitive organs of ſmelling and taſting, correſpondent with human delicacy, there is not an animal that will keep the place he ſleeps in, ſo clean as a pig will; provided the ſtye or cot is conſtructed in a proper manner.

The place of reſt or retirement ſhould be covered in, with the bottom paved with ſtone or ſome other materials, and a court adjoining walled in to give them their food.

It is uſeleſs to litter the place where they lie, as they enjoy themſelves in a cooler manner on the pavement; and there is not one pig in twenty but what will go into the court where he eats his food, and evacuate. If this court is littered or ſtrewed with ſtraw, or for want of ſtraw, earth or ſand to abſorb the urine, and keep the dung from drying, and frequently cleaned out, a great deal of valuable manure will be procured, and by that means preſerved.

Trivial as this obſervation may ſeem, it will be of more real advantage in practice, than will at firſt be imagined.

Pig dung on meadow or paſture is of great utility, mixed with ſoil it is uſed to the beſt advantage; and the moſt proper ſeaſon to lay it on is when the graſs begins to grow in the ſpring.

SHEEP DUNG

Is by experimentaliſts held in great eſtimation as a forcing ſtrong manure; certain it is that the folding of ſheep is much practiſed, and the ſucceſs attending it very great. But we do not believe it equal in virtue to either horſe or pig dung; as Mr. Davis who made an experiment with the manure from pigs, made alſo the like from ſheep, in a much larger quantity per acre, which by no means anſwered his expectation.

Folding, or penning upon land, is ſufficiently known to need any particular deſcription, and when a large flock are managed carefully, and the fold not hurried too faſt over the land, a good purpoſe is anſwered.

Land ſhould be ploughed as ſoon as poſſible after folding, otherwiſe no benefit is to be expected, except from the urine, which it is reaſonable to ſuppoſe, is in ſmall quantities, as ſheep ſeldom drink, ſometimes not when they live on dry food.

Sheep are often folded on light hollow ſandy lands, and dry hard chalk, after the ſeed is ſown, particularly wheat; this is intended to tread the land, and to improve it by making it more firm, as well as to add ſome benefit by manure: care ſhould be taken, and caution uſed in wet weather, alſo when the corn appears.

We have known ſheep drove morning and evening over turnips, when the fly or ſlug has been ſuppoſed to be buſy; and doubtleſs to a very good purpoſe, although ſuch exerciſe is by no means ſerviceable to the ſheep, particularly thoſe which bear heavy fleeces.

To houſe ſheep on nights, and litter them with ſtraw or haulm, or for want of thoſe, with ſand or fine gravelly loam, has furniſhed topics for many writers; the PLATTS, and more particularly the celebrated CAPTAIN BLYTHE, recommended the cuſtom very ſtrongly, and with as many pertinent remarks, and as much to the purpoſe as any writer of the preſent day.

This method on ſome kinds of ſoil would prove an admirable acquiſition; as a large quantity of excellent manure might by that means be obtained; to be uſed at pleaſure, and on ſtiff cold land, both that and the ſheep would be benefited; for treading ſuch ſoil does injury to both the ſheep and the land. Covered houſes, open on both ſides are preferable, with a court encloſed round according to the ſize of the flock.

On large paſture fields or downs, which are ſummer eat every year, (if ſheep are not driven to fold on ploughed or arable land) the upper part of ſuch fields will be rendered very rich and fertile by cattle, (ſheep in particular) lying on thoſe higher parts.

As the folding of ſheep on poor moſſy paſture is very improving, it would amply repay the trouble and expence to drive ſtore ſheep to fold to an adjoining paſture, which is occaſionally mowed for hay; it would be the means of helping land which wanted, without injuring that which was ſufficiently rich.

According to the preſent management of ſheep, their dung is not an important article in agriculture, any further than as they diſtribute it themſelves.

There is not a doubt that care and attention, by houſing them on nights as before deſcribed, with racks to give them hay or other food, as may be thought proper, would be a great advantage, and when put in practice attended with very little trouble.

Eating turnips off the land with ſheep, in a proper manner where the ſoil ſuits, is one of the greateſt points in the turnip culture; we ſhall be more particular under the head turnips.

The obſtacle to new methods are very formidable, in imagination, but deliberate perſeverance makes ſmall difficulties light and eaſy.

Having deſcanted on the uſe and properties of manure raiſed from thoſe domeſtic animals, which are conſidered neceſſary to the purpoſe of huſbandry in our own country, we ſhall proceed to poultry or fowl.

DUNG OF POULTRY.

By poultry we mean hens, ducks, geeſe, pigeons, and whatever elſe our readers think proper to rank with them, as no injury can accrue from uſing them as manures indiſcriminately.

Theſe contain large quantities of the eſſentials, which conſtitute ſtrong manures; and we believe principally to be attributed to fowl not having any evacuation by urine, and their feeding chiefly on corn.

In inland countries, where rich manures are not to be purchaſed, it is an object worthy the farmers notice to carefully preſerve every thing, be the quantity ſmall or large, which can add to the fertility of the land.

Prepoſſeſſed highly in favour of this method, we are certain a valuable ſource for manure lies neglected by the multitude with reſpect to the dung of fowls.

To litter with ſtraw, or lay ſand or dry mould where poultry lie, and clean them out often, and again repleniſh the litter, would produce more manure, and that of the beſt qualities, than any one not maturely conſidering the ſubject would imagine.

We would recommend this manure to be uſed on meadow, paſture, or arable lands, particularly on thoſe of a cold nature, and are well aſſured, all trouble and expence would be fully paid.

It is a cuſtom to uſe pigeons dung, by ſowing it upon young wheat for the rain to waſh it in; ſome advantage may attend ſuch a practice; but ploughing it in on arable land, is by far the moſt preferable method.

HUMAN ORDURE.

This ſhall be called, if you pleaſe, animal manure; but reſpect to our ſpecies prevented our connecting it with brute, although the word brute is frequently diſgraced by the compariſon.

An eminent writer on Agriculture, ſays, “ There is ſomething “ diſguſtful in the thought of uſing the excrement of our ſpecies, “ for the dreſſing of lands, as it is putting it again down our “ mouth.” This gentleman was certainly of a very delicate turn, as the celebrated **DEAN SWIFT** obſerves, “ Nice people have the moſt naſty ideas;” and a more filthy thought than this ſurely never entered the moſt delicate brain, even if we conſider that of a fine lady.

Do not let your nice feelings be alarmed, fair reader! For we are under the neceſſity of informing you, that the greateſt part of the vegetables and roots uſed near the metropolis and other large places, owe their forwardneſs and luxuriant appearance to the fertilizing manure now under our conſideration.

Of all others this makes the moſt exciting compoſt, and ſhould not be uſed until it has lain well mixed with earth, ſand, or clay, a conſiderable time; the mixture to ſuit the huſbandman's convenience, or the kind of ſoil he intends to uſe it upon.

Doctor Prieſtley, Mr. Young, Mr. Winter, and all the tribe of chymical and experimental farmers may diſpute, and try to diſcover the food of plants; but we defy any of them to find a more nutritive and ſubſtantial food for all kinds of plants, than this we are now ſpeaking of; if properly adminiſtered.

This manure, as previouſly obſerved, cannot be obtained, except near large cities or towns; therefore, we adviſe thoſe who have an opportunity of getting it, by no means to let it paſs unnoticed; obſerving to mix it well with earth, and let it lie thick near twelve months.

ARTIFICIAL MANURES.

This brings us to artificial manures: we deem thoſe artificial which are calcined or undergo ſome proceſs before they are rendered of uſe as manure, and which we diſtinguiſh by **LIME**, **SOOT**, **ASHES**, **RAGS**, and improving land by **PARING** and **BURNING**, commonly called breaſt plowing and burning.

LIME.

Uſing lime as a manure has been practiſed upwards of two hundred years in this country, and continues in uſe to the preſent time, which is certainly much in favour of its utility, and proof poſitive that it is advantageous. In ſome countries, where materials for fire are expenſive, it is uſed on land at the expence of eight-pence per buſhel; and perhaps fetched ſeven or eight miles diſtance, which conſiderably enhances the price.

Lime being a ſtrong alkali is ſuppoſed to fertilize land, by correcting and blunting the vitriolic acids with which moſt ſoils abound; when ſuch purpoſe is anſwered by deſtroying the effects of thoſe acids, it is ſuppoſed lime loſes its fertilizing quality and becomes uſeleſs, nay, ſome pronounce it injurious. In ſupport of this, it is generally known that lime is ſeldom uſed to ſo much advantage after the firſt or ſecond dreſſing.

In lime it is well known there is nothing of a nutricious or oily property, that can poſſibly be conducive to vegetation; and that mixed with earth in a proper manner, it ſtimulates the growth of corn and moſt other kinds of plants in a very eminent degree.

On ſome kinds of land we find it of no uſe whatever, whether the ſoil be poor or rich, conſequently it requires judgment to diſcern on what ſoil it is proper to uſe it; and likewiſe the moſt proper manner to apply it, to anſwer the purpoſe.

Some account for the good effects of lime, in quite a different manner than that above-mentioned; namely, by attracting and drawing its enriching, and fertilizing qualities from the atmoſphere; this opinion has for its advocate, the *celebrated georgical* **DR. HUNTER**, and other ſcientific gentlemen.

Such an idea as this deſtroys the common practice of uſing lime, mixed with earth or dung; and likewiſe the cuſtom of ploughing it in, as ſoon as laid on the land, as burying it muſt neceſſarily prevent its atmoſpheric attractions.

When doctors diſagree, how are farmers to determine?

By Mr. Young's leave, we will preſent our readers with a letter from the *Annals of Agriculture, Vol. 4. page 47.*

ON THE ADVANTAGE OF MIXING LIME WITH DUNG.

By ROBERT ANDREWS, ESQ. of AUBERIES, near SUDBURY.

“ CART the dung out of the farm yard, ſometime in De-
“ cember, and continue to do it as made, in the following
“ months, till the heap amounts to about 120 loads, each 40
“ buſhels; if made larger, the dung does not rot ſo well; when
“ finiſhed, leave it about two months, and then add 200 buſhels
“ of lime, which is ſold at the pit at 5d per buſhel, mix the
“ whole together immediately; but it is to be obſerved, that the
“ dung muſt not be dry, if it is, it will fire by being mixed with
“ lime; let it lie three months, and then ſtir it over again; the
“ expence of the firſt ſtirring is 1d a load, and of the ſecond $\frac{1}{2}$,
“ carry it on to the pea ſtubble as ſoon as harveſt is over, and
“ plough it in for barley; if the ſeaſon does not ſuit for cart-
“ ing, take the opportunity of a froſt; this management has
“ anſwered ſo well, that upon an average of 12 years, my
“ barley crops have amounted to four quarters ſix buſhels per
“ acre. I have at different times laid ſome dung on without
“ lime being mixed, and the difference was very perceptible; ſo
“ that from many experiments, I find it neceſſary to ſpread 12
“ loads an acre, inſtead of 10, which, with the lime, is the
“ uſual quantity.

“ The benefit reſulting from the lime is to be attributed to
“ two circumſtances, firſt, it deſtroys the ſeeds of weeds, ſo that
“ I have always found the land cleaneſt where the lime mixture is
“ laid; and, ſecond, it brings the dung forwarder, by raiſing the
“ fermentation higher. The expence of the lime 10s. an acre,
“ which holds very good for four crops; and I have, in one
“ inſtance, ſeen the difference of part of a field being manured
“ with lime muck, and the other part with muck without lime,
“ four years after it was ſpread.”

This practical information from Mr. Andrews, a gentleman, according to Mr. Young, who ſtands very high in Agricultural experience, is a matter of much importance to thoſe who uſe lime as a manure, or who having it in their power, omit it for want of being informed of its effects.

As a further confirmation of its merits and demerits, likewiſe its effects on various ſoils, the methods of uſing it as manure and other matters, eſſential to be known, we take the liberty to tranſcribe another letter from the Fifth Volume of Mr. Young's Annals, page 147.

By R. LEGRAND, ESQ. of GUILTON HOUSE, near SANDWICH.

ON LIME.

“ IN the courſe of my Huſbandry, I have frequently uſed it,
“ ſometimes upon a large ſcale, and always with ſucceſs upon
“ arable land. General method, one buſhel upon a rod, covered
“ the ſoil till it is ſlacked, then ſpread abroad, and ploughed in.

"Experience juſtifies a better way, viz. hot as poſſible from the kiln; ſpread it immediately upon the ſoil; and no more in a day than can be ploughed in the ſame day.

"I have uſed it upon ſandy, loamy, and clayey ſoils; all have have been greatly improved, but moſt ſo the ſandy.

"Upon paſture land, neither expenſe nor expectation have been anſwered.

"I have applied it ſimply, and mixed with mould, making a compoſt of 40 loads per acre, allowing 5 loads of lime to 35 of mould.

"At the ſame time a portion of land in the ſame field, and contiguous thereto, has been dreſſed with the ſame ſort of mould well pulverized; reſult, the compoſt much better than the lime alone, and ſuperior to the mould alone, more in ſeeming than in fact: both the lime and compoſt gave a more early and lively verdure; but the ſuperiority was of ſhort duration.

"In the compariſon of Chalk and Lime, it is neceſſary I ſhould ſay, my experience is decidedly in favour of chalk upon arable land.

"Lime alſo greatly cleans the ſoil from weeds, and eſpecially deſtroys the wild marygold."

We cannot ſay too much on the diſintereſted and candid manner in which this gentleman acquits himſelf in his correſpondence with Mr. Young; from ſuch a ſource, every part of the community are benefited; and the Annals of Agriculture become reſpectable and inſtructive.

To this experimental information, we add the practice of Mr. Fowler, near Chipping Norton, in the county of Oxon. On paſture, the ſoil, a ſtiff clayey loam, he mixed mould, the ſhovelings of a limeſtone turnpike road, and lime freſh from the kiln; about one eighth lime. This compoſt was collected and thrown together in the winter, and ſpread on the land early in the ſpring, about 10 cart loads to an acre. The reſult was the herbage which was before benty and thin, with a mixture of rye graſs; (owing to the land not being laid down paſture more than eight years) entirely changed its nature, growing much thicker, and conſiſted of white clover and other ſweet graſſes. The cattle fed on the part manured with avidity, and while there remained a blade uncroped, would not touch that part of the ground which had not been dreſſed.

Mr. LEGRAND obſerves that lime gave a more early and promiſing verdure, but it was of ſhort duration; how Mr. Fowler's may continue, we cannot determine, as it was done but laſt year, but it has the moſt promiſing aſpect.

The ſame gentleman, a few years ſince, uſed lime on black ſour hill land, at the time it received a ſpring fallow for turnip; but was diſappointed in his expectation, both with the turnip, and the ſucceeding crop of barley. In all probability, in the laſt inſtance, the lime was not applied in a proper manner; in fact, we think it lay on the land a long time before it was ploughed in; certainly a cuſtom founded in error.

Upon the whole, it muſt be acknowledged, lime is a fertilizing uſeful article as a manure, but not of much permanence, or to be too often repeated on the ſame land; and on ſome ſoils not beneficial equal to the expenſe.

Before a farmer runs into an expenſive uſe of lime, prudence ſhould direct him to try the experiment on a ſmall ſcale, by ſelecting ſmall pieces in the midſt of fields, uſing different quantities with different mixtures, by which advantages might be anticipated, and loſs and trouble often prevented.

The uſe of lime, in Agriculture, only comes under our conſideration at this time; directions for making, and its other uſes, ſee the Article LIME.

SOOT.

Soot, another artificial manure, which is alſo produced by fire. Soot is of different kinds, being made from both wood and coal, uſed as manures: their effects are the ſame on vegetation, although long arguments have been uſed by various writers, as MORTIMER, HALE, and others, to adapt each to particular ſoils to anſwer their reſpective purpoſes.

We can, from experimental authority, aſſure thoſe who have an opportunity of uſing ſoot, that each kind anſwers the ſame purpoſe. On ſome kinds of paſture land, ſoot does not ſhew itſelf to advantage equal to others: on meadow, where drift ſand was an excellent manure, we knew ſoot uſed at the rate of forty buſhels to the acre on a ſmall part in the middle of a meadow; the reſult was not viſible, as the ſmalleſt traces of improvement never appeared. We muſt confeſs this circumſtance is quite oppoſite to the general theory reſpecting ſoot, but thought it our duty to record it, as we ſaw the experiment tried. Thoſe who manure with ſoot, are in general well ſatisfied with the advantege which ariſe; as the following extract from the Annals of Agriculture, Vol. V. p. 148. by R. LEGRAND, Eſq. is an inſtance of.

"Soot is moſt evidently an excellent manure for paſture land. Quantity 40 buſhels per acre. I generally dreſs from 7 to 10 acres annually with it; and the ſucceſs anſwers every reaſonable expectation.

"One acre of lucerne, reſerved for my horſes, receives annually a dreſſing of 40 buſhels, and I am perfectly ſatisfied with the reward it gives.

"N. B. One rod of lucerne cut juſt before flowering, will weigh upwards of one hundred weight."

This extract from ſo faithful a reporter of cauſes and effects as R. Legrand, Eſq. we look upon as a leſſon, which may guide thoſe who have not uſed ſoot as a manure.

It is frequently ſowed on young peas and other kinds of grain to deſtroy ſlugs and ſnails, and to a very good purpoſe. The time this ſhould be done is very early in the morning, or late in the evening, when thoſe inſects are out of the earth and feeding; as the eſſential part is loſt when it is uſed in the day time, by the ſun, air, or rain.

Soot is an alkali and oily compoſition, conſequently a ſtimulative and nouriſhing manure; the ſooner it is uſed after it comes from the chimney, the better it will anſwer the purpoſe; as like other manures, its virtues fly when expoſed to the air. The beſt method of uſing ſoot is by mixing it well with earth, and on paſture ſpread it early in the ſpring; if rain comes ſoon after it is laid on the land it is fortunate, as by that means its virtues are waſhed into the earth. On arable land it ſhould be buried as ſoon as diſtributed, for the ſoil to imbibe its virtues. *Malt kiln duſt*, and *malt duſt*, the one being the ſweepings of the kiln, and the other duſt or roots ſcreened from the malt. The former is greatly ſuperior in quality, as manure it is much like ſoot in its operation on land, and in general uſed the ſame. The latter is likewiſe uſed on land, but not with equal ſucceſs.

They are both excellent to put in the houſes where poultry or pigeons lie, to mix with and abſorb the moiſture of their dung, and are improveable on arable or paſture, but moſtly uſed on paſture. This brings us to aſhes and their uſe.

COAL AND WOOD ASHES.

Mr. YOUNG has very ingeniouſly made various experiments on manures, and ſeems well ſatisfied of the good effects of wood and coal aſhes, as promoters of vegetation; particularly wood aſhes, when uſed on ſoils that abound with *vitriolic acid*. This language to farmers can only puzzle and make them ſcratch their heads, and ſhould they be prompted to conſult the rector, curate, or an apothecary, it is full twenty to one, they could not be informed whether the land contained *vitriolic* acid or not. As we hope to make ourſelves underſtood by farmers, we would adviſe them when doubts ariſe to make experiments on a ſmall ſcale, and thenthey may go to work more expenſively, with courage and ſatisfaction.

Coal aſhes, on rough ſour paſture, are an excellent manure, rendering what cattle would not eat, ſweet and palateable to them; in truth, we will pronounce it unequalled in making coarſe paſture land ſweet and fine; and if you give a good dreſſing it will endure; we mean by a good dreſſing, fifty or ſixty buſhels to an acre.

We have known wood aſhes uſed to much leſs advantage on paſture, and cannot by any means think them equal in value; they are ſometimes uſed on wheat and other corn in ſpring, but are not equal to ſoot. On all kinds of arable land, aſhes ploughed in with the ſoil, are a valuable manure, the land ſhould work fine when munured with aſhes; ſuch kind of manures tend greatly to deſtroy weeds.

Before baſilla was ſo much uſed in making ſoap, wood aſhes were difficult to procure for the purpoſe of manure; but they are of late become more plenty in ſome countries.

Soapers aſhes are a powerful manure on arable or paſture land, they being a mixture of lime, wood aſhes or barilla, ſalt, and likewiſe ſtrongly impregnated with animal oil. This manure, judiciouſly uſed, ſweetens herbage, and is in every reſpect valuable. But Mr. WINTER, *Author of the Compendious Syſtem of Huſbandry*, could not be ſerious, when he recommends "one hundred and ſixty, or two hundred buſhels per acre, on paſture;" if that is his practice, we cannot wonder at his caution; that when "uſed to exceſs he has known it very hurtful, like a man drinking too much brandy."

What we call uſing it judiciouſly, is mixing it with earth or dung in compoſt about an eighth or tenth part ſoapers aſhes, and then ſpreading about twenty load of ſuch compoſt to an acre early in the ſpring, if on paſture, and if arable when you plough for ſeeding.

WOOLEN RAGS AND WOOL-CLIPPINGS.

Woolen rags and wool-clippings are a good manure for arable lands, on any kind of ſoil; the way they are uſed is by cutting them in ſmall pieces, like taylors ſhreds, ſowing them on the land before it is ploughed, about twenty buſhels to an acre, or more, as no one need fear injuring their land by laying on too much. This manure will endure a long time, and does not yield its virtue the firſt year; but will keep improving ſeveral years.

AGRICULTURE.

Dr. **Pott**, in his Hiſtory of Oxfordſhire, ſays, woolen rags were eſteemed a beneficial manure for land, in that county, at the time he wrote; and that they have been ſo according to tradition in remote ages. Woolen rags are to be purchaſed in large quantities in ſea-port towns, and other large places; and we aſſure the farmer, they are an article well worth his notice.

To artificial manures may be added leather parings, horn ſhavings, pulverized brick, old mortar, and other matters from old buildings: theſe are of conſiderable ſervice when laid on coarſe paſture, or ſour arable; and ſhould by no means be neglected; for their uſe is very great, which experience will ſhew.

As the benefits which accrue from paring and burning, more commonly called breaſt ploughing and burning, are by means of the aſhes, and the action of fire on the earth; we proceed next to

BREAST PLOUGHING AND BURNING.

This is likewiſe in ſome countries called bumbarting, and in others denſhiring, ſuppoſed to bear an alluſion to Denghbyſhire, the county where it was firſt practiced in this country. The antiquity of this practice is very great, **Hesiod**, **Virgil**, and **Columella**, make mention of it; and it is very probable, the Romans introduced it into Britain.

Matthew of Weſtminſter, ſays, it was a practice in Wales to pare the turf from the ſurface, and burn it when dry, by which means this moſt barren land was rendered fertile.

From theſe inſtances, it is doubtleſs an ancient cuſtom; and at this time, that large extent of hills called the Cotſwold Hills, in Glocesterſhire, and Wiltſhire, are kept in cultivation by means of breaſt ploughing and burning.

Some gentlemen of landed property entertain a notion, that repeated ploughing and burning weakens and injures the land; to this we can only obſerve, that in the country we have above noticed, thouſands of acres have been breaſt ploughed, and burned once in ten years, ſometimes oftener; and ſometimes not ſo often for ſixty or ſeventy years paſt, and rents have kept riſing; inſomuch that lands, which let for four or five ſhillings per acre 30 years paſt, let now from ſeven to fifteen ſhillings; and are improved in quality.

Although Mr. Young juſt rode through it, and called it an "ill-cultivated country," we can aſſure him, conſidering the natural poverty of the ſoil, this kingdom does not ſhew ſo large a track of land in better cultivation. It is true, thoſe drilling fancies are not ſo much in vogue as they are in ſome other parts of the kingdom; but ſummer fallows for wheat or barley, have given place to turnips for upwards of 30 years.

Spring plowings and manure are the preparations for the turnip crop, which is ſucceeded by barley, rye graſs, clover, and trefoil, are generally ſowed among the barley. The land being generally broke up for wheat, if a turf of any ſubſtance is formed, it is generally breaſt plowed and burned.

Farmers have commonly a piece or two of ſaintfoin, which laſts 12 or 16 years, which when broke up is invariably breaſt ploughed and burned, either for turnips or wheat; but the former is better deemed the beſt management, and with juſtice on the poor land with which the Cotſwold hills abound.

Better crops of turnips are not raiſed in England than in the barren hills of Glocesterſhire, nor are they any where more carefully hoed; hoeing has been the general practice for more than 20 years; *but more of this, when we ſpeak of turnips.*

Breaſt ploughing and burning is a laborious exerciſe, but thoſe thoſe men who are accuſtomed to work at it perform it with as much eaſe and pleaſure as any other of the different branches of huſbandry.

Many perſons have endeavoured to invent methods to perform the ploughing or paring, by means of horſes: but as yet every effort has proved ineffectual.

It is particularly requiſite, to pare the ſurface as thin as poſſible, that the aſhes may be free from the earth calcined or burnt, which it is generally imagined is of no ſervice to vegetation: it is alſo neceſſary to pare the turf thin, as it burns much the better, particularly in wet catching weather.

On land free from ſtones or gravel, it is probable, paring the turf to burn might be performed with a horſe or horſes; a method that would make the expence much eaſier; but on ſtony or gravely ſoil, we think it impracticable.

Mr. **Winlaw**, of *Margaret ſtreet*, *Cavendiſh ſquare*, has a paring plough which he made, and has ſold many of them, and of which he has received very favourable accounts; this ſeems the moſt promiſing machine we have ever ſeen of the kind; for an engraving and deſcription, we refer the reader to the article Implements of Huſbandry, &c. alſo for the common Breaſt Plough, and its deſcription.

Breaſt ploughing is generally performed early in the ſpring, and the turf ſeldom burned till well dried by the ſummer's ſun: if it happens to be burnt long before the time of ſeeding, whether turnips or wheat, it is deemed good management to ſpread the aſhes and rib, or reſt balk, the land croſsways and very thin.

Ribing or reſt balking is performed by ploughing a furrow, and leaving the intermediate ſpace unploughed, by which means the ſurface of the ploughed furrow and that unploughed, lie one upon the other, and incloſe the aſhes between them; this prevents the wind and air from exhaling the virtues of the aſhes, and when ploughed acroſs at ſeed time ſomething deeper, mixes the aſhes and ſoil duly.

This method frequently makes, what a farmer calls, rough work; for wheat, we make no doubt, ſuch rough ſituation of the ſoil is preferable. We have known breaſt ploughing and burning performed early in the ſpring and barley ſowed; but it is ſeldom the weather will permit, and the method is by no means adviſeable. Breaſt ploughing and burning rough grunſward has been uſed advantageouſly, particularly on freſh boggy land full of ruſhes, ſegs, and other plants uſual on wet ground.

Mr. **Robert Line**, a young enterprizing farmer, of Rendecombe, near Cirenceſter in Glocesterſhire, breaſt ploughed and burned a conſiderable quantity of newly drained land; and on its not becoming fine the firſt ſummer, ſerved it the ſame the next ſpring, which made a very valuable, although expenſive, improvement.

Such exertions as theſe deſerve every encouragement, and a gentleman of diſcernment will always reward a tenant who ſo earneſtly endeavours at improvement.

In burning the turf, care ſhould be taken to attend the heaps while they are on fire, and cover in the ſmoke, when it is ſeen to riſe rapid; this is done with thoſe looſe turfs which fall down on the ſides of the heap, and one perſon will be able to attend an acre: by this care the aſhes are rendered ſuperior in quality.

We preſume it will be uſeleſs to give particular deſcriptions of paring and burning, as the practice is old and general.

If in any country there ſhould be men and their families wanting, to perform ſuch labour, in a proper manner, we are well aſſured 50 might be raiſed on the Cotſwold hills in Glocesterſhire, in a few days, who would go 100 miles, or any diſtance, if they could meet with a ſummer's labour; the price of ploughing, burning and ſpreading the aſhes, is from fourteen to twenty ſhillings per acre.

NATURAL MANURES.

In treating of natural manures is, we mean ſuch as are uſed without any previous preparation, by fire or artificial proceſs, as **Marle**, **Chalk**, **Lime Stone** pulverized, **Sea Shells**, and the effects of one ſoil upon another.

It is proverbial with old farmers, "*that ſomething may be always* "*diſcovered by digging in the earth, which will enrich the ſurface.*" How unfortunate to Agriculture ſuch an idea is not more frequently put in practice: this is a maxim well known, but ſeldom attempted. To account for this remiſs conduct in huſbandmen, we need look no further than the expence attending ſuch improvements.

In the article

MARLE,

Wherever it is found, is certainly a great acquiſition, and in thoſe countries where it is not ſought after or regarded, undoubtedly there is a groſs neglect.

The criterion by which Marle is known is its fat and ſlippery appearance, when rubbed in the hand; after being wetted, it falls to pieces like dry fuller's earth, or quick lime. If a piece of Marle lies expoſed to the ſun and air, it tumbles to pieces, bearing ſomething of a hoary appearance. If the dry powder is thrown into a briſk fire, it will crack like ſalt when caſt into the fire. Another method, by which Marle is proved, is putting it into water, if it effervice or ſparkle in the water; this trial is deemed ſatisfactory. Marles are of different colours, as blue, white, red, and yellow; the colour makes little difference, provided the quality is of an enriching nature.

Sometimes Marle is diſcovered near the ſurface, but generally deep and below different ſtrata of clay, rock, or mould; and as the quantity neceſſary to render ſervice to land is conſiderable, the expence of marling is very great.

To give a proper idea of marling and claying, we are confident Arthur Young, Eſq; as a friend to improved Agriculture, joins us, in commending the practical and concluſive opinions on the ſubject given by Mr. W. Macro, in the Ninth Volume of the Annals of Agriculture, page 117.

As ſuch genuine information cannot be too much diſſeminated, we give an extract, and although rather too much at large, conſidering our plan, which is to treat of every thing, we are well convinced our readers whom it concerns will think it much too ſhort.

On the Expence and Profits of Claying and Marling, and how far it anſwers for a common Farmer to be at all the Expence himſelf.

By Mr. W. MACRO.

"I Promiſed to give you my opinion in writing, why I thought Claying and Marling did not anſwer to a common farmer, even on a 21 years leaſe, although he might in that time improve the lands, ſo as to be worth two or three ſhillings an acre more to the landlord.

" As a well wiſher to all improvements in Agriculture, I am ſorry to find, that it is now quite out of faſhion for the proprietors of lands to bear any part of the great expence that attends Claying and Marling, and which, on that account, falls cruelly heavy indeed upon the common farmer, that has a taſte and ſpirit for improvement; and who, too, after ſpending a ſum of money nearly equal to the value of the lands he improves, lies under a certainty, I may ſay, of not enjoying the benefit of them for little more than 15 years, without the ungrateful return for all his labour and induſtry, that of being obliged to pay an advanced rent for his own improvements.

" To begin with the expence: The firſt is the filling, which (including ſpreading) is 25s. a hundred, or 2d ½ a load, with an allowance, by ſome farmers, of 2s. 6d. by others of 5s. for opening the Pit; and 1s. a load for all the large ſtones they throw out at the time of filling, the farmer to find drifts and ſtakes, for letting down what they call the falls.

" The team muſt conſiſt of four ſtrong traice horſes, and two ſhaft ditto, which for ſuch ſtrong work, muſt have very high keeping; I cannot, therefore, lay their labour at leſs than 2s. a day each, and the carter at 1s. 6d. a day, which, ſuppoſing they carry one day with another, (allowing for wet weather, and hindrance by accidents, &c.) 30 loads a day, will be about 5d ¼ per load more, making in the whole 7d ¼ a load, for filling, carting, and ſpreading.

"As farmers differ in their opinion about the quantity that ſhould be laid upon an acre, ſome preferring 80 loads, and others 70, I will take the medium, aud ſay 75 loads, which at 7d ¼ a load is

	£.	s.	d.
Per Acre	2	8	5¼
Harrowing and rolling ſeveral times to pulverize and ſpread it equally on the ſurface, per acre	0	1	6
Picking the ſtones up and caſting off, where uſed for the highways	0	0	0
Loſs by the ſtones thrown out by the labourers in the pit, the farmer ſeldom making half the money of them again, about a load to 70 loads of clay . . .	0	0	0
Wear and tear of carts and harneſs, including accidents, at a farthing a load per acre	0	1	6¾
Drifts, ſtakes, &c. &c. per acre	0	0	0
Loſs of ſeed, as it ſhould always be laid upon a layer, and lie ſome months before it is ploughed in, per acre	0	1	0
	2	12	6
Intereſt of the above ſum, for two years and a half, as it will be ſo long before the farmer gets any of his money into his pocket again . . . . . -	0	6	6¾
	2	19	9¾

" The next expence the farmer has to encounter, and which muſt ever be a bar to all improvements in Agriculture in this kingdom, as the laws now ſtand, is the tithes; for no ſooner has he been at the expence of carrying a thouſand or two thouſand loads of clay, or marle, than his good rector comes and demands a larger compoſition.

" The farmer's argument, that he has been at all the expence, and has not yet got his money into his pocket again, is of no avail; for he tells him, that the tenth of all his paſt and future improvements are, by the Engliſh laws, as firmly veſted in him and his ſucceſſors, as if a tenth part of the expence had been taken from his (the rector's) own pocket; therefore, if he will not give him ten or fifteen pounds a year more for the next three years, he muſt draw his tithes.

" The farmer unwilling to have the tithe cart come and carry away a part of the improvements, ſo recently laid on, ſays, he will agree to the advance, provided it is for the remaining part of his leaſe, if they both live ſo long: No, ſays the rector, as you are going on with your improvements, at the three years end, my tithes will be worth more, and ſo on the next, and the next three years; and ſo it is, I ſuppoſe, that ſome improved farms in Norfolk (as I have been informed) have before the firſt leaſe is expired, paid nearly as much tithes as they did rent.

" Of this, I ſhall take notice again in another place, and return to the £2. 19*s.* 9*d.* ¾, which ſum, being money ſunk upon another perſon's eſtate, the intereſt of it is not only an additional rent to the farmer, of about three ſhillings an acre, but he is in all fairneſs in the courſe of his term, to be reimburſed, the principal likewiſe; and which ſums added together, allowing for the decreaſe of intereſt, as the principal is paid off, I calculate to amount to 5s and 6d an acre per annum; which, ſuppoſing the rent to be 5s an acre when the farmers enter upon his farm, more than doubles it, from the time of improving, till the leaſe expires.

" I will now calculate the improvements and compare them; but before I do this, it will be neceſſary to remind you, that there are many lands where the clay or marle beneath the ſurface, is ſo intermixed with ſand, that there are many hundreds of loads carried that yield no improvement at all; another thing is, that ſuppoſing the marle, &c. good, yet if the carriage is long, or it is laid on ſhiftable fields, which are ſubjected to two crops, and a fallow, I am of opinion that in this caſe likewiſe it never pays half the expence; becauſe, being obliged to plough the clay or marle in directly, and continuing the common, it is ſunk and loſt before it ever incorporates properly with the ſoil; theſe failures, therefore, may fairly be laid at one fifth of the lands covered.

" To proceed to the calculation of the profits from the produce, I will throw the lands into the following courſe.

" Firſt, peaſe dibbled, or oats harrowed in, upon the flag with one plowing; ſecond, turnips; third, barley; fourth and fifth, layer for two years.

" Now as lands thrown into the above courſe, would by reſt, and taking only two crops of corn, and one of turnips, in five years, be in a ſtate of improvement without clay or marle; I can ſay the additional produce to each crop, on account of the clay, &c. (ſuppoſing it anſwers the farmer's wiſhes) only be as follows:

	£.	s.	d.
1. If with peaſe one comb, or if with oats, ſix buſhels per acre	0	12	0
2. Turnips per acre	0	4	0
3. Barley per acre, ſix buſhels	0	15	0
4. Layer per acre, firſt year	0	4	0
5. Ditto ſecond year	0	2	6
	1	17	6
Deduct 1-tenth for tithes	0	3	9
	1	13	9
The 5th of which is	0	6	9
But as 1-fifth of the claying fails of improvement, 1-fifth of this ſum muſt be deducted . . .	0	1	4
Extra profit on account of the clay, &c. per acre	0	5	5

" If I am right in the above calculation, (and if not I wiſh to be ſet right) a farmer who has a ſpirit to improve another perſon's eſtate, by clay and marle, may, in the courſe of a 21 years leaſe, get nearly all his money into his pocket again: but then you will ſay, that the great expence being over, he will have the advantage in the next leaſe; certainly, as he has had no advantage in the firſt term, his landlord can and ought to give him ſome in a ſecond; but there is no pull upon him, but honour and gratitude; and if the tenant is not in better luck than ſome folks I could name, he will find upon a new agreement, that he will have to pay very dear for improvements made wholly at his expence, or be obliged to turn his back and leave them.

" Yet far be it from me to ſuggeſt, that there are not ſome worthy characters, that have nobly and generouſly ſaid to a tenant at the expiration of a leaſe, " I know you have been at a very great expence in improving my eſtate, therefore go on and enjoy it at the old rent, ſo long as we both live." Two or three inſtances of this ſort have come within my own knowledge; I wiſh, for the encouragement of improvements in Agriculture, I could ſay 20 or 30.

" But ſuppoſe there were more inſtances, and a farmer was lucky enough to begin to improve a large tract of land, under one of thoſe worthy landlords, before a 21 years leaſe was expired; it is odds, but he might be dead, and his heir might be quite a different character; or, if as good a one, I am ſorry to ſay it, there are too many fools, nay knaves, they ought to be called, of farmers, that would endeavour to ſpoil him by going ſecretly, like a thief in the night, and offering all the rent that his induſtrious tenant has, with great toil and expence (which he is not again repaid) made it worth, and by ſo doing, bring it to what I obſerved above, that he muſt either pay a full rent for all his own improvements, or leave them to be enjoyed by a villain.

" From this unfair, unneighbourly behaviour, ariſes a double expence; for no ſooner is it known that A, has offered 50l. a year more for B's farm, and the latter unwilling to turn his back upon all his improvements, has given the advance offered, (for his landlord could not well refuſe him the firſt offer) then his neighbours in the pariſh begin with him; firſt, the overſeer puts 4s and 2d more into every poor's rate, which ſuppoſing them four or five ſhillings in the pound, as they are in many pariſhes, and daily encreaſing, ſay only 9l. a year, for them; then comes the ſurveyor, and calls for ſix days work more, with another team on the highways, which, if compounded for, is often 1l. 16s. more; but ſay, 1l. 7s. which is the leaſt; the 50l. advance is then got to upwards of 60l. to this muſt be added, the advance of tithes, which 19 times out of 20 is more in proportion than the advance of rent.

" The above, Sir, without dwelling any longer upon the ſubject, I ſhould think ſufficiently explains what I advanced, that there are too many obſtacles in the way, to make it prudent for a common farmer to improve by claying or marling, (wholly at his own expence, a large track of light lands on another perſon's eſtate, even upon a leaſe of 21 years; indeed it is my opinion, that it ſeldom anſwers in the firſt, and often fails in the ſecond leaſe, by a farmer's giving too great an advance of rent, rather than turn his back upon his improvements; for, if he is once led to give a little too much rent, he is next rated higher to the tithes, higher to the poor, higher to the church, and higher to the highways; in ſhort, there is no end that I can ſee, but utter ruin.

" I ſhould think, therefore, that it would be only fair and juſt, for gentlemen, afrer their tenants have laid out a thouſand pounds or upwards, (or leſs if the occupation is leſs) in improving their lands, to renew their leaſes at the ſame rent for 21 years, from the time the laſt years improvements was laid on, provided they went on with ſpirit and got through the whole in ſeven years, from the time of entering upon the farm; this, I muſt take the liberty to ſay, is the leaſt a gentleman can, or ought to do, to encourage a tenant, that has a ſpirit to improve his eſtate at his own expence.

" I would not have you or your readers think, that I write this paper to diſcourage improvements in Agriculture, quite the contrary; I believe it is well known, that I contradict ſuch an idea by my practice, all I aim at is, to lay what is termed the *ſaddle* upon the *right horſe*, by cautioning young ſpirited farmers to conſider a little, and have ſome good grounds to go upon, before they lay out great ſums of money upon another perſon's eſtate, and I wiſh at the ſame time, to give land owners a hint, that it is their duty, as well as intereſt, to aſſiſt their tenants in ſo expenſive an undertaking, as that of improving their light lands by clay and marle."

In addition to this we cannot help making another ſhort extract from the ſame gentleman, who obſerves, vol. I. p. 286, Annals, &c.

" From trials and obſervations I am clearly convinced that 7 cubic yards is the propereſt quantity to be laid upon an acre of land. If more be laid on, the longer it will be before it incorporates with the ſoil, and, of courſe, the longer before any benefit can be received.

" I once knew an inſtance where a farmer laid on 120 yards per acre, and after an expence which would have purchaſed the fee ſimple of the land, no benefit could be perceived.

" No pains ſhould be ſpared to break all the lumps, and get it fine by repeated harrowing and rolling, otherwiſe claying and marling ſeldom anſwer, where you go on with a courſe of ploughing in the old way.

" Little need be ſaid about the different quality of clay or marle, as every one muſt be content to uſe ſuch as is found on his premiſes.

" Clay that is freeſt from ſand, and marle that is ſoft and greaſy, are certainly the moſt valuable. And even blue clay that is condemned by moſt farmers I have found anſwer very well on light ſand; but they generally lie at too great diſtance from each other to be prudently got together.

" I have a ſcheme in agitation, on a ſmall ſcale, which I mean to execute, and which I expect to be very much condemned for; that is, to ſink a pit upon a ſtiff, clayey ſoil, and carry it about half a mile to light ſandy ſoil; to keep a ſtanding cart at both places, and take off as many loads from the ſurface of the latter and bring back: ſo that when I have clayed a few acres of land, I ſhall have ſanded about the ſame number of acres of clay land."

We can only beg pardon of Mr. Macro for the liberty we have taken in abridging his letter, as we do aſſure him it was a painful taſk to lop off a ſyllable from ſo uſeful a ſubject ſo well treated.

Our comments on theſe extracts would be uſeleſs, for they want no elucidation.

Did every gentleman feel ſo juſtly for that profeſſion to which he ſo honourably belongs, Agriculture would be improved; as the ſource of all great and expenſive improvements ſhould originate with the proprietor of land, and not with a tenant, who is here or there at the nod of his landlord.

Marle is unqueſtionably the moſt antient of natural manures, and well mixed and worked fine with the ſoil adds vigour to land of any kind, that has been exhauſted by cultivation. On paſture marle is likewiſe uſeful, provided it is of a good kind: the only way to enſure ſucceſs is, to make a ſmall experiment, as precepts cannot be infallible, and examples ſpeak for themſelves. The next on the liſt of natural manures is

CHALK.

Chalk is beneficial as a manure on ſtiff clays and ſand, as it is likewiſe on other ſoils, where it does not compoſe a part of the ſoil by nature. Chalk of the ſoft kind is beſt ſuited as manure for gravel or ſand, and that of the ſtony or hard kind will anſwer beſt on clay or ſtiff loam. Hard ſtony chalk is burnt into lime, ſimilar in quality to lime made from ſtone.

A gentleman of experience in Kent ſays, " In compariſon of chalk and lime, it is neceſſary I ſhould ſay my experience is in favour of chalk." As a further inſtance of the great eſtimation in which the Kentiſh farmers hold chalk, Mr. Young informs us " it coſts them 20s. per load by then they get it home: that they lay from 5 to 8 loads on an acre, either on a clover lay that it may be waſhed into the earth before it is ploughed, or on ſummer fallow; and that the effect is equal to the beſt rotten dung, and laſts 15 or 20 years. On loam it anſwers the beſt: in fact, he ſays it performs wonders. This is certainly valuable information for thoſe who have it in their power to procure chalk, and are ignorant of its value as manure. We are now led to an article little known as a manure; namely,

LIMESTONE pulverized.

Limeſtone broke into ſmall pieces certainly adds fertility to ſeveral kinds of ſoil, as clay, loams which have not previouſly a mixture of ſmall ſtones or pebbles, and alſo a ſandy loam without ſtones.

The method of enriching lands by means of ſtone chippings is mentioned by Doctor Plot in his " Hiſtory of Oxfordſhire," as a cuſtom in common uſe in ſome parts of the country; which deſtroys all doubts of its antiquity. The effect of ſtones promoting vegetation on cloſe ſtiff lands may be rationally accounted for, without even admitting they poſſeſs any alkaline quality. In the firſt place, ſoil with a mixture of ſmall round ſtones is preferable to one of the ſame kind without any: this hypotheſis we believe is invariable. The reaſon of ſuch an effect in ſtones we apprehend proceeds from their breaking and dividing cloſe ſoils, thereby giving room for the roots of plants to ſtrike; and as they render the texture of the land more looſe, the ſun and air have an eaſier admiſſion, and conſequently their benign and fertilizing influence have the power of acting with the greater force.

Where coals are expenſive, and other firing ſcarce, lime is a very chargeable manure. We have not the leaſt doubt but lime ſtone beat ſmall would anſwer every purpoſe of lime, particularly on ſtiff, cold land: ſhould this be the caſe, a valuable ſource for manure lies unexplored; as the breaking and preparing ſtones for lime is attended with an heavy expence, breaking them ſtill ſmaller would not be a material addition. But this being ſpeculation, as we have never known it tried, we hope the reader will judge for himſelf, and excuſe the hint we have given; and we will introduce a manure which has been tried with the greateſt ſucceſs: this is Limestone reduced to powder in a turnpike road. This, as a manure, was introduced to practice by Mr. Richard Davis of Kiteborough, near Morton in Glouceſterſhire, between 30 and 40 years ſince. The ſoil of his farm was of a hollow, cold, loamy nature, ſubject to grow furze and a long coarſe graſs, and very uncertain for corn. Thinking the ſoil wanted ſomething to give it firmneſs, he carted the cleanings from a limeſtone turnpike road (which runs parallel with his farm) upon a ſummer fallow for wheat, about 30 cart loads to an acre. The ſucceſs which attended this firſt effort was beyond his moſt ſanguine expectation, and was a ſufficient ſtimulative for him to proceed. The ſhovelings, or cleanings of the road, which had, from the time of its being firſt made a turnpike, been throwed by the road ſide as uſeleſs, were ſoon conveyed by Mr. Davis upon his farm, and their effect was much greater than the beſt horſe dung. One year in particular he carried ſomething more than 1000 loads on a piece of fallow of about 15 acres, and the reſult was equal to the quantity. Four quarters of oats upon an acre previous to the diſcovery of this improving manure were deemed a good crop, but ſince he has had 8 or 9 quarters upon an acre. Theſe improvements have not been confined to arable lands alone, but have been found equally beneficial to meadow and paſture, as it produces white clover, and other ſweet herbage, where the moſt rough and ſour graſs grew before.

It is neceſſary to remark, that the lime ſtone of which we are ſpeaking is ſoft in its nature, by no means of a proper ſubſtance to make roads; but upon the road we are noticing it is *Hobſon's choice*, that or none. After theſe ſtones are laid and broke upon the road, if rain follows very ſoon, the heavy carriages which paſs, quickly reduce them to the conſiſtence of a very ſoft mud, which is raked or ſhovelled off, and is as a manure ſuperior to any thing which can be procured. To uſe it generally on all kinds of ſoil, it might not be equally efficacious, as on the hollow wet land we are mentioning; but we have every reaſon to believe it would anſwer a very good purpoſe on any kind of ſoil, as we have known it tried ſucceſsfully on ſeveral.

On a rich ſtrong loam in particular it has a very good effect; and with one fourth of good mould it will produce cabbage of a very large ſize; theſe we imagine are proofs of its general utility as an excellent manure.

Mr. Davis, the gentleman who has the credit of firſt uſing the cleanings of a lime ſtone road as a manure, has acquired a very conſiderable fortune, and with pleaſure attributes no ſmall ſhare of his great ſucceſs to the diſcovery; he is now retired from buſineſs, and enjoys the reward of his integrity and induſtry; making himſelf a uſeful member of ſociety, unambitious of any other diſtinction than that of an Engliſh farmer.

As with marle, the ſame care ſhould be taken with lime ſtone road cleanings, to mix it well with the ſoil; ſowhich purpoſe, it is a good method to ſpread it on clover, or other graſſes, ſome months before they are ploughed for corn; the rains waſhing it into the earth makes it incorporate, more intimately with the ſoil. Otherwiſe on fallows, when they are clean from weeds and worked fine. Winter being the ſeaſon roads want cleaning; what is thrown in winter or ſpring may be carried and ſpread upon paſture, and meadow the following autumn; as the winter rains will waſh it into the earth before ſpring, and the land receive benefit in the ſummer. Let it be noticed, that the virtues of this manure are not exhaled by the air and ſun, like animal and artificial manures.

Should any doubt ariſe, or the foregoing account prove unſatisfactory, we are of opinion, the gentleman who has uſed it with ſuch ſucceſs would willingly give his ideas to any gentleman on the ſubject with pleaſure. This leads us to

MUD.

Mud is of different kinds and qualities, according to the ſource from whence it is collected; if the drainings of yards, or the waſhings of rich ſoils run into ponds, or ſlow running brooks, the mud or cleanings are valuable. And if from barren hills or poor unmanured clays, its virtues are not of much conſequence. Mud ſhould be thrown out of ponds and brooks a conſiderable time before it is uſed, and mixed in compoſt with lime is reckoned the moſt advantageous way of uſing it on land; or if aſhes made from either coal or wood can be procured, they may be mixed with mud to a good purpoſe.

As this is the reſult of univerſal experience, we by all means recommend it to the practice of thoſe who have it in their power to procure mud to mix to it with lime, or aſhes.

When it has lain in compoſt a few months, it will be found an excellent manure for paſture or arable, and the poorer the ſoil, the greater will be the advantage. We will now conſider the virtues of

COMMON SALT.

The Scotch Encyclopædia pronounce ſalt ineffectual, as a manure, which we deny! As experience, the moſt ſatisfactory of all evidences, proves the contrary.

Common ſalt loaded with the heavy duty government have at different times laid upon it, is ſo expenſive an article, that its virtues muſt be great indeed, to compenſate for the expence, if uſed as a manure. But there is a cheaper kind to be obtained, at all places where ſalt is made, which is the cleanings of the pans or oilers, and called foul ſalt, and is an incruſtation of the ſalt to the ſides and bottom of the pan, occaſioned by the heat of the fire. This is ſold very reaſonable, and is always attended by an officer to ſee that it is made uſe of as manure only. It has been uſed round *Droitwich in Worceſterſhire* as manure, as long as ſalt has been made there, and with ſucceſs: to proportion the quantity to the ſoil ſhould be attended to with care, as too large a quantity is very injurious. The following communication of R. Legrand, Eſq. to Mr. Young, Annals, &c. Vol. 5. p. 149. contains a decided proof of the efficacy of ſalt.

" HAVING tried it upon a ſmall ſcale, upon a ſandy ſoil, I can aſſert ſixteen buſhels to be a proper quantity for one acre: it gradually advanced in its effects to 16, and as gradually diminiſhed to 40 buſhels, when vegetation was deſtroyed.

" Twice only have I had an opportunity of buying a few tons of foul ſalt, and uſed it both times upon a barley tilth; ſowing the ſalt immediately after the barley, the event was perfectly ſatisfactory.

" The verdure in the ſpring exceeded any thing of the kind I ever ſaw, and the ripened appearance was whiter by many ſhades than I ever beheld.

" N. B. Salt is noxious both to weeds and vermin."

If ſalt is uſed on paſture it ſhould be mixed well in compoſt, with mud, or loamy earth, 15 or 20 loads of earth to one of ſalt, and turned in the heap two or three times to incorporate it properly. This compoſt ſhould be laid on and ſpread in autumn; a common mould dreſſing will be ſufficient, and there are few kinds of ſoil but will be benefited.

GROWING VEGETABLES.

It has been cuſtomary in many places, particularly in England, to ſow buck-wheat, vetches, &c. and then to plough them in for manuring the land: this being ſimilar to that operation of nature by which ſhe renders the uncultivated ſoils ſo exceedingly fertile, cannot fail of being attended with ſingular advantages; and might be looked upon preferable even to laying dung on the land to fatten it, was it not attended with the entire loſs of a crop for that year.

Where manures cannot be obtained, and on outlying lands, ploughing in thoſe ſucculent plants is certainly good management. Before ſuch management is attempted, the ſoil ſhould be cleaned from weeds, and after the crop is buried ſhould be rolled with a heavy roller, which will be the means of facilitating fermentation.

This method will anſwer on any kind of ſoil, and ſhould be put in practice in the following manner. Sow winter tares or vetches in autumn, and mow or eat them off the ſpring following; and immediately, on one ploughing, ſow buck wheat, which plough in and roll, and the land will be in excellent condition for wheat, or the more ſo for barley the next ſpring.

ONE SOIL USED AS MANURE ON ANOTHER.

The cloſe texture of clay, and the looſe and friable nature of ſand, form a contraſt in the nature of ſoils, by no means friendly to vegetation: when thoſe oppoſites are united, the ſoil becomes more fertile, and when blended with native or vegetable mould, is further improved.

Thus clay is conſidered as a manure to ſand, and on the contrary ſand to clay. The reſult of mixtures of this kind cannot be defined, nor aſcertained on paper; to experiment we muſt refer the Agriculturiſt for ſatisfaction.

As thoſe ſoils are ſeldom found very near each other, improvements are not to be effected, without expence and difficulties which a prudent man would be afraid to encounter with.

Although there are thoſe formidable obſtacles in the way, improvements of the kind are often practicable; and a ſpirited perſeverance performs wonders.

Clay is generally found more beneficial on ſand, than ſand on clay. Clay enriches a ſandy ſoil, by giving it body or firmneſs; and ſand in clay by breaking its toughneſs. Clay is alſo uſed with ſucceſs on ſome gravelly ground; but there are ſome kinds of clay and gravel, which will not unite; this happens when the ſoil conſiſts of ſmooth round pebbles, and a ſmall portion of mould.

Loam is a manure on any ſort of land, provided the ſoil you manure with is not inferior to that you intend to manure.

When land has been exhauſted by long continued cultivation, freſh mould from under hedges, the ſides of roads, or other places, where it is to be procured, ſurprizingly fertilize and refreſh the ſoil.

SHELLS.

The perpetual fertility of calcareous earth, ſo confidently mentioned in the Scotch Encyclopædia is a phenomenon in Agriculture, with which we are unacquainted, and can only inform our readers by an extract from that work, viz.

" In all ſeaſons it produces the moſt luxuriant herbage, and never got any manure ſince the creation, and has been from time immemorial ſubject to the following courſe of crops:

" 1. Bear, after once ploughing from graſs, uſually a good crop.
" 2. Bear, after once ploughing, a better crop than the firſt.
" 3. Bear, after once ploughing, a crop equal to the firſt.
" 4. 5. and 6. Natural graſs, as cloſe and rich as could be imagined, might be cut, if the poſſeſſor ſo inclined, and would yield an extraordinary crop of hay each year.

" After this the ſame courſe of cropping is renewed. The ſoil that admits of this ſingular mode of farming appears to be a pure incoherent ſand, deſtitute of the ſmalleſt particle of vegetable mould; but, upon examination, it is found to conſiſt almoſt entirely of broken ſhells: the fine mould here bears ſuch a ſmall proportion to the calcareous matter, as to be ſcarce preceptible, and yet it forms the moſt fertile ſoil that ever we yet met with."

OBSERVATIONS.

This is a miraculous ſoil, and if the fact is as related, places ſhells and other calcerous ſubſtances before every other manure, in as great a degree as the ſun exceeds the moon in brilliance.

Manures being the grand ſupport of Agriculture, we have went rather fully into the nature of thoſe we deemed moſt uſeful, and upon the whole have noticed all that are in uſe, as far as our experience and obſervation led us.

SECT. III.

WHEAT AND ITS CULTIVATION.

WHEN we are mentioning Wheat, our ſubject may be juſtly deemed, of the firſt importance, it being on what is very emphatically called the " STAFF OF LIFE." In the firſt place we propoſe conſidering the preparation of the ſoil for the growth of Wheat, — the different kinds in uſe, — the time of planting, — the various methods of planting or depoſiting the ſeed in the earth, — the caſualties or diſeaſes to which Wheat is ſubject; — with a few other obſervations.

Wheat ſhould be planted on land that is freſh, and in good heart; there is no preſcribed rule what crop it ſhould follow, although it is a general maxim with farmers not to let Wheat and Barley follow each other; and we believe the prohibition is founded on experience; as exhauſting crops ſhould not ſucceed each other.

AGRICULTURE.

To ſummer fallow for Wheat is an old practice, and certainly a good practice on cold ſtiff land, yet the cuſtom of ſowing Wheat on fallow may be varied, by letting the fallow lie all winter, and ſow Barley in the ſpring; after Barley, Beans; and the Wheat crop ſucceed the Beans; but this, although called good huſbandry, we by no means think equal to ſowing Wheat on fallow, Beans next, and then Oats or Barley with Clover, and Wheat again on the Clover lay.

This we call a round of management on land which will not bear Turnips; but it is contrary to the opinion of thoſe gentlemen who call themſelves anti-fallowiſts, who contend that Beans, Peaſe, Vetches, or Clover, anſwer the purpoſe of fallows; in ſome reſpects they may; but be aſſured they will not keep land clean, particularly from Couch graſs.

Let it be underſtood, that with thoſe meliorating crops, as they are called, drilling and horſe-hoeing is to be purſued; but how drilling and horſe-hoeing are in all ſeaſons to be effected on ſtiff clay, or ſour tough loam, is the queſtion? The diſcuſſion of this matter muſt be when we treat of Ploughing, &c.

If fallows can be aboliſhed on ſtiff land, the Wheat crop will of courſe follow Beans or Clover; but how drilling can be performed on this kind of ſoil, on a Clover lay, and as autumn ſeaſons are very precarious, is a circumſtance beyond our experience or obſervation.

When clover is intended to be ſowed wheat, plough the land, and let it lie three, four, or more days to dry (that is on low, wet land) before you ſow the ſeed, which will make the harrows perform their work better, and the ſeed will be better covered, and not be ſo ſubject to matt or burſt in the ground, a circumſtance which frequently injures the crop: be alſo careful to plough the furrows narrow.

On hill land, and other, that will bear turnips, and permit them to be eat off in a proper manner, wheat is either ſowed on clover, or rye graſs and clover, or according to the drill management on potatoe fallow: where potatoes are properly cultivated, this is certainly a valuable and improved branch of huſbandry, and muſt get land in fine condition for wheat.

The kinds of wheat are *Cone* and *Lammas*; the cone with a beard like barley, and the Lammas ſmooth in the head: theſe ſeem the only ſorts where the diſtinction is ſo viſible; but they are branched into a variety of ſorts, bearing a ſimilitude in appearance to either Cone or Lammas.

Red Lammas is the wheat of that kind moſt generally ſowed on hill and vale, and had no other kind of lammas wheat been known, we do not know the loſs would have been material.

There is a variety of other ſorts of lammas wheat, as yellow, white, &c. ſowed in different countries, and frequently changed from curioſity or experiment, generally with great expectations at firſt, which ſeldom laſt long.

The Cone, or bearded wheat, in general cultivation, is commonly ſowed on ſtrong rich land, generally in vales on ſtrong loam, where its produce is very great; and being ſtrong and large in the ſtraw, is not ſo liable to fall down by wet weather on the approach of harveſt.

There is often an advantage on high lands, where the ſoil is good, in ſowing Lammas and Cone Wheats, mixed about one third Cone. We have obſerved often great benefit from this method, as where one half of a ground has been ſowed with mixed wheat, and the other lammas alone, the mixed has been much ſuperior both in quantity and quality.

There is another kind of wheat lately introduced, or rather revived, in this kingdom, quite different in its nature to thoſe in general uſe: this is called ſpring wheat. it is of the beard or Cone kind, and inſtead of being ſowed in autumn, is not ſerved till ſpring: great advantages were expected when firſt this kind of wheat was announced; but a few experiments convinced thoſe who made them, that ſpring wheat was not adapted to this climate, at leaſt that barley, oats, or other ſpring corn, were preferable to ſpring wheat.

Mr. Young has lately introduced a kind of Wheat, which he calls *Velvet Wheat*; and remarks upon it, that it is very promiſing to become an acquiſition: ſhould that be the caſe, it cannot be in better hands to diſtribute it; and we ſincerely wiſh Mr. Young on this, as on every other occaſion, the greateſt ſucceſs.

The times of ſowing Wheat differ very materially; on the hills and rocky land, they begin ſowing the latter end of July, if the weather permits; and it is no uncommon ſight to ſee a perſon have two crops of Wheat of different years, growing at the ſame time.

This early ſeeding is moſtly on a rye-graſs and clover, ſward of two years, or on ſaintfoin breaſt ploughed and burned, and give the Wheat ſufficient ſtrength to endure the winter, as, before the froſts are ſevere, you will ſee the Wheat matted together on the land.

The Wheat ſeeding on thoſe hills is generally finiſhed before the middle of September, provided the weather ſuits, as particular regard is paid towards the land being ſufficiently wet, if that is not the caſe it renders the crop hazardous.

In the vales and low lands, in general on fallows, Wheat ſowing begins about the middle of October, and continues till Chriſtmas; the latter Wheat ſowing is generally prolonged by too much wet weather, as the early is by dry.

The quantity of Wheat generally ſowed on hill land, and ſowed early, is from two and a half to three buſhels per acre. On low or vale land not ſo much, the general quantity being about two and a half buſhels if ſowed in October, and two buſhels or ſomething leſs if in November or later in the ſeaſon; as early ſowing ſkould not be ſowed dry, ſo the later feeding ſhould be wet.

Spring Wheat is generally ſowed in April, or the beginning of May.

Attempts at improvements are certainly laudable and praiſeworthy; and the man who renders ſervice to the art of Agriculture, is a real friend to his country; but new inventions are generally introduced with ſuch zealous and poſitive aſſurances of ſucceſs, that the great theoretic promiſes which are previouſly made, always fall ſhort when put in practice.

Were improvements brought forward with more diffidence, we are of opinion general practice would ſooner follow, if the invention merited public attention.

Setting of Wheat is a practice recently brought into uſe, and in all probability is a method deſerving public attention; as we have never ſeen it in extenſive practice, we beg leave to lay the following before our readers.

Setting of Wheat, a method which is reckoned one of the greateſt improvements in huſbandry that has taken place this century. It ſeems to have been firſt ſuggeſted by planting grains in a garden from mere curioſity, by perſons who had no thought or opportunity of extending it to a lucrative purpoſe. Nor was it attempted on a larger ſcale, till a little farmer near Norwich began it about 17 years ſince, upon leſs than an acre of land. For two or three years only a few followed his example; and theſe were generally the hurt of their neighbours merriment for adopting ſo ſingular a practice. They had, however, conſiderably better corn and larger crops than their neighbours: this, together with the ſaving in need, engaged more to follow them: while ſome ingenious perſons, obſerving its great advantage, recommended and publiſhed its utility in the Norwich papers. Theſe recommendations had their effect. The curioſity and inquiry of the Norfolk farmers (particularly round Norwich) were excited, and they found ſufficient reaſon to make general experiments. Among the reſt was one of the largeſt occupiers of lands in this county, who ſet 57 acres in one year. His ſucceſs, from the viſible ſuperiority of his crop, both in quantity and quality, was ſo great, that the following autumn he ſet 300 acres, and has continued the practice ever ſince.

This noble experiment eſtabliſhed the practice, and was the means of introducing it generally among the intelligent farmers in a very large diſtrict of land; there being few who now ſow any wheat, if they can procure hands to ſet it.

It has been generally obſerved, that although the ſet crops appear very thin during the autumn and winter, the plants tiller and ſpread prodigiouſly in the ſpring. The ears are indiſputably larger, without any dwarfiſh or ſmall corn; the grain is of a larger bulk, and ſpecifically heavier per buſhel than when ſown.

The lands on which this method is particularly proſperous, are either after a clover ſtubble, or on which trefoil and graſs-ſeed were ſown the ſpring before the laſt. Theſe grounds, after the uſual manuring, are once turned over by the plough in an extended flag or turf, at two inches wide; along which a man, who is called a *dibbler*, with two ſetting-irons, ſomewhat bigger than ram-rods, but conſiderably bigger at the lower end, and pointed at the extremity, ſteps backwards along the turf and makes the holes about four inches aſunder every way, and an inch deep. Into theſe holes the droppers (women, boys, and girls) drop two grains, which is quite ſufficient. After this, a gate buſhed with thorns is drawn by one horſe over the land, and cloſes up the holes. By this mode, three pecks of grain is ſufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of froſt.

The regularity of its riſing gives the beſt opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

Wheat-ſetting is a method peculiarly beneficial when corn is dear; and, if the ſeaſon be favourable, may be practiſed with great benefit to the farmer.

Sir Thomas Beevor of Hethel-Hall in Norfolk, found the produce to be two buſhels per acre more than from Wheat which is ſown; but having much leſs ſmall corn intermixed, the ſample is better, and always fetches a higher price, to the amount generally of two ſhillings per quarter.

This method, too, ſaves to the farmer and to the public ſix pecks of ſeed-wheat in every acre; which, if nationally adopted, would of itſelf afford bread for more than half a million of people.

Add to theſe conſiderations, the great ſupport given to the poor by this *ſecond* harveſt, as it may be called, which enables them to diſcharge their rents and maintain their families without having recourſe to the pariſh.

AGRICULTURE.

The expence of ſetting by hand is now reduced to about ſix ſhillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five ſhillings per day; of which, if the dibbler gives to the children ſixpence each, he will have himſelf three ſhillings and ſixpence for his day's work, which is much more than he can poſſibly earn by any other labour ſo eaſy to himſelf.

But put the caſe, that the man has a wife who dibbles with him, and two or three of his own children to drop to him, you ſee his gains will then be prodigious, and enough to enſure a plenty of candidates for that work, even in the leaſt populous parts of the country.

It is, however, to be obſerved with regard to this method, that in ſeaſons when ſeed-corn is very cheap, or the autumn particularly unfavourable to the practice, it muſt certainly be leſſened. In light lands, for inſtance, a very dry time prevents dibbling; as the holes made with the inſtruments will be filled up again by the mould as faſt as the inſtrument is withdrawn. So, again, in a very wet ſeaſon, on ſtrong and ſtiff clays, the ſeeds in the holes cannot be well and properly covered by the buſhes drawn over them.

But theſe extremes of dry and wet do not often happen, nor do they affect lands of a moderately conſiſtent texture, or both light and heavy ſoils at the ſame time, ſo that the general practice is in fact never greatly impeded by them.

The ſetting of wheat certainly is an invention of utility on rich ſtrong land, which has ſtrength ſufficient to nouriſh a number of ſtems or ſtraws from the ſame root.

Setting may be performed on a ſoil, and in weather in which drilling is impracticable; but where a real uſeful and commodious drill can be uſed, a very material ſaving in the expence will be made, certainly an object of conſequence to a farmer.

Improvements in the planting of Wheat go ſtill further; *dividing and tranſplanting the roots* has been practiſed: an account of which has been publiſhed in the Philoſophical Tranſactions, and likewiſe by the Rev. Mr. PIKE, of Edmonton, in his correſpondence with Mr. Young; as a rational and pleaſing amuſement; and at the ſame time inveſtigating the works of nature, theſe experiments do honour to thoſe who make them; and communicating them to the public, is gratifying the curious.

As an acquiſition to Agriculture, we cannot rank the tranſplant of Wheat, as ſo tedious a proceſs can never become uſeful.

As vegetables, like animals, are ſubject to diſeaſes, the principal maladies which affect Wheat, are ſmut and mildews. Smut is a diſeaſe very injurious to a crop of Wheat in every other reſpects fair and promiſing; the grains which are affected with the ſmut, inſtead of being filled with the natural mealy ſubſtance, contains a black powder, like lamp black of a very diſagreeable ſmell, which by the operations of thraſhing and grinding, communicates its diſagreeable properties to the bulk.

Dr. Home, in his Principles of Agriculture and Vegetation, claſſes the *ſmut* in grain among the diſeaſes ariſing from this cauſe. He is of opinion, that too great an abundance of juices in a vegetable will produce diſeaſes ſimilar to thoſe occaſioned by repletion in animal bodies; viz. ſtagnations, corruptions, varices, carioſities, &c. along with the too great luxuriancy we have juſt now mentioned, which he expreſſes by "too great an abundance of water-ſhoots." Hence he is induced to claſs the ſmut among diſeaſes ariſing from this cauſe; it being a corruption happening moſt in rainy ſeaſons, and to weak grain.

Like other contagious diſeaſes, he tells us, the ſmut may be communicated from the infected to healthful grain.

As a preventative, he recommends ſteeping the grain in a ſtrong pickle of ſea-ſalt.

Beſides the effect which this has upon the grain itſelf, it is uſeful in ſeparating the good from the bad; the beſt ſeed falling to the bottom, and the faulty ſwimming on the top of the liquor.

For the ſame purpoſe, a ley of wood-aſhes and quicklime is recommended by ſome; and, by others, a ſolution of ſaltpetre or copperas; after which the grain is to be dried with ſlacked lime.

How far Dr. Home may be right in his conjectures on the cauſe of ſmut, we cannot determine, opinions on the ſubject being ſo various; but his prevention is according to the prevailing practice.

A ſtrong lye or lixivium is the remedy in general uſe, and Mr. Andrews an ingenious gentleman, who correſponds with Mr. Young, gives the following receipt:

"Make half a hogſhead of ſtrong lye from wood aſhes, put it into a boiler, and add 7lb. of common ſalt, and half a pound of arſenic; boil it in a copper about five minutes, which will ſo far take off the poiſonous quality of the arſenic, as to prevent its deſtroying fowls, or birds, ſhould they pick up any of the uncovered ſeeds, after the lye is boiled put it into a tub, (an old wine pipe will make two) and let it ſtand till cold; then get a ſtrong cloſe made baſket, that will hold about two buſhels, and ſet in the lye, put half a buſhel of wheat into the baſket at a time, ſtirring it, and ſkim off the light grains that ariſe; then take it out of the lye, and ſpread it on a floor, and mix as much quick lime powdered as is neceſſary to prepare it for ſowing; you may prepare a quantity three or four days before it is wanted. The quantity of lye will ſwim about 50 buſhels Wheat."

Mr. Young has tried this lixivium himſelf, and from experience thinks it preferable to any other, as he is of opinion the arſenic is particularly efficacious.

A ſteep or brine may be made with ſoap-lyes, with a mixture of one half water, otherwiſe the hands of the ſeedſman will be injured.

Chamber lye may be ſaved, and the brine in which meat has been ſalted and mixed together; with the addition of ſalt and water, ſhould the quantity be inſufficient for the purpoſe: it will be of further ſervice, indeed it is neceſſary to let the Wheat ſteep all night, by which management it grows much ſooner: and it is a general received opinion, that it makes it grow more kind and ſtrong.

From experience and obſervation, as alſo from the opinion of that excellent cultivator, Mr. Macro, we think the great benefit of ſteeping Wheat ariſes from the opportunity it gives of taking the light unhealthy grains from the quantity; added to which, that the ſaline mixtures which are uſed tend to ſtrengthen and promote the growth in its firſt ſtate, and to protect the root of the plant from the ſeverities of the weather.

Good ſound ſeed, which grew on land of a different and oppoſite kind of ſoil to that on which you intend to ſow it, certainly in ſome degree, prevents ſmut; for we have been witneſs frequently to the ill effects which attend the ſowing ſeed too often on the ſame kind of land.

Another diſeaſe to which Wheat is liable is the mildew, which appears on the ſtraw in black ſpots, and ſometimes inclining to yellow: this generally attacks the Wheat when it approaches towards ripening.

We have never ſeen the mildew on wheat, and other grain, accounted for on ſuch familiar and rational principles as by Mr. John Jenkinſon, in his Letter to Mr. Young on the ſubject.—Vide Annals, &c. vol. III. p. 318.

ON THE MILDEW.

By Mr. JOHN JENKINSON.

"THE mildew in grain is a very bad diſorder, and I am afraid an incurable one; ſituation and early ſowing may in part, and ſometimes wholly prevent the evil. In ſome places, not one year in ten thin Wheat eſcapes it; and often then other grain is affected.

"For many years I have thought, and obſervation and experience every year confirm it, that the mildew is nothing more or leſs than the ſtoppage of circulation in the plant, and as the grain grows near ripe, the circulation becomes more languid, which makes it at that ſtage more liable than any other to be ſiezed with the diſorder.

"In this northern part of the nation, I have obſerved froſt to be the moſt general cauſe of the malady; and ſometimes wet ſtormy weather. Some people are of opinion, that a thick glutinous matter which ſometimes falls in the night, and what is commonly called *a honeyfall*, which, not being ſoon expelled by the ſun, will bring it on. This cauſe is from hence ſuppoſed, to derive its name; but, for my own part, I never obſerved the mildew proceed from this cauſe

"When it proceeds from froſt, and the mildew is only partial, then low hollow places, and ground much confined only ſuffer; the reaſon is, in hollow and confined ſituations the vapours are in greater quantities, which being condenſed by the cold, and falling on the grain, congeal the juices of the plants which ſtagnate, and, according to the degree, become more or leſs affected.

"When the grain is near ripe, as obſerved before, it is ſooner affected than when freſher; but then the damage is not ſo great as when it takes place when the grain is farther from maturity.

"When the froſt is attended with a thick fog, which is not uncommon in the latter part of ſummer, then almoſt inevitable deſtruction enſues. The fog preventing the rays of the ſun from taking effect as they otherwiſe would.

"The mildew, laſt year, was almoſt general in this part, which aroſe from froſt, accompanied with a cold ſtrong north wind. The year before it was occaſioned by a few days of wet, cold, ſtormy weather, and ground with a north aſpect was moſt ſubject to the diſorder; but wheat being moſtly cut, only the late ripe was affected, ſo that the injury to the wheat crop was in no comparison to this laſt year.

“ On the contrary, laſt year, the oats being moſtly green, were very little, if any, affected along with the wheat; but the year before, the oats being nearer at hand, were materially injured.

“ An acquaintance of mine, a little before laſt harveſt, and ſeveral days before the general ſtorm took place, went 15 or 16 miles north of Kendal, which you know is at the foot of the mountains. A little north of the town he beheld a fine field of Wheat, which he told me he viewed with pleaſure.

“ The perſon returned in two or three days at fartheſt, and the whole field, except a little riſing ground near the middle, was ſtruck with the mildew, which greatly ſurpriſed him; but, on my deſiring him to recollect what nights they had in the fells, he readily called to mind, that they were very cold, with a ſharp froſt. Upon the riſing ground, the ſun had relieved the plants before their deſtruction, and very probably the congealed vapours were not quite ſo denſe in that part.

“ The mildew affects the grain like a mortification in the human frame, becomes full of little black places, and of conſequence brings on a premature death.

“ I am yours, &c.

“ J. Jenkinson.”

The cauſe of the mildew in Wheat is in all probability occaſioned by froſts in the ſpring, which cauſes a ſtagnation of the vegetable juices; the ſoil being ſoaked by wet, and froſt immediately ſucceeding, has a greater effect than if the ſoil was dry, for this reaſon, a dry ſpring is always kind for Wheat.

A thin crop of Wheat is more apt to mildew than one which is thicker, as thoſe caſual froſts find a more ready admiſſion by the ground not being ſo well defended.

If the mildew happens, through the too hollow texture of the ſoil, the land ſhould not be too often ploughed, previous to its being ſowed Wheat, likewiſe eating it off, and treading in ſpring, may be of ſervice as a preventative.

Land, which is ſubject to mildew Wheat, renders the crop very precarious, as it very ſeldom eſcapes; it is therefore neceſſary for a farmer to be very circumſpect in his enquiries in this reſpect before he enters upon a farm to which he is a ſtranger.

Let it be particularly noticed, that ſteeping of Wheat effectually prevents its deſtruction by inſects in autumn.

OBSERVATIONS.

Reſpecting the growth of Wheat, nothing ſhould be neglected either in reaſonable expence or labour, to procure good crops of Wheat; at the ſame time the return which expence and induſtry require, ſhould be kept in view; for that man is the beſt farmer who obtains the greateſt crops of corn at the leaſt expence; for little does it avail to get 40 buſhels of Wheat or upwards, upon an acre, if the expence has been greater than the return will be.

To riſque Wheat or Barley on land, which is foul with weeds, or poor in condition, is bad management; ſeed and expence are nearly the ſame; and the greateſt good fortune of ſeaſons and other circumſtances will only bring forth a ſaving crop, and the land is doubly exhauſted.

The management of Wheat at the time of harveſt is generally known, and pretty uniformly purſued throughout the kingdom; there is one error we would wiſh to point out to the public, which is the cuſtom of letting Wheat, and indeed all kinds of corn, grow too long in the field before it is cut.

By this means if wet ſucceeds the grain is ſtained and diſcoloured immediately, and will quickly grow in the ſheaf: whereas if it is cut juſt as it begins to bend the head, and while a few of the ſtraws retain ſome of their green appearance, and tied up in ſmall ſheaves, it will ſtand in the field a conſiderable time, and neither grow nor looſe its colour.

In oppoſition to this, we may be perhaps told that corn cut green will not thraſh ſo eaſy; it may not perhaps; but we will venture to aſſert, that one penny per buſhel will make up the deficiency, which the ſuperior colour of the grain will doubly repay.

This being the reſult of experience, we communicate it as ſuch, and are confident it merits attention; and next conſider

SECT. IV.

BARLEY AND ITS CULTIVATION.

BARLEY is the grain, next to Wheat, in general utility; and is ſufficiently known to need any deſcription: like Wheat, Barley is an exhauſting crop; for that reaſon they ſhould not follow each other.

Land, which will bear good turnips, and permit ſheep to eat them off in the winter is generally kind for Barley; but that is a rule to which we can make an exception, as a ſandy loam, without a mixture of ſtones, ſeldom or never bears Barley of a good body or colour, there is generally ſtraw plenty, but the corn indifferent, and this ſoil turnips well.

The ſoil which grows Barley to the beſt advantage, is a harſh, ſtone loam, and after a crop of turnips ſeldom diſappoints the expectation.

The ſort of Barley ſowed on turnip land is generally the long eared Barley, which ripens early.

There is a cuſtom prevails of procuring ſeed from Patney, in Wiltshire, and the Iſle of Thanet in Kent, which, according to the popular notion yields its produce earlier in ſeaſon, than Barley brought from any other place, although the change of ſoil be equally good: this idea experience, in ſome inſtances, has been in favour of, and in others no difference has appeared.

From thoſe proofs on each ſide the queſtion, it may be reaſonable to conjecture, that when perſons go to the extra price of this far fetched ſeed, to inſure ſucceſs, they plant it on the beſt manured and more promiſing ſoil, that their hopes may not be diſappointed: this accounts for its being fit to harveſt a week ſooner than the other parts of the crop.

On the advantage of ſowing Barley early, we cannot preſent the public with a more exact ſtatement of circumſtances than that given by the Right Honourable the Earl of Orford, to Arthur Young, Eſq. Vide Annals, Vol. IX. p. 385.

ON THE TIME OF SOWING BARLEY.

By the Earl of Orford.

“ THE common management of the turnip huſbandry in Norfolk has this evil in it, that the crop is kept feeding ſo late in the ſpring, that ſucceeding barley often ſuffers conſiderably, ſometimes to the amount of the value of the turnips.

“ To aſcertain what would be the effect of much earlier ſowing than is ever practiſed here, I made the following experiments upon a ſandy or an imperfect chalk bottom, but deep, and worth about ſeven ſhillings an acre.

1785.

“ Twenty-three acres of turnips being fed off in time, were ribbled, that is, half ploughed, on to four-furrow ridges, ſowing the barley 3½ buſhels an acre, the 7th of February, in the manner of Wheat ſown on the ridge. Sharp froſts, with and without ſnow, followed the ſowing, and the ſeed laid five weeks before it appeared; but the crop received injury. It was reaped. The produce, five quarters, one buſhel, and one peck per acre; a very good and ſhort ſample.

“ I threw the land on a ridge work, for three reaſons; 1. Becauſe it promiſed to preſerve the plants dryer in caſe of much wet weather; 2. To afford the hares, which abounded very much here, eaſy paths, to prevent their making others acroſs the lands; 3. To have the power of ploughing the furrows with a broad double-winged ſhare, to anſwer the purpoſe of horſe-hoeing.

1786.

“ Fourteen acres were this year cultivated exactly as in the preceding. The turnips were fed off in time for giving the ſame tillage as before, and the land was ſowed the 8th of February; reaped as before. The produce four quarters, ſeven buſhels, one peck per acre; a ſhorter and better ſample than any I had from later ſowing.

1787.

“ Thirty acres were ſown this year as before on turnip land, and in ridge and furrow. Began the 6th of February; ploughed between the ridges once; reaped; one ſtack has been threſhed; the reſt is equal; the produce five quarters one peck per acre; the ſample ſhort and good; and weight 14 ſtone 7lb. the ſack.

1788.

“ This year I have ſowed 43 acres in the ſame manner; began the 5th of February, and finiſhed ſoon after: the reſult you ſhall be informed of.

“ From theſe particulars it is evident, that the practice, however contrary to the common method, has ſucceeded remarkably well, nor do I ſee any well founded objection to purſuing it on the largeſt ſcale.

“ It has been ſaid, *if you feed off your turnips ſo early in the ſeaſon, what do you do for your food later?* To me it appears, that the right time to eat a crop is when it will yield the moſt food, and go the fartheſt. Turnips are often kept till they are good for nothing; and every one knows, in this county, that it is no uncommon thing to ſee them given away to have them fed off, for what the farmers call time for barley; that is, in April and even in the beginning of May. This late ſeeding inſures the loſs of two crops; the turnips are worth nothing; the land is impoveriſhed by them, and there is no chance of good barley.

"Would it not be much better for the farmer to have other reſources for his ſheep, than ſuffer ſuch certain loſs, and run ſuch great hazard? I am ſo well convinced of this, that I do not venture barley after late fed turnips, but reſerve the land for cabbages.

"But beſides this reply to the objection, I may obſerve that the practice is directly applicable to all the lands fed off by the end of January, and to all other preparations for barley, excluſive of the queſtion of late feeding; but the farmers leave their lands till the common ſeed time, giving twice the tillage that I do, to get worſe crops.

"You will obſerve that I ſow no clover or other ſeeds with barley. I think the expectation of having two crops growing on the land at once, not very well founded: indeed, ſucceſs is the worſt thing that can be looked for; as we often find in late harveſts, in which the Barley is left out ſo late for the clover to dry as to become black, and in every reſpect a bad ſample.

"It is better to ſow the ſeeds alone. But thoſe who will perſiſt in this bad management, may do it at an early ſeaſon as well as at the common one, ſeeing that all the plants ſo cultivated are indigenous, and, therefore, may be ſown at any time.

"Another advantage of ſowing early is early harveſt; from a fortnight to three weeks is thus gained: Every one knows the conſequence of this."

We perfectly agree with Mr. Young in the very juſt eulogium he beſtows upon the noble Earl, and conſider the minute attention a perſon ſo elevated in life as his lordſhip, beſtows on Agriculture, as a happy circumſtance to this country. At the ſame time we cannot help thinking that a few acres of turnips in ſpring, are of more conſequence than his lordſhip thinks them; particularly on cold backward ſoils, where herbage lies late.

To eat turnips off in ſpring, as early as poſſible, is certainly good management, as when they begin to put forward for ſeed, they exhauſt the land, and oftentimes keep ſeeding back to the injury of the Barley crop.

But with theſe diſadvantages, the value of turnips, to thoſe who have a flock of ſheep, and no graſs or other herbage to put them to, cannot be diſpenſed with; and taking one ſeaſon with another, we do not think prolonging a part of the Barley ſowing to the middle or latter end of April, a circumſtance of material conſequence, as the late ſowed Barley is ſometimes ſuperior.

The Bath ſociety papers being held in eſtimation; and as they contain a variety of information not generally known or practiſed, we can do no other than preſent our readers with the following letter to that ſociety.

"THE beſt ſoil is that which is dry and healthy, rather light than ſtiff, but yet of ſufficient tenacity and ſtrength to retain the moiſture.

"On this kind of land the grain is always the beſt bodied aad coloured, the nimbleſt in the hand, and has the thinneſt rind.

"Theſe are qualities which recommend it moſt to the maltſter. If the land is poor, it ſhould be dry and warm; and when ſo, it will often bear better corn than richer land in a cold and wet ſituation.

"In the choice of your ſeed, it is needful to obſerve, that the beſt is of a pale lively colour, and brightiſh caſt, without any deep redneſs or black tinge at the tail. If the rind be a little ſhrivelled, it is the better; for that ſlight ſhrivelling proves it to have a thin ſkin, and to have ſweated in the mow.

"The neceſſity of a change of ſeed by not ſowing two years together what grew on the ſame ſoil, is not in any part of huſbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarſer and coarſer every ſucceeding year.

"It has generally been thought that ſeed-barley would be benefited by ſteeping; but liming it has, in many inſtances, been found prejudicial.

"Sprinkling a little ſoot with the water in which it is ſteeped has been of great ſervice, as it will ſecure the ſeed from inſects.

"In a very dry ſeed-time, Barley that has been wetted for malting, and begins to ſprout, will come up ſooner, and produce as good a crop as any other.

"If you ſow after a fallow, plough three times at leaſt. At the firſt ploughing, lay your land up in ſmall ridges, and let it remain ſo during the winter, for the froſt to mellow it; the ſecond ploughing ſhould be the beginning of February.

"In March ſplit the ridges, and lay the land as flat as poſſible, at the ſame time harrowing it fine. But in ſtrong wet lands (if you have no other for Barley) lay it round, and make deep furrows to receive the water.

"I have often, continues he, taken the following method with ſucceſs: on lands tolerably manured, I ſowed clover with my Barley, which I reaped at harveſt; and fed the clover all the following winter, and from ſpring to July, when I fallowed it till the following ſpring, and then ſowed it with Barley and clover as before.

"Repeating this method every year I had very large crops, but would not recommend this practice on poor light land.

"We ſow on our lighteſt lands in April, on our moiſt lands in May; finding that thoſe lands which are the moſt ſubject to weeds produce the beſt crops when ſown late.

"The common method is to ſow the Barley-ſeed broad-caſt at two ſowings; the firſt harrowed in once; the ſecond twice; the uſual allowance from three to four buſhels per acre. But if farmers could be prevailed on to alter this practice, they would ſoon find their account in it.

"Was leſs ſeed generally ſowed the produce would be equal, and the corn leſs liable to lodge: for when corn ſtands very cloſe, the ſtalks are drawn up weak; and on that account are leſs capable of reſiſting the force of winds, or ſupporting themſelves under heavy rains.

"From our great ſucceſs in ſetting and drilling Wheat, ſome of our farmers tried theſe methods with Barley; but did not find it anſwer their expectations, except on very rich land.

"I have myſelf had 80 ſtalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too extenſive for general practice.

"In poor land, ſow thin, for your crop will be worth little. Farmers who do not reaſon on the matter will be of a different opinion; but the fact is indiſputable.

"When the Barley is ſowed and harrowed in, he adviſes that the land be rolled after a ſhower of rain, to break the clods. This will cloſe the earth about the roots, which will be a great advantage to it in dry weather.

"When the Barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the ſun or air from penetrating the ground to the injury of the roots.

"This rolling, before it branches out, will alſo cauſe it to tiller into a great number of ſtalks; ſo that if the plants be thin, the ground will be thereby filled, and the ſtalks ſtrengthened.

"If the blade grows too rank, as it ſometimes will in a warm wet ſpring, mowing is a much better method than feeding it down with ſheep; becauſe the ſcythe takes off only the rank tops, but the ſheep being fond of the ſweet end of the ſtalk next the root, will often bite ſo cloſe as to injure its future growth.

"By attending to what I here recommend, many of our farmers uſually get forty buſhels of barley per acre, from land of no extraordinary quality. On ſome that is rich, I have had fifty-two buſhels without manure; but I never ſow more than ten, and often only eight pecks of ſeed per acre.

"I am, &c.

"J. S."

Steeping or ſoaking of Barley has been a cuſtom recently adopted, to guard againſt the injuries and inconveniences attendant on a dry ſeed time.

To ſay it has anſwered the intended purpoſe, would be ſaying too little, as wonders have been performed, by means of ſteeping Barley; as the following Letter to the Secretary of the BATH SOCIETY, by Mr. JAMES CHAPPLE, of BODMIN, will teſtify.

ON STEEPING SEED BARLEY IN A DRY SEASON.

"MY great ſucceſs in making the following experiment, occaſions my communicating an account of it to you, for the benefit of the public, if thought worthy a place in the Bath Society's Experimental Papers.

"The laſt ſpring being remarkably dry, I ſoaked my ſeed-barley in the black water, taken from a reſervoir, which conſtantly receives the draining of my dung-heap and ſtables. As the light corn floated on the top, I ſkimmed it off, and let the reſt ſtand twenty-four hours.

"On taking it from the water, I mixed the ſeed grain with a ſufficient quantity of ſifted wood aſhes, to make it ſpread regularly, and ſowed three fields with it. I began ſowing the 16th, and finiſhed the 23d of April; the produce was ſixty buſhels per acre, of good clean Barley, without any ſmall or green corn, or weeds at harveſt; no perſon in this country had better grain.

"I ſowed alſo ſeveral other fields with the ſame ſeed dry, and without any preparation; but the crop, like thoſe of my neighbours,

bours, was very poor; not more than twenty buſhels per acre, and much mixed with green corn and weeds when harveſted. I alſo ſowed ſome of the ſeed dry on one ridge in each of my former fields, but the produce was very poor in compariſon of the other parts of the field."

The important advantages which Mr. Chapple derived from ſteeping Barley, are greatly in favour of the method, and his laying the reſult before the public, deſerves every commendation. The ſucceſs attending his experiment would appear incredible, if the teſtimony had not been ſo reſpectable and concluſive.

Mr. Chapple's land muſt have been of a ſuperior quality as ſixty buſhels on an acre, is a crop almoſt unprecedented: at all events the material difference between the ſeed which was ſteeped before it was ſowed, and that which was ſowed dry, will certainly bring the cuſtom into general practice.

BROAD EARED BARLEY AND BEAR.

Broad eared Barley is known by the grain being of broad flat make, both ſhorter and broader than the long eared Barley, and generally ſomewhat larger and heavier; this kind is beſt ſuited to ſtiff loam or clay, and ſhould be ſowed early, as it does not ripen ſo ſoon as the long eared.

It produces a ſmall quantity of ſtraw, and that rather coarſe, and not ſo fit for fodder; when kind in its nature, it makes ſtrong malt, and yields a deal of meal or flour.

Bear or Big is moſtly cultivated in Scotland and Ireland, and is ſowed in autumn, as we do wheat; it is harder in its nature, than the Barleys in general uſe in England, and inferior in quality, neither producing ſo good beer when brewed, nor yields ſo fine a ſpirit when diſtilled.

There is another grain claſſed with Barley, and called Siberian Barley; it is ſmooth in the ſkin like wheat, and of colour more reſembling rye; it weighs heavy, and of courſe yields a large quantity of meal; and is not ſuitable to any purpoſe, except for pigs and cattle, for which it is equal to our common kinds of Barley.

If the practice of cutting Barley more early than uſually is done was adopted, ſamples would be produced at market of a better colour, and the corn would have a much better advantage in caſe of a caſualty HARVEST.

SECT. V.

OATS AND THEIR CULTIVATION.

OATS are in their nature more ſuited to our climate than any other kind of grain we are acquainted with; one ſpecies of the Oat ſeems a native, as it grows ſpontaneous on cultivated land, and cannot be deſtroyed; but this is of a very bad ſort, and commonly called a rough Oat, and held in no greater eſtimation than the baſeſt weed; all thoſe in cultivation are probably exotics.

The Oat family are very numerous, and, like the human ſpecie, are black, white, and of a reddiſh or copper colour. Thoſe of the white kind, are the thin ſkined Oat, commonly called the Dutch Oat, and the Poland Oat, brought into England from Poland.

Thoſe of the Black kind, are the common Black Oat, in its nature much reſembling the Dutch Oat, (colour excepted) and the Siberian Black Oat, reſembling the Poland Oat, with the former exception; for which reaſon it will be needleſs to ſpeak of them any otherwiſe than as two ſorts, the tawny not being materially different from the Poland Oat.

The White Dutch Oat, and the common Black Oat, are alike thin in the ſkin or huſk, and produce a large kernel. White Dutch Oats are imported in large quantities for ſeed, every year, from Holland, as they degenerate by being repeatedly planted in this kingdom; and, in proceſs of time, a great many of them become grey.

The common Black Oat we believe is ſeldom introduced from any foreign climate, neither is it cultivated ſo much as it was ſome years paſt. One objection to the Black Oat is, thoſe corns which drop on the land at harveſt, growing again the next year with Wheat or Barley, and being mixed with them has a very unſightly appearance; otherwiſe they are in every reſpect as uſeful and prolific as any Oat that grows.

The Poland Oat, and the Black Siberian, are much thicker in the ſkin or huſk, than thoſe we have juſt mentioned, and the kernel is not larger. This being a material diſadvantage, we ſhall let them paſs, and recommend for general cultivation, the White Dutch Oat, which for horſes, or to make oatmeal, ranks foremoſt of thoſe we are at preſent acquainted with.

Oats accommodate themſelves to any kind of ſoil, and are a more certain crop than any other kind of grain; but, like all others, they never return much profit without good management; and the perſon who expects a good crop of Oats, becauſe his land is not in condition to produce any thing elſe, will be very apt to deceive himſelf. Although, in the South part of England, Oats are not uſed for any other purpoſe except for horſes, and a ſmall quantity for grotes and oatmeal; in the northern parts of the kingdom they are in great and general eſtimation, as food for the human ſpecies, which, by the temperate mildneſs of their nature, they are well adapted for; and if we judge of the quality of the the food by the health and ſtrength of thoſe who eat it, where can we find a race of beings more healthy and ſtrong than the inhabitants of Scotland, and the north of England, where the product of the Oat makes the chief part of the food of the middle and lower claſs of the people.

The ſeed uſually allowed for an acre is four buſhels, but ſometimes more are ſowed; but if it is good, and to be depended upon, and the land clean and in good tilth, four buſhels are ſufficient. Changing the ſeed from a different kind of ſoil, is by no means to be neglected.

Formerly the cuſtom of ſowing Oats was in March and April, and ſometimes after the barley ſeeding; but that cuſtom is now altered, and Oats are generally ſowed the beginning of February, or as ſoon as the ſeaſon will permit, and are moſtly the grain which brings in harveſt.

We have ſeen excellent Oats ſowed in autumn, which were ripe a month before any other corn; but it is not a cuſtom to be recommended to general practice, as a ſevere winter will be very likely to deſtroy them.

When oats are ſowed early, it is not requiſite to ſoak or ſteep the ſeed, but on the contrary dangerous; but ſhould the ſeeding, from circumſtances, be deferred till the latter end of April, they who ſteep them all night in water, before they diſtribute them on the earth, will, taking one ſeaſon with another, find it much to their advantage.

Oats well managed and ſowed in proper ſeaſon, are a productive and profitable crop: and as the following experimental information, publiſhed in the Bath ſociety's papers, is curious, and to the purpoſe, we preſent it to our readers.

ON BLACK OATS.

“ THE preceding year it had carried potatoes, and received one ploughing for a winter fallow.

“ In February laſt another ploughing was given, and on the 27th and 28th of the ſame month four Wincheſter buſhels per acre of Black Oats were ſown; this was earlier by about a month, than oats are generally ſown in our pariſh, and I did it with a view to aſcertain the effects of early ſowing; when the Oats were ripe, I cauſed exactly half an acre to be cut with the ſickle and ſheaved; theſe were threſhed out, the produce was $49\frac{1}{8}$ Wincheſter buſhels, a quantity moſt amazing in theſe parts. The ſucceſs of the crop, I impute partly to early ſowing and partly to good deep tillage; and, I believe, the half acre was a fair average of the whole piece.

Expences of an Acre.

	£.	s.	d.
Rent	2	0	0
Two ploughings, at 5s.	0	10	0
Cutting	0	3	0
Harveſting	0	5	0
Four buſhels of ſeed, at 2s. 6d.	0	10	0
Sowing and harrowing	0	3	0
	£. 3	11	0
Produce.			
$98\frac{1}{4}$ buſhels of Oats, at 2s.	9	16	6
Deduct expences	3	11	0
Profit	£. 6	5	6

“ The ſtraw may be valued in lieu of threſhing, conveying to market, &c. but is worth abundantly more than what would defray thoſe expences.

“ I am, Sir,

“ Your obedient ſervant,

“ NEHEMIAH BARTLEY.”

As fodder, the ſtraw of Oats, is reckoned ſweeter and of more value for cattle than the ſtraw of any other kind of grain; particularly if the crop was not very large and ſtrong. When Oats are a very plentiful crop and grow high, it is good huſbandry to reap and bind them in ſheaves, as it is cuſtomary with wheat; by this means they are not ſo liable to be loſt on the land, as no grain ſo eaſily beats out as Oats, and although the expence is greater, the ſaving from waſte amply repays it. If the crop is not large, and they do not grow high in the ſtraw, the uſual cuſtom of mowing them with the ſcythe is to be preferred.

Oats are certainly a grain not ſo exhauſting in their nature as wheat, barley, or rye, and better ſuited to the great variety of ſoils with which this country abounds; neither does it require ſo much care to depoſite them in the earth, as we have frequently ſeen in a dry ſpring Oats ſowed upon a clay ſoil freſh broke up, where apparently they could not be ſufficiently buried in the earth to cauſe them to vegetate, as the heavieſt drag or harrow, made little impreſſion on the ſoil, and yet this management has been productive of an excellent crop. We do not mean to infer from this, that it is immaterial whether they are tilled in a proper manner or not, but only to ſhew the probable advantages which may be expected, provided circumſtances are not ſo favourable as could be wiſhed.

As a proof of the poſſible produce of a crop of Oats, we ſhould not think ourſelves juſtified if we did not lay before the public an extract from Mr. Young's Annals of Agriculture, Vol. 8. p. 104. and with which we conclude the article; and truſt the reader will ſay, we conclude well.

AN EXTRAORDINARY CROP OF OATS,

“ Reaped laſt harveſt by the Rev. Mr. CARNE, Vicar of
“ ABBERFORD, in Yorkſhire. The land contained exactly 3
“ acres, 1 rood, 10 perches. Before it was under the plough it
“ produced nothing but ruſhes, being a wet ſwampy ſoil.
“ Mr. CARNE drained it, and ſowed it with Oats, and reaped
“ 314 buſhels. He ſold the Oats for 36l. 13s. 6d. and the
“ Straw for 12l. 6s. 2d. amounting to 48l. 19s. 8d.”

Let it be remarked, there was neither drilling nor horſe-hoeing in producing this crop.

SECT. VI.

BEANS, PEAS, AND THEIR CULTIVATION.

BEANS are of various kinds, but thoſe in common cultivation for agricultural purpoſes are not very numerous, the large common horſe Bean of a longiſh ſhape is the moſt in general uſe; and one of a much ſmaller kind approaching in ſhape and ſize to that of a pea, but rather long than round, this in ſome countries is called the Berkſhire Bean, and in others the tick Bean.

They are doubtleſs very prolific in their nature, branching a number of ſtems from the ſame root, each of which is frequently armed with pods from top to bottom; curious perſons have been induced to number the product of a ſingle Bean, and have diſcovered three hundred and upwards ariſe from one.

This brings to our recollection a circumſtance, apropos, which happened at Bourton on the Hill, in the county of Glocester. A perſon by profeſſion a taylor, walking in the field, accidentally picked up a Bean-ſtalk, and on a minute inveſtigation diſcovered that its contents of fair marketable Beans amounted to upwards of eighty; revolving this demonſtrative truth in his mind, the obvious profits attending on the buſineſs of a farmer wanted no further proof; and having a ſmall farm of his own in the pariſh, which he had acquired by induſtriouſly purſuing his trade, gave his tenant notice to quit, and immediately commenced farmer, converting his *ſhears* into plough ſhares, and his *needles* into weeding hooks. Thus having quitted the ſhopboard, his next object was, to farm out of the beaten track of obſtinate farmers; of courſe, being a man of letters, he purchaſed books, and became an admirer and diſciple of the celebrated Jethero Tull. Drilling and horſe-hoeing were the only profitable methods for an enlightened farmer to purſue; if one Bean produced an hundred, what occaſion could there be to throw ſeed away in the common method? Like a true experimentaliſt, this ſhred of a farmer, went drilling on, condemning and deſpiſing every body who was not as wiſe as himſelf; till at length he diſcovered that the ſyſtem, which he followed, was deſigned for experiment only and that thoſe who were its advocates; never thought of getting money; it was having too much that made them diſcontented and whimſical.

To alter his plan it was too late, for his eſtate was mortgaged, and his credit became bad: there was no reſource, but to return to the deſerted *bodkin and thimble*; but, alas! his eyes were waxed dim; he could not ſee to thread the needle; hard labour had made his hands ſhake; he pricked his fingers as often as the cloth.

To conclude this detail, this unfortunate and induſtrious man from this period lived and died a pauper.

We hope to be excuſed for this ſhort digreſſion, which contains nothing but the plain truth; our readers may comment upon it as they pleaſe.

Beans are reckoned a meliorating rather than an exhauſting crop, and are beſt to plant on wheat or barley ſtubble; where the ſoil is of a mellow, friable nature, and the roundneſs or convexity of ridges not too great. Drilling Beans may anſwer the purpoſe very well; but on ſtiff clay, or loam, drilling will ſcarcely be found practicable, except the land is in excellent tillage and the ſeaſon very favourable. Dibbling or ſetting may be practiced almoſt any ſeaſon, and on any kind of ſoil; the diſtance between the rows about twelve inches, and between each Bean in the row two inches; it is an error to drop more than one Bean into each hole you make with the ſetting ſtick or dibble: Beans planted in this manner ſhould be well hoed twice or thrice in the courſe of their growing, minding each time to hoe before the weeds become high or ſtrong, as cutting them in their infant ſtate bids faireſt to deſtroy them.

Mr. Young's accurate calculations and obſervations being held in high eſtimation, we tranſcribe the following from his Annals, Vol. 7. p. 204.

The ſoil is a ſandy loam, with a very ſmall portion of calcareous earth: this for 8 inches deep, and under it a wet clay marle. The deſcent gently to the north. It was worth about 11s. an acre. In the year 1784, I fed it. In November of that year, manured it with 220 ſingle horſe loads of farm-yard compoſt, made in the preceding winter. In 1785, it was mown. March 17, 1786, ploughed it. April the 3d, dibbled it with horſe Beans; three lands, containing 3 roods and 31 poles, one row on every furrow, (9 inches wide) and the reſt of the field, containing 3 acres, 1 rood, and 8 poles on every other furrow. The intention of the experiment was to diſcover which of theſe methods was beſt; ſome trials on drilling Beans in tilth land at different diſtances have been publiſhed, but I know of none of doing the ſame thing on a lay. The ſeed was put in 4 inches from Bean to Bean in the wide rows, and 5 in the narrow ones. My orders were 2 inches in the former caſe, and 4 in the latter, which would have made quantity of ſeed the ſame in both; bnt there were uſed on the piece of narrow rows, at the rate of 8 becks an acre, and for the wide ones, 7 per acre. The expence of dibbling the latter 3s. 3d. and of the former 5s. per acre. The rows at 18 inches were horſe-hoed with a ſhim three times and hand-hoed thrice. The others were hand-hoed twice and looked over ſlightly a third time. The expence of the whole in labour 2l. 1s. 8d. or 10s. an acre. In dividing this ſum, the narrow rows were at the rate of 5s. the firſt hoeing; 4s. 6d. the ſecond; and 2s. 6d. the third, in all 12s. The hand-hoeings of the wide ones were 3s. 2s. 6d. and 2s. 6d. or 8s. in the whole; to which add, for three horſe-hoeings, including man, boy, and horſe, 3s. 3d. a day, or, at four acres a day, 10s. an acre; in all, for the wide rows, 8s. 10d. At harveſt cutting, the narrow rows was 6s. an acre, the wide ones 5s. All other expences the ſame to both. Laid and threſhed them ſeparate; produce of the 3 roods 31 poles, narrow rows, 7 coomb 2 buſhels; of the 3 acres, 1 rood, 8 poles, wide rows, 16 coomb 2 buſhels. The proportions are, pretty exactly, 8 coomb per acre, narrow rows; 5 coomb per acre, wide ones. Accounts per acre.

Eighteen Inch Rows.

Expences.	£.	s.	d.
One ploughing	0	6	0
Seed, 7 pecks of beans, at 3s. a buſhel	0	5	3
Planting	0	3	3
Buſh harrowing	0	1	6
Keeping from vermin	0	1	0
Hand hoeing	0	8	0
Horſe hoeing	0	0	10
Reaping	0	5	0
Splent yarn for binding	0	1	6
Harveſting, ſtacking, thatching, taking in, &c. &c.	0	4	6
Thraſhing five coomb, at 7d.	0	2	11
Carrying out five coomb	0	2	6
Rent, tythe, and poor rates	0	16	1
Fences	0	1	4
Sundry charges	0	0	9
	£. 3	0	5

Produce.	£.	s.	d.
Five coomb, at 11s. 9d.	2	18	9
Straw, value in conſumption	0	3	6
	3	2	3
Expences	3	0	5
Profit	£. 0	1	10

Nine Inch Rows.

Expences.	£.	s.	d.
One ploughing	0	6	0
Seed, two buſhels	0	6	0
Planting	0	5	0
Buſh harrowing	0	1	6
Keeping from vermin	0	1	0
Hand hoeing	0	12	0
Reaping	0	6	0
Splent yarn	0	2	0
Harveſting, &c.	0	5	3
Threſhing eight coomb, at 7d.	0	4	8
Carrying out	0	4	0
Rent, &c.	0	16	1
Fences, and ſundry charges	0	2	1
	£. 3	11	7

Produce.	£.	s.	d.
Eight coomb, at 11s. 9d.	4	14	0
Straw	0	5	0
	£. 4	19	0
Expences	3	11	7
Profit	£. 1	7	5

N. B. A coomb is 44 buſhels.

OBSERVATIONS,

The firſt remark I have to make, is on the great ſuperiority of the cloſe planting; this has reference chiefly to the poverty of this cold and exhauſted ſoil. In proportion to the weakneſs of land ſhould be the quantity of ſeed; and thoſe who plant upon better ſoils may ſet them thinner; upon very rich ones, every other furrow, would, probably, do better than on every furrow. But the circumſtance of its being on a lay is not to be forgotten: tilth land is far more ſubject to weeds, in which caſe the introduction of the horſe-hoe may more than make amends for the deficiency in number of plants: it has hardly fair play on a lay, for the moulds are not in quantity for it to work in.

The ſuperiority of every furrow is very great indeed: the profit in one caſe is ample, amounting to near three rents, which is as much and generally more than is to be expected from wheat in common culture: but, in the wide ſows, the advantage is, on compariſon, very little.

Intereſting obſervations might be made even on the ſmalleſt product, in relation to fallowing; but I forbear, as the what muſt be reaped, with which the field is ſown, and brought to an account before that compariſon can be fully aſcertained.

I muſt beg the reader will have candour enough to pronounce no condemnation on the management of this crop, from the ſmallneſs of the produce: the land is naturally poor, wet, and cold: I took it at the expiration of a leaſe, during which, the tenant had done much to exhauſt, and nothing to repleniſh it. It was flat, and without drains: the dunging, it is true, did ſomething; but nothing on compariſon with the effect it would have had, had it been laid dry. The Beans were unavoidably planted too late; and the harveſt was unfortunate. There wants little information of the culture on rich, deep, friable loams: but to know that they may be depended upon on poor wet loams of 10s. or 12s. an acre, is a point not at all aſcertained, and of much importance to various queſtions of rural œconomy.

One other circumſtance ſhould be mentioned, that the ſtraw, notwithſtanding the unfavourableneſs of the harveſt, proved of great uſe to my lean cattle. They were tied up in ſtandings, in Mr. Bakewell's method, and from having good barley and oat ſtraw, were put to that of Bean, and nothing elſe to depend on, without at all feeling off in their looks; but they had it given them in larger quantities. The ſtraw well harveſted is known in various parts to be very valuable, eſpecially for horſes. I found it ſo for cows and young cattle. The price charged in this experiment is what it paid, reckoning the cows at 9d. and the young cattle, at 6d. per week. I need not obſerve, that the object of dung is more conſiderable than this.

This practice and the obſervations thereon, ſhew Mr. Young a *man of buſineſs* an appellation, which we hope he does not think derogatory to that of a gentleman.

As novelty is generally ſought after with eagerneſs, particularly when it is blended with ſomething of the wonderful, we preſume the following letter by Mr. JOHN BULTS, of Kingſtone, near Taunton, to the Secretary of the Bath Society, will be acceptable.

ACCOUNT OF A CROP OF BEANS AND TURNIPS IN ALTERNATE ROWS.

"IN reply to your enquiries relative to my drilled crop of Beans, with the turnips in the intervals, I ſend you the following particulars:

"The field meaſures ſix ſtatute acres and a quarter, and is a good clayey ſoil.

"The Beans were planted in drills near two feet a part on two ploughings, and horſe-hoed three times, the turnips being ſowed in the intervals at the third or laſt hoeing.

"There has been no kind of manure or dreſſing laid on the land for ſix crops paſt, nor is there any need of it; as I find by experience that drilling and horſe-hoeing anſwer the end fully. The crop of Beans was near three quarters per acre.

"The weight of turnips was thirty ſeven tons five hundred weight, as meaſured and weighed by Mr. Pavier, and Mr. Headford: theſe turnips are now feeding off. Thirty one head of horned cattle, ſixty ſeven ſheep, and twenty ſix pigs, have been maintained by them for a month paſt; and what remains will keep them at leaſt a month longer. The whole expence of drawing and carting them into an adjacent field for the cattle, is between ſix and ſeven ſhillings per acre.

"I am, &c.

"JOHN BULT."

Mr. Bult's ſurpriſing ſucceſs, is enough to rouſe every farmer who regards his own intereſt, to the horſe-hoeing ſyſtem; thoſe who feel themſelves diſpoſed to make the experiment, we wiſh them ſucceſs.

This account by Mr. Bult is further confirmed by two letters on the ſame ſubject, by Mr. Thomas Pavier, of Weſt-Monckton. Were we to form any conjecture on this buſineſs, it would be that Mr. Bult's land was of a ſuperior quality; but admitting that to be the caſe, he has no reaſon to repent his management.

As the broad Windſor Beans, are ſometimes planted for agricultural purpoſes, we will mention a few circumſtances reſpecting their cultivation. They ſhould be planted on ſtrong rich land about the beginning of April, if the weather permit, and ſet or dibbled in rows of eighteen or twenty inches aſunder, and four inches diſtance from Bean to Bean in the rows, and ſhould be hoed twice or three times. To make them pod the better, and to facilitate their ripening, it is good management if the crop is luxuriant and ſtrong to cut about two inches off the top of each Bean (with a reaping hook, or ſome ſuch inſtrument) juſt at the time the bloſſom begins to fall; this labour is quickly performed, and gives the ſun admiſſion, and keeps the ſap down to nouriſh the Beans, which is eſſentially neceſſary, as the principal objection to their cultivation for ſeed is the lateneſs of their ripening.

Theſe Beans, likewiſe all others of the Bean kind, when the crop is large and good, ſhould be reaped as ſoon as the ſtraw begins to turn black; the beſt method of managing Beans is what they call in the inland counties, pucking them; that is, ſetting them up in ſingle ſheaves extended wide at the bottom, and tied together at the top, in a conic ſhape, reſembling a ſugar loaf; this, in the countries where it is practiced, is done for four or five ſhillings per acre, and we have known them ſtand in the field till the middle of November, and when thraſhed there has not been a black or decayed Bean in the ſample.

PEAS.

There are ſeveral kinds of Peas in cultivation, of various colours and ſhapes, the grey Peas moſt commonly ſowed in fields are the early Charlton and the common late ripe pea; theſe do not flouriſh ſo well in a clayey ſoil; but on all ſoils, which bear good corn of other kinds you may naturally expect good grey Peas, they ſhould be planted as early as the ſeaſon will permit, are generally ſowed under furrow or ploughed in; but the only proper management is to drill them if circumſtances will admit, and if not, ſet or dibble them. White and blue Peas ſhould be planted on a good friable loam, or on a ſandy or gravelly loam; in March, or the beginning of April, ſome land will bear them to boil tender, and other kind of land will not; there is no juſt and infallable rule by which the proper ſoil to produce them good boilers can be aſcertained, therefore experience alone muſt determine. As Peas are planted for a meliorating crop, they ſhould be never ſowed broad caſt, as by that means hoeing is prevented, which is of great ſervice to the crop of Peas, and doubly ſo to the land for the ſucceeding tillage. There is a large egg ſhaped Pea lately introduced, called the American Pea; and if planted on warm rich land, anſwers extremely well; but if land is not of that deſcription, we by no means would recommend its cultivation out of the garden, but for culinary purpoſes they are ſuperior to any kind that are known in this country.

Peas of all kinds ſhould be cut before they are too ripe, otherwiſe the pods will open, and a great loſs will be ſuſtained by their ſhedding on the ground, particularly ſhould the weather be aukward. Mowing peas with a ſcythe may with juſtice be called a ſlovenly practice, whether they were planted broad caſt, or in rows by drilling or ſetting. The beſt method to cut them is with a hook, like a reaping hook fixed to a ſtick 3 feet long or upwards, and generally called a ſtaff-hook; although ſome prefer a common reaping hook to cut them with, and a hooked ſtick or an old ſickle in the other hand, which is very uſeful in parting them, in order to place them in ſmall cocks or heaps. Practice, which makes all things familiar, makes ſome prefer one way and ſome the other; in either method care ſhould be taken not to make the heaps too large; in fact, you cannot err by making them too ſmall

SECT. VII.

VETCHES OR TARES, RYE, BUCKWHEAT, LENTILLS OR TILL, AND THEIR CULTIVATION.

THE kinds of Vetches (or perhaps, as they are more generally called, Tares) which are cultivated in this kingdom, are the winter Vetch, which is of a ſmall kind and ſowed in autumn, and the ſpring Vetch ſowed in ſpring; theſe are very ſeldom uſed for any other purpoſe, except as green food for cattle of all kinds.

AGRICULTURE.

Sometimes they are mowed and given to horſes in the ſtable, or to horned cattle in yards, and ſometimes eat off the land by ſheep, or young cattle, in the manner of turnips. As Vetches, when they are ſowed on warm dry land in autumn, or the latter end of ſummer, produce early ſpring feed; their cultivation is particularly neceſſary where graſs lies backward, to ſupply the ſpace between the finiſhing of the turnip crop and the time when natural graſs is in condition to have cattle turned into it. This is an acquiſition of material conſequence to every farmer, as green food is always at that time much wanted, for ſheep in particular, for breaking or turning cattle into paſture early in ſpring before graſs has attained any forwardneſs, is keeping herbage low all the ſummer, by nipping the tender plant before it has arrived at any degree of ſtrength. Winter Vetches ſhould be ſowed as ſoon as poſſible after the preceding crop is cleared off the ground, that they may acquire ſufficient ſtrength before the ſeverities of winter appear, which will alſo render them forward in the ſpring.

Spring Vetches are ſowed any time in ſpring to follow thoſe of the winter kind, and may, if requiſite, be ſowed from time to time, to procure a ſucceſſion of crops during the ſummer.

After early Vetches are ſpent, there is a very good opportunity of giving land a partial ſummer fallow. We have known buckwheat ſowed in May, or the beginning of June, after winter Vetches, and ploughed in to manure the land for a crop of wheat or ſpring corn; and if land is clean from weeds it is certainly excellent management, particularly on land of a light texture.

The Rev. Mr. LAURENTS, of Bury St. Edmunds, an intelligent gentleman, who correſponds with Mr. Young, has proved, from ſeveral demonſtrative experiments, that the winter and ſpring vetch are by no means calculated as ſubſtitutes for each other, although it is a prevailing opinion that both will anſwer the ſame purpoſe: theſe experiments are ſo clear, that we would wiſh to caution the huſbandman in this particular.

The wild Vetch, or Tare, has been lately cultivated in a particular ſucceſsful manner by the Rev. Mr. Swayne; and if the ſeeds can be preſerved bids fair to become an article of importance in Agriculture.

As we cannot do juſtice to this gentleman's curious and uſeful experiment if we abridge or alter his letter, we beg leave to lay it before the public in his own words, as communicated to the Bath Society.

ON THE CULTURE OF THE BUSH VETCH.

By the Rev. Mr. Swayne, of Pucklechurch.

The plant which the ſtatement reſpects is, the Buſh Vetch, or botannically, according to Linnæus, (Vicia Sepium.) It is not only a perennial, but an ever-green: it ſhoots the ear beſt in the ſpring of any plant eaten by cattle with which I am acquainted, vegetates late in autumn, and continues green through the winter; add to this, cattle are remarkably fond of it.

"IN the autumn of the year 1782, I collected a quantity of theſe ſeeds from the hedges, &c. March 15th, 1783, I ſowed them in drills in a plat of ground in my kitchen garden, which meaſured exactly five yards ſquare; they were ſown in eight drills, as thick in the drills as I would have ſown peas. They came up very thin and irregular; in ſome places there was more than a foot vacancy between plant and plant. This I was much ſurpriſed at, as the ſeed had been carefully preſerved during the winter, and I could not, from their appearance at the time of ſowing, ſuſpect them to be in the leaſt defective. The plants grew very ſparingly till towards the autumn, but before winter they made a tolerable appearance.

"This plat is in the moſt expoſed part of my garden; the ſoil a blackiſh loam, rather ſtiff; it had been planted with potatoes the year before, for which I believe it was dunged, but am not certain; the two preceding years it was uſed as a nurſery for Lombardy poplars.

"Early in July 1783, I collected ſome more of theſe ſeeds from the hedges, tied them up in a paper, and put them in a drawer of my bureau. Upon opening the paper in September, I obſerved a vaſt number of dead flies in it, and as many of the ſeeds with a ſmall hole in each. The number of the flies was 280. The whole number of the ſeeds 1080. Theſe flies, upon examination, proved to be a ſmall ſpecies of ichneumon. This puzzled me not a little, as I had learnt that theſe inſects were termed a race of cannibals, from their larvæ or caterpillars always feeding on other inſects. Upon which I opened many of the other ſeeds that had no holes in them, and in ſeveral of theſe diſcovered another inſect, alive, and in different ſtates of its growth. This proved to be the *bruchus piſi* of Linnæus, a near relation of the weevil [*curculio*] and the attelabus. From hence I ſurmiſed, that at the time when the buſh-vetch bloſſoms the female bruchus lays her egg within the bloſſom, and the ichneumon immediately after depoſits her egg in the ſame place.

"After the froſts were over, I was much pleaſed to obſerve, that ſcarce a plant of my vetches had been killed by them, and their verdure very little injured. In April 1784, they had entirely filled up the ground, and were beginning to flower; at this time I found, as I expected, numbers of the bruchi intruding themſelves into the bloſſoms, before they were ſcarcely open, and the attendant ichneumones ready to follow them. I uſed every method I could think of to chaſe away theſe inſects from my crop, by ſtrewing ſoot over, kindling ſmoaky fires around, &c. but all to no purpoſe.

"In the beginning of May the Vetches were in full bloſſom, and it was amazing to ſee what a croud of inſects were ſwarming about them. At that time I intended to preſerve the Vetches for ſeed; but ſome time after, obſerving that they were beginning to rot from their over-luxuriance, I cut them, without taking any particular account of the produce. They were cut twice afterwards during the ſummer. Having remarked in general that the produce of theſe cuttings was very great, I was determined this year to keep a particular account,

"Accordingly, March 16, 1785, I began to cut the Vetches for the firſt time this ſeaſon. This cutting weighed green 16℔. I did not dry any part of it, but muſt ſuppoſe, that if dried, it would have weighed at leaſt one-fourth, as it was not near ſo ſucculent as any of the after-cuttings.

"May 17th, they were cut a ſecond time, in full bloſſom, and weighed 130 pounds,—36℔. of the green fodder weighed when dry ſix pounds.

"July 21ſt, they were cut a third time, and weighed 62℔.—33½ ℔. green weighed 8℔. dry.

"Sep. 30th, they were cut the fourth time, and weighed green 72½℔.—15lb. green weighed 2½℔. dry.

"The whole plat then of twenty-five ſquare yards produced,

		℔.		℔.	
1ſt	cutting	16	green ſuppoſed	4	dry
2d	ditto	130	ditto, would have weighed	21½	dry
3d	ditto	62	ditto, would have weighed	14	dry
4th	ditto	76½	ditto, would have weighed	12½	dry
	Total	284½	green	52	dry

"An acre therefore, (reckoning 4840 ſquare yards to the acre) in the ſame circumſtances, would have produced the total amount of

Tons.	cwt.	qrs.	℔.	
24	11	3	3	green
4	9	3	15	dry fodder.

"N. B. You are to recollect, that at the time the firſt cutting was made, there was ſcarce a green blade of graſs to be ſeen; and that the ſeaſon, till after the third cutting, was as unfavourable to vegetation as perhaps any in the memory of man.

"Your obliged humble ſervant,

PUCKLECHURCH,
OCTOBER 13, 1785.

G. SWAYNE."

As every perſon converſant in Agricultural concerns muſt have ſeen this plant in its wild ſtate, we can only wiſh to impreſs the probable idea of its promiſing utility on the minds of thoſe who endeavour to promote the art, not doubting but their labours will be crowned with ſucceſs.—For the repreſentation of the Wild Vetch, or Vicia Sepium, we refer our readers to the Plate of BRITISH GRASS.

RYE.

Rye was formerly ranked next to wheat as bread corn, but its reputation as food for the human ſpecies has been on the decline for many years, although in ſome places a ſmall quantity continues to be mixed with the wheat: this gives bread a diſagreeable ſweetneſs, and, to thoſe who are not accuſtomed to eat it, is productive of pains in the bowels, and other unpleaſant ſymptoms. It is adapted to a ſandy ſoil, not kind for any other ſort of grain, which may be the cauſe of preſerving the ſhare of repute it continues to hold as grain.

Rye ſown upon ſtubbles in autumn produces very early ſpring feed, for which purpoſe it is very uſeful.

For ſheep, ewes and lambs in particular, it is of infinite ſervice, as it vegetates earlier in the ſpring than any other kind of feed; this was the motive which induced us to range it with ſpring feed. It is for want of providing ſpring food for cattle, that people are obliged to have their ewes yean late, and without which they cannot ſupport their lambs, ſhould they come earlier; and if that is the caſe, without rye or ſome other early feed, they are under the neceſſity of eating the grounds which are intended to be mowed for hay, till perhaps the middle of May.

If a dry ſeaſon follows, theſe grounds are burned up, and the expected produce of hay wholly, or in a great meaſure deſtroyed: this might frequently be prevenſed by ſowing rye, and eating it off early, and then plough and manage as neceſſity or convenience permits for turnips.

Rye is a very exhauſting crop, if harveſted; but not ſo if it does not ſtand the ſummer.

BUCK WHEAT,

Is a native of the Eaſt, and uſed for making of bread, in the country from whence it was imported into this kingdom; but with us it gives place as food for humanity to wheats of a much ſuperior quality.

Buck Wheat will grow on a very barren ſoil, which requires very little previous preparation, and ſhould not be ſowed till all other ſpring feeding is over.

"Buck Wheat is only proper to ſow on lands of low value, and, as a Norfolk gentleman obſerves, can never anſwer on deep rich land worth a guinea per acre, as on ſuch land it produces too much ſtraw. Like all other full running crops it prevents the growth of weeds, and in Suffolk is ſown with graſs ſeeds for the purpoſe of laying down land;" but we can by no means ſubſcribe to a doctrine of that kind, as what prevents the growth of weeds will of courſe prevent the growth of tender graſſes.

The principal advantage of Buck Wheat in Agriculture is, undoubtedly, as manure on light lands, which are aukwardly ſituate for manures of other kinds: ſowing Buck Wheat after rye or winter vetches, about the latter end of May, ſeems a very rational and improving ſyſtem on poor land.

E. HOLMES, Eſq. of Scorton in Yorkſhire, obſerves, in his correſpondence with Mr. YOUNG, that turnips are to be preferred: we agree with him that turnips, in every reſpect where profit is conſidered, would be ſuperior; but on poor land, which has been run too hard and exhauſted, and has alſo been frequently ſowed with turnips, there is more difficulty to raiſe a tolerable crop of them than perhaps Mr. HOLMES is aware of.

Moſt farmers who have been uſed to the turnip cultivation are well convinced they are not raiſed on land, which has growed them ſeveral times, without an expenſive dreſſing of good manure, even on good loamy rich ſoil.

Buck Wheat being adapted to light land, we make no heſitation in recommending it as excellent management as above directed, and greatly before turnips on a poor light ſoil.

LENTIL, OR TILL.

Lentils are of the pulſe kind, ſomething reſembling the wild or buſh vetch. They are cultivated after the ſame manner as the ſpring vetch, and to the ſame purpoſe; but in ſome reſpects are preferable, as they will grow on poor braſhy land, ſuch as vetches will not.

Lentils are excellent as green fodder, and for hay to make horſes fat, ſuperior to every other kind: when deſigned for hay they ſhould be cut juſt after the pod or kids are formed.

SECT. VIII.

CLOVER, RYE GRASS, AND TREFOIL.

THE kinds of Clover are, the Broad Clover and the White Bloſſomed Clover, both of them of Dutch extraction, at leaſt the Hollanders taught us their cultivation, and ſupplied us firſt with ſeed, which they have continued to do annually to the preſent day.

Broad Clover is in general uſe throughout this kingdom, on land that will bear it. Should there be an individual who refuſes to ſow it, becauſe his grand-father, or father, did not, we can only wiſh his ſon or ſucceſſor may deviate from the path his predeceſſor ſo obſtinately walked in.

When land is ſowed with any kind of artificial graſs to continue one year only, Broad Clover is always fixed upon, and certainly for that purpoſe is ſuperior to all others, as it produces a plentiful crop, and is excellent as herbage, green fodder, or for hay.

Clover is better adapted to all kinds of clayey, ſtrong ſoils, than any other kind of graſs, and is very frequently, and with great propriety, ſowed among wheat on ſtrong land in the ſpring.

Land that has been repeatedly planted with Clover becomes ſatiated, or tired, particularly if it is mowed twice the ſame ſummer, or let ſtand for ſeed: when either of theſe methods are practiſed, a more exhauſting crop than Clover cannot be cultivated, nor any more profitable if attended with good luck in harveſt.

When Clover is cut for hay it ſhould be at the time the bloſſom begins to put forth, which moſtly happens the end of May, or the beginning of June: the earlier it is cut the firſt time the more luxuriant and quick will the ſhoots put forward for the next crop, and the leſs will the land be exhauſted.

White Dutch Clover is not ſo thrifty and ſtrong in its nature as Broad Clover, neither is it ſo well adapted to ſtrong land; but as a mixture with other ſeeds in laying down land for three or four years, or longer, it is extremely uſeful, as the herbage is remarkably ſweet, and its growth has more permanence. This is better ſuited to light ſandy, or gravelly loams, than Broad Clover, but ſeldom produces ſo large a crop.

RYE GRASS.

This valuable plant ſeems to have loſt ſome of its reputation amongſt the experimental gentlemen of the preſent day. Mr. Young, in particular, bears it no kind of good will: if he cultivated a large track of light loamy land, we have not a doubt but he would mix one or two buſhels of Rye Graſs with four pounds of white clover and ſix of trefoil, in laying it down for two or three years, as light lands and braſhy loams require more reſt than one year.

For lands which are tillage and paſture alternately, no artificial graſs is equal to Rye Graſs: its early appearance in ſpring, and its kind flouriſhing ſtate on land that is tired with, or not natural for, clover, will ſecure Rye Graſs a reſpectable name among artificial graſſes.

TREFOIL.

Trefoil, by ſome called Hop-Clover, is ſweet herbage for cattle, and excellent to thicken rye graſs and clover on light lands: it makes excellent hay, and on a friable loam, which ſuits it, will grow to a good crop alone. The ſeeds are incloſed in huſk, like a thoſe of ſaintfoin, and are generally ſowed as they come from the flail, and although the kernel is ſometimes ſeparated from the huſk, and is what is called milled ſeed, the method is by no means adviſeable, the growth being not ſo certain.

It may not be amiſs to remark, that a frequent change of graſſes is almoſt as neceſſary as to vary crops of corn.

SECT. IX.

SAINTFOIN AND LUCERNE.

SAINTFOIN, in ſome countries called Cinquefoil, is ſaid to have been introduced into this kingdom as early as the reign of Richard II. who brought the ſeeds with him from Paleſtine on his return from the Holy Wars, and is in that account called Saintfoint. It is a plant of great and important utility in Agriculture, and the more ſo as it flouriſhes beſt on poor rocky land, where no other cultivated graſſes will; this is certainly a very material advantage, and, what is further extraordinary, the cultivators of Saintfoin deem poor light land in the beſt ſituation to be planted Saintfoin, when it becomes ſo foul with couch graſs, and ſo exhauſted by being over-cropped, that it will produce nothing elſe. This doctrine is really ſurpriſing, but we have frequently ſeen excellent Saintfoin grow on land exactly in the condition of that we have juſt deſcribed; whether it would have been better if the land had been clean and in good condition we know not, but the proprietor aſſerted that he was well ſatisfied with his management.

Saintfoin is ſometimes ſowed alone, always in ſpring about the time of barley ſowing, after the land has had two or three winter ploughings; but the beſt and moſt common method is to ſow it with oats or barley, and not to ſuffer any cattle to feed it the next winter or ſummer following, nor yet to mow it the firſt ſummer; but let the ſeed drop on the land, which will greatly increaſe the plant. It is deemed good management to mow Saintfoin for hay every year, and ſome perſons are ſo particular that they never ſuffer a ſheep to feed it: we do not apprehend ſheep do a material injury to Saintfoin, if they are kept from it in autumn and all the winter; indeed, it is neceſſary it ſhould be kept free from cattle during the winter.

Saintfoin may be ſowed after the ſpring corn is up, as it requires a very ſlight harrowing to bury it ſufficiently, it being natural to ſtrike root. Three buſhels and an half, or four buſhels, are ſufficient to plant an acre.

A great fault reſpecting Saintfoin hay, is permitting it to grow too long before it is cut; the cuſtom being not to cut it till it is in full bloſſom; whereas if it was mowed juſt at its coming into bloſſom, the hay would be greatly ſuperior in quality, the leaves would not beat off in making, and the ſecond crop, or aftermath, would grow much ſtronger.

There is very little nouriſhment in Saintfoin hay which has been over-grown, and when it is cut with its juices in perfection, there is not any hay equal to it in goodneſs for all kinds of cattle.

The experimentaliſts recommend the drill and horſe-hoeing ſyſtem with Saintfoin: this may anſwer in a garden, or on a ſmall ſcale for the ſupport of a horſe and cow, but to keep good land in ſuch an expenſive courſe of tillage, to produce a crop, which will grow without trouble or expence on a ſoil which will ſcarcely grow any thing elſe, muſt be extreme folly.

Saintfoin ſtrikes its root very deep, particularly on a hollow rocky land, which is the beſt adapted for its culture, and will continue in perfection from twelve to twenty years; when the land is brought into tillage again, the beſt method is to pare and burn it, and plant turnips, or wheat.

Let it be noticed, that when a crop of Saintfoin has ſtood its time, and the land is again converted to tillage, Saintfoin will not grow kind a ſecond time without a long interval.

LUCERNE.

Lucerne is the *Herba Medica* of the ancients: the high eſteem they held it in appears by the extraordinary attention they beſtowed on its culture. Its roots are very large: thoſe which are above the ſurface are clothed with bark like a tree. From this, and by its ſtalk ſpringing juſt below the place where they were cut off, and the hardneſs of the ſtalks when they ſtand too long without cutting, it ſeems that Lucerne is of a nature nearly approaching to that of a ſhrub. As green fodder it is excellent for all ſorts of cattle, and as hay it is eſteemed of a very ſuperior quality; and with reſpect to quantity, it yields a much larger than any other plant that is known in cultivation.

With all theſe great advantages it may be aſked, why are Britiſh farmers ſo blind to their intereſts to neglect the culture of this valuable plant? The reaſon we ſuppoſe ariſes from the great trouble and expence requiſite to keep it in proper order, without which it is in vain to attempt the growth of Lucerne.

It has been frequently tried in the common broad-caſt method, but always failed; drilling and hoeing are abſolutely neceſſary, and to this expenſive management a large quantity of the beſt mauure muſt be added annually, otherwiſe Lucerne will not flouriſh.

The proper ſeaſon to plant Lucerne is in April, and the only method by which any ſucceſs can be expected is to drill it in rows of two feet diameter, or upwards. As ſoon as it has grown a ſmall height, it ſhould be cleaned with the hand hoe from weeds, and the plants ſhould be thinned in the row, leaving thoſe which appear the moſt promiſing at about ſix inches diſtance from each other. After this, Lucerne is principally kept in order, and cultivated with the horſe hoe at leſs expence. Manure is generally laid in the intervals in winter, and by ploughing gradually brought to the roots of the plants. Its great uſe is to give green to cattle in the ſtable or elſewhere, for which it has no equal.

The proper time to cut Lucerne is before the bloſſom begins to open, and cannot be performed ſo well with any inſtrument as a reaping hook.

We would not recommend the culture of this valuable plant to any perſon who will not determine with themſelves to give it the greateſt attention, and ſpare neither expence in labour or manure, for without theſe it cannot anſwer, and with them it will.

R. Legrand, Eſq. obſerves, that he manured an acre of Lucerne, which he has in cultivation, with forty buſhels of ſoot annually, and does not repent his management: at this rate the produce muſt be prodigious.

SECT. X.

OTHER GRASSES NOT IN GENERAL USE, AND THEIR CULTIVATION.

We ſhall commence this ſection with an account of ſix valuable *Britiſh Graſſes*, collected and brought into cultivation by the ingenious Mr. Curtis of Lambeth Marſh, author of the Flora Londonienſis, and that much admired work the Botanical Magazine now publiſhing.

It is with the greateſt pleaſure we inform our readers that Mr. Curtis has not only favoured us with the following valuable deſcription of the Graſſes now before us; but will likewiſe render us every aſſiſtance in his power in the Botanical department of our work.

ON THE ADVANTAGE WHICH MAY RESULT FROM THE INTRODUCTION OF THE SEEDS OF OUR BEST GRASSES.

THAT much of our meadow and paſture land may be rendered infinitely more valuable than it is at preſent, by the introduction of ſome of our beſt Graſſes, is an opinion which has long prevailed among many of the more enlightened agriculturiſts of the preſent age. And while ſome of theſe have endeavoured to excite the huſbandman to collect and cultivate ſeeds of this ſort, by writings fraught with the ſoundeſt reaſoning; others have attempted to attract him by the offers of well-directed premiums. But, hitherto, neither the writings of the one, however convincing, nor the premiums of the other, however alluring, have been productive of the deſired effect: Ray-Graſs ſtill continues to be the only Graſs whoſe ſeeds can be purchaſed for the purpoſe of laying down meadow and paſture land; and how inadequate that Graſs is for ſuch a purpoſe, is known to every intelligent farmer. Why indeed the *Lolium perenne*, or Rye-Graſs, ſhould originally have been made uſe of, in preference to all the other Graſſes, cannot, perhaps, be ſatisfactorily accounted for; moſt probably it owes its introduction to accident, or to its being a common Graſs whoſe ſeeds were eaſily collected, rather than to its being preferred from an inveſtigation of its merits compared with the others; however this may be, there appears to be no reaſon for excluding the others, for it would appear exceedingly improbable that of upwards of a hundred Graſſes growing wild in this country, the Author of Nature ſhould have created one only as ſuitable to be cultivated for paſturage or fodder.

The difficulty of diſtinguiſhing the Graſſes one from another, has no doubt proved one grand obſtacle; many of theſe plants are ſo much alike, that the moſt diſcerning botaniſt is often at a loſs to know ſome of them apart; if ſo, how eaſily may the huſbandman be deterred from the arduous taſk.

From the numerous applications made to me, by a variety of gentlemen, for Graſs Seeds, it has appeared incumbent on me to do ſomething which might gratify them, and render the public an eſſential ſervice; I wiſh, at leaſt, to put it into their power to decide on a matter which has been long agitated, and from which I am far from being the only one that entertains the moſt ſanguine hopes of its proving a great national advantage.

The Graſſes recommended will, I am certain, do all that *our natural Graſſes* can do: they are ſix of thoſe which conſtitute the bulk of our beſt paſtures; moſt of them are early, all of them are productive, and they are adapted to ſuch ſoils and ſituations as are proper for meadows and paſtures.

But let no one expect them to perform wonders; for, after all, they are but Graſſes, and, as ſuch, are liable to produce great or ſmall crops, according to particular ſeaſons, or to the fertility or barrenneſs of the ſoil on which they are ſown.

OBSERVATIONS ON THE GRASSES RECOMMENDED

I. ANTHOXANTHUM ODORATUM. *Sweet-Scented Vernal-Graſs. Fig.* 1.

NEXT to the *Cynoſurus Cæruleus*, or *Blue Dogs-Tail Graſs*, this, of all our Engliſh Graſſes, comes firſt into bloſſom; it is therefore valuable as an early Graſs; it is valuable alſo for its readineſs to grow in all kinds of ſoil and ſituation, being found in bogs, in woods, (eſpecially ſuch as are of low growth, or have had the underwood cut down) in rich meadows, and in dry paſtures: in point of crop, it is not ſo productive as ſome, yet more ſo than others; cattle appear to be fond of it; and it is well known to be the only Engliſh Graſs which is odoriferous; the agreeable ſcent of new-made hay ariſes entirely from this Graſs, hence its name of *odoratum*, or ſweet-ſcented; the green leaves, when bruiſed, readily impart this perfume to the fingers, by which means the foliage may at all times be known; and perſons not deeply ſkilled in botany, may diſtinguiſh it when in bloſſom, by its having only two threads or ſtamina to each flower.

Of the ſeveral Graſſes here recommended, it is the leaſt productive in point of ſeed.

II. ALOPECURUS PRATENSIS. *Meadow Fox-Tail Graſs. Fig.* 2.

PRODUCES its ſpike almoſt, and in ſome ſituations, to the full, as early as the *Anthoxanthum*; hence it is equally valuable as an early Graſs; and as it is much larger, and quicker in its growth, it is conſequently much more productive: it ſhoots very rapidly after mowing, producing a very plentiful aftermath: and where land is rich, and two crops are not thought too much for it to bear, of all our Engliſh graſſes this appears to be the beſt adapted to ſuch a purpoſe, and ought to form a principal part of the crop: its foliage may, perhaps, appear coarſe to ſome, but it ſhould be remembered, that no Engliſh Graſs can be productive that is not in ſome degree coarſe; but if mown early, juſt as it comes into bloom, though the leaves are large, the hay will not be coarſe; in general, the great advantage ariſing from the earlineſs of this and the preceding Graſs is entirely loſt at a diſtance from London, where hay-making commences late, and where the huſbandman ſeems to wait for a crop of general indiſcriminate herbage, rather than of Graſs.

The *Meadow Fox-Tail* is more confined as to its place of growth, growing naturally in a moiſt ſoil only; hence it is beſt adapted to improve very wet ground that may be drained of its ſuperfluous moiſture, or to form or meliorate meadows that have a moiſt bottom, and are not apt to be burnt up in dry ſummers.

Its ſeeds are eaſily collected, but a great number of them, we believe, at leaſt one-third, are yearly deſtroyed by a very minute orange-coloured larva or maggot, which feeds on the embryo of the ſeed, and produces a very ſmall muſca or fly, probably the *Muſca Frit* of Linnæus.

This Graſs is diſtinguiſhed, in ſome degree, by the largeneſs of its foliage, and by its producing a ſoft ſpike on a long ſtalk early in May. The *Meadow Cats-Tail Graſs* produces a ſpike ſomewhat ſimilar, but rougher to the touch, and much later in the ſummer.

III. POA PRATENSIS. *Smooth-Stalked Meadow-Graſs. Fig.* 3.

THE foliage of this Graſs begins to ſhoot, and to aſſume a beautiful verdure very early in the ſpring, but its flowering ſtems are not produced ſo ſoon, by at leaſt a week, as thoſe of the *Alopecurus*; this trifling difference, however, in point of earlineſs of flowering, does not prevent it from ranking very properly with the two preceding; and, where early graſſy paſturage is a deſideratum, we are of opinion it cannot better be obtained than by a combination of theſe three; if crop be at the ſame time an object, the *Meadow Fox-Tail Graſs* ſhould predominate.

This Graſs rather affects a dry than a moiſt ſituation, and hence it keeps its verdure in long-continued dry weather better than moſt others, but it will thrive in either; will grow on the top of a dry wall, but grow much more luxuriantly in a rich meadow: it is to be obſerved, however, that it has a root which creeps like the *Couch Graſs*, and is almoſt as difficult to extirpate; it ought therefore to be cautiouſly introduced where the paſturage is not intended to be permanent.

Of the trifling improvements which we flatter ourſelves to have occaſionally made in ſome of the ſpecific characters of the Engliſh plants, none have given us more ſatisfaction than thoſe which relate to this ſpecies and the *Poa Trivialis*, two Graſſes ſo very ſimilar, as ſcarcely to be diſtinguiſhed, even by the moſt diſcerning eye, at a little diſtance, and very obſcurely characteriſed by Linnæus, but which, by attending to two characters only in each Graſs, may now, in a moment, be diſtinguiſhed by the utmoſt facility and certainty.

The *Poa Pratenſis* has a ſmooth ſtalk, the *Trivialis* a rough one, perceptible when drawn betwixt the thumb and finger, and which ariſes from little ſharp points, viſible when the ſheath of the leaf which covers the ſtalk is magnified, the *Trivialis* has a long pointed membrane at the baſe of the leaf, the *Pratenſis* a ſhort blunt one. Theſe Graſſes differ ſpecifically in a variety of other particulars, not neceſſary here to dwell on; and which ſuch as wiſh to be more particularly informed of, may conſult the Flora Londinenſis.

IV. Poa Trivialis. *Rough-Stalked Meadow-Graſs. Fig.* 7.

SIMILAR as this Graſs and the preceding are in their appearance, particularly in their mode of flowering, they differ very eſſentially in their qualities. While the *Smooth-Stalked Meadow-Graſs* is found chiefly in dry paſtures, the *Rough-Stalked* principally occurs in moiſt meadows, or on the edges of wet ditches; it loves moiſture, and a ſituation that is rather ſhady; hence, though there are few Graſſes more productive, or better adapted, for hay or paſturage, it is a tender Graſs, and liable to be injured by ſevere cold, or exceſſive drought: in very wet ground near the Thames, we have obſerved it grow very tall, while in poor land we have, on the contrary, ſeen it altogether as diminutive; it is, perhaps, no ſmall recommendatien to it that it is a principal Graſs in that uncommonly productive meadow near Saliſbury, mentioned by Stillingfleet, and more particularly deſcribed in the Memoirs of the Bath Agricultural Society, Vol. I. p. 94.

We may remark that the ſeeds of the *Poa Trivialis* and *Poa Pratenſis*, but more eſpecially thoſe of the former, are apt to be entangled and adhere to each other, as if cobwebs had been intermixed with them.

V. Festuca Pratensis. *Meadow Feſcue-Graſs. Fig.* 8.

OF the ſeveral Graſſes here recommended, this comes the neareſt in its appearance to the Ray-Graſs, to which, however, it ſeems to us, in many reſpects, to be greatly ſuperior, at leaſt, for the purpoſe of forming or improving meadows; it is larger, and more productive of foliage; it is ſtrictly perennial, it is very hardy, and will thrive not only in very wet, but alſo in dry ground: we have found it growing in all ſituations, from the ſand-pits at Charlton to the oſier-grounds at Batterſea; and it abounds in the very beſt meadows about London; in ſhort, we know of no graſs more likely to ſupply the deficiencies complained of in Ray-graſs; and yet it has not, that we know of, been particularly recommended. One quality it has, which bids fair to introduce it quickly into more general uſe; it produces more ſeeds than any of the others, which are eaſily gathered, and readily grow. In one reſpect, it is inferior to the three firſt Graſſes; it does not produce its flowering ſtems earlier than about the middle of June, a fortnight or three weeks later than the *Meadow Fox-Tail Graſs*, yet it cannot be conſidered as a late Graſs, as moſt of the Agroſtis tribe, and the *Meadow Cats-Tail Graſs*, flower at leaſt three weeks later. It muſt be carefully diſtinguiſhed from the *Feſtuca Elatior* or *Tall Feſcue-Graſs*, which is a very ſimilar but much coarſer Graſs.

VI. Cynosurus Cristatus. *Creſted Dogs-Tail Graſs. Fig.* 9.

IT is chiefly from the great character which this Graſs bears as a favourite and wholeſome food for ſheep, and from its being found in our ſoundeſt and beſt paſtures, that it is here recommended. It grows naturally in dry ſituations, and will not thrive in meadows that are very wet: it flowers about the ſame time as the *Meadow Feſcue-Graſs*, and is not very productive of foliage. As its flowering ſtems are always left untouched by cattle, its ſeeds may eaſily be collected where the paſturage is fed, not mown.

Of the ſaid SIX GRASSES, it will appear that the

Meadow Fox-Tail, and Rough-Stalked Meadow-Graſs	are fitteſt for	Moiſt Land.
Meadow Feſcue, and Sweeet-Scented Vernal		Land either moiſt or moderately dry.
Smooth-Stalked Meadow-Graſs, and Creſted Dogs-Tail		Dry Paſture.

The ORDER of their FLOWERING.

1. Sweet-Scented Vernal.
2. Meadow Fox-Tail.
3. Smooth-Stalked Meadow.
4. Rough-Stalked Meadow.
5. Meadow Feſcue.
6. Creſted Dogs-Tail.

We could eaſily add many more Graſſes to this liſt, and thoſe too which, perhaps, may be highly deſerving of it; but we have our doubts, whether, by recommending more, we might not increaſe the difficulty of introducing Graſs ſeeds without any adequate advantage.

Directions for Sowing the GRASS SEEDS above deſcribed.

IF a piece of ground can be had, that is neither very moiſt nor very dry, it will anſwer for all the ſeeds; they may then be ſown on one ſpot: but if ſuch a piece cannot be obtained, they muſt be ſown on ſeparate ſpots, according to their reſpective qualities, no matter whether in a garden, a nurſery, or a field, provided it be well ſecured and clean. Dig up the ground, level, and rake it, then ſo each kind of ſeed thinly in a ſeparate row, each row about a foot apart, and cover them over lightly with the earth: the latter end of Auguſt, or beginning of September, will be the moſt proper time for this buſineſs. If the weather be not uncommonly dry, the ſeeds will quickly vegetate, and the only attention they will require will be to be carefully weeded: in about a fortnight from their coming up, ſuch of the plants as grow thickly together may be thined, and thoſe which are taken up tranſplanted, ſo as to make more rows of the ſame Graſs.

If the winter ſhould be very ſevere, though natives, as ſeedlings, they may receive injury, therefore it will not be amiſs to protect them with mats, fern, or by ſome other contrivance.

Advantage ſhould be taken of the firſt dry weather in the ſpring, to roll or tread them down, in order to faſten their roots in the earth, which the froſt generally looſens: care muſt ſtill be taken to keep them perfectly clear from weeds. As the ſpring advances, many of them will throw up their flowering ſtems, and ſome of them will continue to do ſo all the ſummer. As the ſeed in each ſpike or panicle ripens, it muſt be very carefully gathered, and ſown in the autumn, at which time the roots of the original plants, which will now bear ſeparating, ſhould be divided and tranſplanted, ſo as to form more rows; the roots of the *Smooth-Stalked Meadow-Graſs*, in particular, creeping like *Couch-Graſs*, may readily be increaſed in this way; and thus, by degrees, a large plantation of theſe Graſſes may be formed, and much ſeed collected.

While the ſeeds are thus increaſing, the piece or pieces of ground which are intended to be laid down, ſhould be got in order. If very foul, perhaps, the beſt practice (if paſture land) will be to pare off the ſward and burn it on the ground; or, if this ſhould not be thought adviſeable, it will be proper to plough up the ground and harrow it repeatedly, burning the roots of *Couch-Graſs*, and other noxious plants, till the ground is become tolerably clean; to render it perfectly ſo, ſome cleanſing crop, as potatoes or turnips, ſhould be planted or ſown.

By this means, the ground we propoſe laying down, will be got into excellent order without much loſs; and being now ready to form into a meadow or paſture, ſhould be ſown broad-caſt, with the following compoſition.

Meadow Fox-Tail, one pint.—*Meadow Feſcue*, ditto.—*Smooth-Stalked Meadow*, half a pint.—*Rough-Stalked Meadow*, ditto.—*Creſted Dogs-Tail*, a quarter of a pint.—*Sweet-Scented Vernal*, ditto.—*Dutch Clover* (*Trifolium Repens*) half a pint.—*Wild Red Clover* (*Trifolium Pratenſe*) or, in its ſtead, *Broad Clover of the Shops*, ditto.—For wet land, the *Creſted Dogs-Tail*, and *Smooth-Stalked Meadow*, may be omitted, eſpecially the former.

Such a compoſition as this, ſown in the proportion of about three buſhels to an acre, on a ſuitable ſoil, in a favourable ſituation, will, I am bold to aſſert, form in two years a moſt excellent meadow; and as all the plants ſown, are ſtrong, hardy perennials, they will not eaſily ſuffer their places to be uſurped by any noxious plants, which by manure or other means, in ſpite of all our endeavours, will be apt to inſinuate themſelves; if they ſhould, they muſt be carefully extirpated, for ſuch a meadow is deſerving of the greateſt attention; but if that attention cannot be beſtowed on it, and, in proceſs of time, weeds ſhould predominate over the crop originally ſown, the whole ſhould be ploughed up, and freſh ſown with the ſame ſeeds, or with a better compoſition, if ſuch ſhall be diſcovered; for I have no doubt but, at ſome future time, it will be as common to ſow a meadow with a compoſition ſomewhat like this, as it now is to ſow a field of wheat or barley.

Mr. Curtis has here laid before the public, information and inſtructions of the utmoſt importance, and has opened ſuch a field for agricultural improvement as will cauſe poſterity to revere his name.

BURNET.

Burnet is a plant which grows wild in many of our Engliſh meadows, and will likewiſe grow on very poor ſandy, or other dry ſoil, this makes it valuable. An anonymous correſpondent in the Bath Society's Papers, has given a very ſatisfactory account of Burnet from experiment, and which the Scotch Encyclopædia have quoted without an acknowledgment, and adopted it as their own; but ſuch plagariſm, we do not think liberal, and when we give any thing not our own, think it our duty to declare to whom we are indebted. The following is from the Bath Society's Papers, Vol. 2. p. 128.

" SIR,

" YOUR letter of December 20, reached me in due courſe, wherein you informed me that Burnet is a graſs but little cultivated in Somerſetſhire, and requeſt my thoughts on its uſefulneſs. I ſhall at all times be happy in communicating any thing that may tend to promote the views of a ſociety eſtabliſhed on ſo liberal a plan as that of Bath, and therefore it is with pleaſure that I comply with your wiſhes, ſo far as the knowledge of the ſubject will admit.

" Burnet is not generally cultivated in this county; but ſome of our moſt intelligent farmers have raiſed it, of late years, with conſiderable ſucceſs.

" I apprehend that one principal cauſe of its not having been more attended to, is the goodneſs of our ſoil, which will produce other crops that in general pay better than Burnet. But this is a reaſon which ought not to operate in countries which abound with poor land, to which this plant is better adapted than many others.

" The cultivation of this graſs is attended with one principal advantage, beſides that of not requiring a rich ſoil; which is, that it proves an excellent winter paſture when hardly any thing elſe vegetates.

" I might indeed mention ſeveral others; to wit, it makes good butter; it never blows or ſwells cattle; it is fine paſture for ſheep; and will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalk hills.

" The cultivation of it is neither hazardous nor expenſive. If the land is prepared, as is generally done for turnips, there is no danger of its failing. After the firſt year, it will be attended with very little expence, as the flat circular ſpread of its leaves will keep down, or prevent the growth of weeds.

" On the failure of turnips, either from the fly or the black worm, ſome of our farmers have ſown the land with Burnet, and in March following had a fine paſture for their ſheep and lambs. It will perfect its ſeed twice in a ſummer; and this ſeed is ſaid to be as good as oats for horſes; but it is too valuable to be applied to that uſe.

" It is ſometimes ſown late in the ſpring with oats and barley, and ſucceeds very well; but it is beſt to ſow it ſingly in the beginning of July, when there is a proſpect of rain, on a ſmall piece of land, and in October following, tranſplant it in rows two feet apart, and about a foot diſtant in the rows. This is a proper diſtance, and gives opportunity for hoeing the intervals in the ſucceeding ſpring and ſummer.

" After it is fed down with cattle, it ſhould be harrowed clean. Some horſes will not eat it freely at firſt, but in two or three days they are generally very fond of it. It affords rich pleaſant milk, and in great plenty.

" A gentleman farmer near Maidſtone, ſome years ſince ſowed four acres as ſoon as the crop of oats were got off, which was the latter end of Auguſt. He threw in 12 pounds of ſeed per acre, broadcaſt; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop, and in the ſpring he ſet the plants out with a turnip-hoe, leaving them about a foot diſtant from each other. But the drill method is preferable, as it ſaves more than half the ſeed. The land was a poor dry gravel, not worth three ſhillings an acre for any thing elſe.

" The ſevereſt froſt never injures this plant; and the oftener it is fed the thicker are its leaves, which ſpring conſtantly from its root."

In confirmation of the value of Burnet, Mr. Young obſerves, " that Mr. Coke, of Holkham, ſowed forty acres, mixing a ſmall quantity of white clover and rib graſs with it. The reſult was as ſatisfactory as can be poſſibly imagined; the field has been full ſtocked with all ſorts of cattle, eſpecially ſheep, and is conſtantly pared as cloſe to the ground, as a favourite ſpot in a paſture is by horſes."

Burnet from its warm aromatic quality is eſteemed very ſerviceable to ſheep, that are touched with the rot; but if any benefit is to be obtained, they ſhould be turned into a field of Burnet immediately on their coming from a ſuſpected paſture.

CABBAGE, TURNIP CABBAGE, AND RAPE, AND THEIR CULTIVATION.

The culture of Cabbages for the feeding of cattle it ſeems probable will never become general, as to grow them to perfection requires rich land, and the expence and trouble in preparing the land, and other contingencies, is very conſiderable.

On lands that will produce full crops of them, Cabbages are certainly cultivated to great advantage: the kind of ſoil is not material, provided it is in good tillage, and capable of producing ſtrong luxuriant crops.

As it is neceſſary we ſhould preſent our readers with directions for raiſing, and applying them to the purpoſes for which they are beſt ſuited, we cannot do it in a more conciſe and practical manner than by the following extract from Mr. Young's Annals, vol. III. p. 183.

ON THE CULTURE OF CABBAGES.

By Mr. William Green, *of Sutton Hall, near Bury, Suffolk.*

" SOW the ſeed on a very rich bed the beginning of March; 1 ℔ of ſeed on 10 rods of ground for three acres; the ſort drumhead, from its flat top, and as hard as a ſtone; price of the ſeed 2s. 6d. per ℔. this better than the tallow-loaf, heavier and harder. The land where they are to be planted to be ploughed up at Michaelmas; let it lie till ſpring; plough four or five times; dung before the laſt ploughing; 15 load (three horſes) an acre dung, or 20 dung and earth; plough it on three-feet ridges the latter end of June ready to plant, that is to wait for rain. Much depends on having large ſtout plants; the ſeed-bed is therefore drawn; when rain comes all hands to work. The expence is about 3s. an acre planting. In about a month plough between, by drawing the lands into balks, and then ſhut up, after which hoe with hand-hoes; but do not hand-hoe before ſhutting up, for by the hoe following the plough the clods which roll on to the plants are eaſily removed; another reaſon is, the ſpace of land on which the plants ſtand after drawing out, being too narrow to bear a hoeing. Hand-hoe thrice, each time 2s. an acre, 6s. in all. I have cultivated them ſix years, and never loſt a crop but once for want of rain.

" About three weeks after planting, taking the opportunity of rain, replant the vacancies from failure.

" Begin to uſe them a month after Michaelmas for milch cows, and keep uſing them ſo till the end of March; but they ought to be off the land the middle of that month, as they then ſhoot and draw the land. Three good acres will do for my dairy of 20 cows, with ſtraw and ſome hay; but if abſolutely no hay, then five acres of cabbages. For weanling calves they are moſt excellent. Turnips are apt to give them the garget, by which they very commonly die; but in ſix years I have loſt only one calf in above 40, by feeding them on Cabbages, nor can any calves thrive better.

" In fattening beaſts, I find that a middling crop will fatten in the proportion of ¼ of an acre for two beaſts of 50 ſtone that have had the ſummer graſs.

" Hogs prefer them exceedingly to turnips; of this I have a ſtriking inſtance the preſent ſeaſon; for having a field part under turnips and part cabbages, my ſows, &c. have at various times this winter got into the field, and I do not think they have begun ten turnips in the whole field, but conſtantly got to the Cabbages.

" In regard to value, I have no poſitive data to calculate on, for it is not eaſy to keep accounts accurate enough to aſcertain it, but in a general way, reckon a good acre worth from 4 to 5l. or, more generally, to be double the value of turnips.

" I am ſenſible that this practice leaves the farmer without cabbage aſſiſtance for a month or ſix weeks in the ſpring; part of this time may be ſupplied by drawing Cabbages for about a fortnight after drawing; and the remainder by a practice which I have followed many years with ſucceſs. It is to keep about 20 acres of my meadow rouen (after graſs) till April, never turning any thing in from the ſcythe till that time. This is excellent for cows, for ewes, and lambs, eſpecially crones; and I believe it will be found (it has proved ſo with me) that any piece of rouen that is worth 5s. at Michaelmas, will be worth 10s. in April, and ſo in other proportions; but the value will depend a good deal on the weather; in a dry time it goes very far, but in a wet ſeaſon it is much ſpoiled. Let it alſo be remembered, that this graſs is ſaved from a ſeaſon (autumn) when food is exceedingly plentiful, and of little value to thoſe who do not ſell.

AGRICULTURE.

Expences of an Acre of Cabbages.

	£.	s.	d.
Rent	0	10	0
Tythe	0	1	6
Poor rates	0	1	3
Five ploughings	1	0	0
Two harrowings	0	0	6
Manuring	2	0	0
Seed-bed ſeed, &c.	0	1	6
Planting	0	3	0
Deficiencies	0	0	6
Hand-hoeings	0	4	0
Horſe-work in hoeing	0	4	0
Cutting and carting ¼ of a mile . .	0	15	0
	5	1	3

" This is giving the total expence of the manure to the Cabbages; but if the advantage is divided, as it certainly is, then not more than 15s. ſhould be laid to the crop, which will make the total expence 3l. 16s. 3d.

" The barley or oats that follow Cabbages, have been thought by ſome to be inferior to that which ſucceeds turnips, but in my experience I have not found it ſo, for I have ſeveral times had turnips and Cabbages in the ſame field equally dunged, and the ſoil and management the ſame, but I have found that that crop gives the beſt barley which is taken off earlieſt.

Sutton-Hall, Feb. 17, 1785. W. G."

This explicit and excellent account of the cultivation of Cabbages for the purpoſes of Agriculture is as much as can be ſaid on the ſubject, were volumes wrote upon it. We can only remark, that in Mr. Green's calculation of expences, we think him below the mark in the articles Rent and Labour; but countries differ in theſe matters conſiderably.

TURNIP CABBAGE.

Turnip Cabbage, or Turnip-rooted Cabbage, ſhould be ſowed on rich good land about the time which is deemed proper to plant the common turnip, and ſhould be hoed and managed in the ſame manner.

The importance which Turnip-rooted Cabbage claims as a valuable appendage to huſbandry, is by retaining their good qualities when the common turnip becomes of little value.

The following ſhort letter by Sir Thomas Beevor, Bart. to the Secretary of the Bath Society is a proof of their excellence.

ON THE VALUE OF TURNIP-ROOTED CABBAGE AS A SPRING CROP.

" MY Turnip-rooted Cabbages are now in high perfection. I have about three acres left, with which I am feeding 22 bullocks intended for fattening this ſummer, 17 cows, 2 bulls, 4 young cattle, and 110 ſheep, beſides 30 horſes, which partake largely of them. I hope and expect they will yet laſt near a fortnight more, by which time I doubt not but I ſhall have a full and plentiful bite of graſs for all my ſtock. In order to aſcertain, in ſome degree, the quantity of food they produced, I carefully ſelected ſome of them, and ſome of the common turnips; and having girted each of them with as much accuracy as poſſible, I found the Turnip-rooted Cabbage at the circumference of 18 inches, weighed 5℔¼, and the common turnip of the ſame circumference 3℔½ only. I took others of different dimenſions, and found throughout, the reſult to be in that proportion: they were all without their tops, otherwiſe the exceeding of the Turnip-rooted Cabbage would have been greater, the leaves of them being remarkably buſhy. It muſt, however, be mentioned, that thoſe roots were weighed at the latter end of March: had they been weighed at Chriſtmas it is likely the difference had not been ſo great: ſtill, their late continuance for a green and moſt nouriſhing food is indiſputably a merit they muſt be allowed beyond any other known vegetable production.

" I am with regard, Your's, &c.

Hethel, May 1. THOMAS BEEVOR."

As Turnip-rooted Cabbages occupy the ground till the ſeaſon becomes too far advanced for barley ſowing, Sir Thomas Beevor, and other cultivators of the Turnip Cabbage, ſow inſtead of barley, buck-wheat, and with it graſs ſeeds: this nouriſhes the graſs ſeeds, and produces a profitable meliorating crop, alſo keeps the land in its proper courſe of tillage.

RAPE.

Rape, or Cole, is generally cultivated on account of the ſeed, from which a large quantity of oil is extracted; for this purpoſe it is generally ſowed in June, in the ſame manner, and the ſame quantities of ſeed to the acre, as turnips.

About the middle or latter end of Auguſt the plants ſhould be hoed, and left ſtanding from twelve to ſixteen inches aſunder; by no means leave them thicker; this, if well performed, will coſt four or five ſhillings per acre.

Should any part miſs, it will be requiſite to fill up the vacancies by tranſplanting from other parts of the field, which are too thick, in October.

The following Auguſt Rape becomes fit to cut and harveſt; great attention is neceſſary to preſerve it from birds; thoſe which are called finches in particular.

It is generally thraſhed in the field, as ſoon as it is ſufficiently dry after it is cut; and great care muſt be taken in collecting it together, at the time it is carried to the thraſher, which is performed with cloths brought into the field for that purpoſe.

The quantity on good land varies from thirty to forty buſhels per acre, and the uſual price for good back ſeed, is about ſix ſhillings and ſix pence per buſhel.

Let it be noticed that Rape for ſeed ſhould be ſowed on freſh rich land; and if on an inferior ſoil, it ſhould be on ſuch as is freſh broke up from graſs. Rape is occaſionally mixed with late ſowed turnips, deſigned for ſpring feed, and anſwers the purpoſe very well.

SECT. XII.

TURNIPS AND THEIR CULTIVATION.

TURNIPS are of the greateſt conſequence in Britiſh Agriculture, as ſuch we preſent the public with a particular account of their cultivation from Mr. Young's Annals, Vol. 3. Page 297; without flattering the author, we pronounce his account really inſtructive.

THE CULTURE OF TURNIPS, RECOMMENDED TO THOSE COUNTIES WHERE THEY ARE NOT YET COMMON.

By Mr. W. Macro.

THE Turnip culture being the beſt winter proviſion for almoſt all kind of ſtock, and yet very little known in ſome counties in England, where I think it might be practiſed to great advantage, I will, under the different titles of ſoil, tillage, &c. give an account of the Suffolk manner of managing that uſeful root.

SOIL.

The right ſoil for this root is a deep ſand, ſuch as has adheſion enough to make it of the value of from 5s. to 10s. an acre, land of 14s. or 15s. has generally too great a mixture of loam; for, if the land is wet or ſtiff, ſuch as yield good wheat-crops, the culture may not be advantageous, eſpecially if uſed, as it ſhould be, as a preparation for barley: on ſuch ſoil it would ſhorten the crop at leaſt 10 or 12 buſhels an acre; I ſhould ſooner prefer blowing ſands of 3s. 6d. and even 2s. 6d. per acre, which, when folded, and the ſeaſon happens to be wet, yield profitable crops; indeed, ſuch lands can be farmed no other way, for, if no turnips are gained, no corn will be had; and a mere ſheep-walk is then the only uſe that can be made of them. Where a farmer has no proper ſoil for Turnips, I think it would be prudent to give up the winter-feeding of more cattle than his hay and ſtraw will do for, unleſs he depends on buying Turnips, which may ſometimes be advantageous, and ſometimes the contrary. I will juſtly obſerve, that I have a neighbour upon a wet ſoil, with about 30 ſcore very fine ſheep, who, one year with another, cannot grow 20 acres of turnips, but depends on buying of his neighbours.

TILLAGE.

The firſt earth ſhould be given before Chriſtmas, of a common ſtaple depth; and if, before the ſpring ſeed-time, a ſecond earth can be given, it will be very uſeful; for, if there ſhould be any ſpear-graſs in the land, that pernicious weed is apt to get too great a hold before barley-ſowing is over; immediately after the barley is in, the third earth ſhould be given, this will be in May; the fourth about the ſecond week in June; and the fifth, or ſeed-earth, the latter end of the ſame month, unleſs the ſoil is ſubject to the mildew, in which caſe old Midſummer will be full ſoon enough. And let it be obſerved, that harrowing with every earth is very neceſſary, for the ſurface ſhould always be kept in fine friable order, that the ſeed-weeds may grow, otherwiſe, if that is omitted, till the ſeed-earth, they will then grow ſo powerfully as to ſmother many of the young plants.

MANURE.

For Manure we depend on the fold or farm-yard, uſually both; of farm-yard dung not leſs than 12 loads ſhould be ſpread on an acre, ſuch as was made the preceding winter, and once turned over. In reſpect to the length of dung, it ſhould neither be long nor quite rotten; the beſt condition is, when it is in ſuch a ſtate that the labourers ſay it will neither ſpit nor fork. I never tried any other Manure for this root, except once an experiment on ſhell marle from Woodbridge-ſide, called there *crag*. I had ſeen ſuch great effects there from it, that, through curioſity, I brought a waggon load (back carriage) and tried it on a light turnip ſoil, and alſo on a good ſtrong loam, and it was with great ſurpriſe I found that it did ſcarcely any good on either: the advantage was, if any thing, rather greater on the former, but not ſufficient to induce me to carry it a ſingle mile had a crag pit been found on the farm. When the dung for turnips is rather long and ploughed in with the ſeed earth, the ſeed ſhould be only rolled in.

SEED.

The quantity of ſeed depends on the ſoil; upon a naturally good Turnip ſand a pint an acre, evenly delivered by a good hand, or ſowing engine, will be enough; no ſoil demands ſo much ſeed as chalky land when the chalk comes quite to the ſurface; upon ſuch ſoil, a quarter of a peck an acre will ſeldom be too much, the reaſon of the difference is, that the fly is ſure to attack the plants upon this ſoil much more voraciouſly and with greater certainty than on any other. I do not, therefore, recommend this ſoil for Turnips in general, but where it ſo happens, that one end, or one ſide of a piece of Turnip land is of this ſort (which is often the caſe) to be careful to lay the ſeed thick enough on thoſe parts.

Having mentioned the ſowing-engine, I ſhould remark, that though it is with care a good tool, yet it is liable to have the holes ſtopped by two ſeeds ſticking in them, ſo that if the ſeedſman is not very attentive, he may go ſome diſtance without a regular delivery.

The ſeaſon for ſowing extends from New-Midſummer to the end of July, this variation is neceſſary for two reaſons; firſt, becauſe the land cannot be all manured to ſow early; and, ſecondly, becauſe the late ſown will laſt much longer than the early ones, which are apt to mildew, and conſequently more likely to be rotted by hard froſts afterwards, for which reaſon, all farmers ſhould take care to have ſome late ſown; I have had them from a ſowing the firſt week in Auguſt, which proved the moſt profitable crop on my farm, owing to the froſt killing others while theſe eſcaped.

HOEING.

Hoeing is ſo eſſential towards getting a good crop, that I am ſurpriſed a farmer ſhould think of ſowing them with any other view. As ſoon as the plants are ſtout enough they ſhould be harrowed with a light harrow once in a place, this aſſiſts the hoeing; it is not eaſy to deſcribe the ſtate of the plants when they are ready for the hoe, age will not diſcriminate, becauſe the ſeaſon will vary from three weeks to eight, and even nine from the time of ſowing; but a better rule is, to begin when the plants in general ſpread a circle of about four inches diameter. If any of the fields, after the hoeing begins, are getting too forward, which in a wet ſeaſon is often the caſe, a ſecond harrowing (the contrary way) may ſafely be given.

I find, by ſowing my Turnips at different ſeaſons, that ſix men will hoe 100 acres twice; but thoſe who do not equally vary their ſeaſons, muſt of courſe proportionally increaſe the number. The ſecond hoeing is given about a fortnight or three weeks after the firſt, at half the expence, that is 2s. an acre; this is ſometimes omitted, but it anſwers exceedingly well.

APPLICATION OF THE CROP.

In regard to conſuming the crop, I would recommend feeding ſheep with them upon the land as by far the beſt preparation for barley, provided the ſoil is true turnip-land, that is dry. The benefit will, however, vary with the time of eating off, for thoſe that are eaten early in the winter, will not, by any means, give ſo good barley as thoſe which are eaten later, provided the plants do not run for bloſſom, for then they exhauſt the land, and the ſucceeding crop ſuffers. Carting off is common, but the expence, allowing for the damage done to the ſucceeding crop, is too great, and I ſhould never recommend the culture with that view.

ACCIDENTS.

It is neceſſary to ſay ſomething on the failures that Turnip crops are liable to, which are the fly, the mildew, the black canker, and to rotting from froſt. I calculate that the froſt deſtroys half the crop once in ſix or ſeven years; the fly not only deſtroys ſome crops entirely, but even when a ſecond or third ſowing yields ſomething, it is gained at the expence of one or two plowings, harrowings, and ſeed, when no tillage is wanting for the land; this may, on an average, be calculated to amount to the loſs of a whole crop once in five or ſix years; the mildew is rather connected with the rot, and the black-canker has not yet been ſo common with us as to demand a particular calculation.

I would, for the above reaſons, notwithſtanding all the praiſe that is due to this moſt uſeful root, recommend to all ſheepmaſters, eſpecially thoſe with breeding-flocks, not to truſt ſingly to them. I have found very great advantage from having certain breadths of cole-ſeed, rye, and winter tares ſown early on the firſt ſtubbles that were cleared the preceding autumn; indeed, ſuppoſing no failures, it is abſolutely neceſſary to have ſome ſuch proviſion for the couples, by the time the lambs begin to feed, as it will put them on a great deal faſter than the beſt turnips that can be given.

Mr. Macro's ideas on the cultivation of Turnips are certainly replee with uſeful and practical information, as much ſo, we are of opinion, as ever appeared in print; our obſervations will therefore be conciſe.

Mr. Macro is certainly right in cultivating Turnips on ſandy land, but we cannot think ſoil, of the deſcription he mentions, will produce them in any quantity to be of ſervice, either to the land by eating off, or pay expences by the Turnip or the future crops; except the ſandy ſoils in Suffolk are let cheaper than they are in the North and Weſt parts of the kingdom.

For we have never ſeen blowing ſands of 2*s*. 6*d*. or 3*s*. 6*d*. per acre, that would repay expenſive cultivation, without there was ſome peculiar advantage in the ſituation, with reſpect to manure or other local circumſtances.

We beg leave alſo to deſcend from Mr. Macro, when he calls ſand the moſt proper ſoil for Turnips, as we have generally found from practice and obſervation, that a braſhy limeſtone loom, not too thin in the ſtaple, has produced Turnips, and the ſucceeding crops to more advantage than ſandy land of equal value.

With reſpect to feeding Turnips off the land, the beſt method both for the ſheep and land is by means of hurdles, to be removed in part, in ſuch a manner as they may have them freſh every day; by this means they eat the Turnips clean, the land is regularly manured, and the ſheep fare every day alike.

As many countries do not purſue this method, we think thoſe who do not, loſe a great part of the benefit belonging to the Turnip crop; and would by all means recommend the practice. In Turnip countries we preſume the method of giving ſheep their feed every day is general; as ſuch we refer thoſe who want information to thoſe countries: a ſhepherd will remove a quantity of hurdles ſufficient to give 200 ſheep their feed in an hour.

Turnips, in their infant ſtate, are always in a precarious ſituation with reſpect to the fly or ſlug, they will perhaps appear promiſing and in good condition one day, and on the morrow be all deſtroyed.

Mr. Vagg, of Chilcampton, aſſured the public by advertiſement and other means of diſtributing information, that he was in poſſeſſion of an infallible receipt for the protection of young turnips from the fly, and that he would diſcover it to the public, provided a thouſand perſons would ſubſcribe two guineas each; this we have been informed was effected; and the great and important ſecret was diſplayed to the world: which was nothing more than this, "when the turnips are ſuſpected to be in danger from the fly or ſlug, cauſe a heavy roller to be drawn over them in the night, repeating the ſame every night till you think them ſafe."

This remedy, if effectual, is eaſily performed, and at a ſmall expence; and if Mr. Vagg is in poſſeſſion of the 2000 l. we give him joy! And ſhould our readers wiſh to know how he came by the ſecret, we beg leave to refer them to a Treatiſe on Agriculture, wrote in the year 1744, called MODERN HUSBANDRY, page 131, by William Ellis, who ſold the ſecret Mr. Vagg has adopted as his own legitimate offspring, and a number of others of equal importance, for no more than TWO SHILLINGS.

Amongſt our implements of Huſbandry, we ſhall give a new invented and ingenious inſtrument for tranſplanting Turnips; to that Section we refer our readers for a deſcription.

SECT. XIII.

POTATOES AND THEIR CULTIVATION.

POTATOES are a root of ſuch ineſtimable value, as food for the human ſpecies and the brute, that in all probability ages to come will be amazed to think, how it was poſſible the inhabitants of this country could ever have ſubſiſted without them.

They have been introduced into Britain upwards of two hundred years; the firſt century after they were known, (conſidering their preſent value) their general utility made a very ſlow progreſs indeed; to the inventive induſtry of the preſent age every praiſe is due which belongs to the cultivation of this uſeful root.

Moſt kinds of ſoil (ſtiff clay excepted) will produce Potatoes; a looſe ſandy loam ſeems the beſt adapted to grow them in large quantities, and of good quality: rich black loam will unqueſtionably yield the largeſt produce, and equally ſerviceable for cattle; but by no means pleaſant food for the table.

AGRICULTURE.

As good information, ſanctioned by practice, is what we communicate to the public, we truſt the following will prove highly acceptable; extracted from the Bath Society Papers.

ON THE CULTURE OF POTATOES.

By the Rev. H. J. CLOSE, Trimley, Suffolk.

" THE following practical obſervations on the culture and uſe of Potatoes, will not, I hope, appear entirely unintereſting. They are the reſult of various experiments made for five years ſucceſſively on that valuable root, the growth of which cannot be too much encouraged.

" When the Potatoe crop has been the only object in view, I have adopted the following method with the greateſt ſucceſs.

" The land being well pulverized by two or three good harrowings and ploughings, is then manured with fifteen or twenty cartloads of dung per acre, before it receives its laſt earth. Then it is thrown on to what the Suffolk farmers call the *trench balk*, which is narrow and deep ridge work, about fifteen inches from the center of one ridge to the center of the other.

" Women and children drop the ſets in the bottom of every furrow fifteen inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down ſo as to bury the ſets five inches deep; they muſt receive two or three hand-hoeings, and be kept free from weeds; always obſerving to draw the earth as much as poſſible to the ſtems of the young plants.

" I find, by repeated trials, the firſt or ſecond week in April the moſt advantageous time for planting.

" In the end of September, or the beginning of October, when the haulm becomes withered, they ſhould be ploughed up with a ſtrong double-breaſted plough.

" The workman muſt be cautioned to ſet his plough very deep, that he may ſtrike below all the Potatoes, to avoid damaging the crop.

" The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any ſucceeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn ſwine in to glean the few that may be left by their negligence.

" By this method, the ſets will be fifteen ſquare inches from each other; it will take eighteen buſhels to plant an acre; and the produce, if on a good mixed loamy ſoil, will amount to three hundred buſhels.

" If the Potatoes are grown as a preparation for wheat, I prefer having the rows two feet two inches from each other, hand-hoeing only the ſpace from plant to plant in each row; then turning a ſmall furrow from the inſide of each row by a common light plough; and afterwards, with a double-breaſted plough with one horſe, ſplit the ridge formed by the firſt ploughing thoroughly to clean the intervals.

" This work ſhould not be done too deep the firſt time, to avoid burying the tender plants; but the laſt earth ſhould be ploughed as deep as poſſible; and the cloſer the mould is thrown to the ſtems of the plants, the more advantageous it will prove. Thus fifteen buſhels will plant an acre, and the produce will be about three hundred buſhels; but the land, by the ſummer ploughings, will be prepared to receive ſeed-wheat immediately, and almoſt enſure a plentiful crop.

" The Potatoe ſets ſhould be cut a week before planting, with one or two eyes to each, and the pieces not very ſmall; two buſhels of freſh ſlaked lime ſhould be ſown over the ſurface of the land as ſoon as planted, which will effectually prevent the attacks of the grub.

" The expence attending an acre of Potatoes well cultivated in the firſt method, ſuppoſing the rent twenty ſhillings, tithe and town charges rather high, (as in Suffolk) taking up, and every thing included, will be about ſix pounds. In the laſt method, it would be ſomewhat reduced.

" I have many years ſold the greateſt part of my crops for ſeven ſhillings per ſack of three buſhels; thus the one hundred and twenty ſacks would amount to forty-two pounds; but they are now ſo much cultivated, that to make a fair, and what may be termed a ſure eſtimate, they ſhould be valued only as applicable to the feeding and fattening of cattle. I am convinced from experience, that they are worth three ſhillings per ſack for thoſe purpoſes, and then the produce would amount to eighteen pounds per acre.

" They are excellent food for hogs; roaſting pork is never ſo moiſt and delicate as when fed with Potatoes, and killed from the barn-doors without any confinement. For bacon and hams, two buſhels of pea-meal ſhould be well incorporated with four buſhels of boiled Potatoes, which quantity will fat a hog of twelve ſtone, (fourteen pounds to the ſtone). Cows are particularly fond of them: half a buſhel at night, and the ſame proportion in the morning, with a ſmall quantity of hay, is ſufficient to keep three cows in full milk; they will yield as much and as ſweet butter as the beſt graſs.

" In fattening cattle, I allow them all they will eat: a beaſt of about thirty-five ſtone will require a buſhel per day, but will fatten one-third ſooner than on turnips. The Potatoes ſhould be clean waſhed, and not given until they are dry. They do not require boiling for any purpoſe but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion Potatoe to any ſort I ever cultivated. They do not anſwer ſo well for horſes and colts as I expected; (at leaſt they have not with me) though ſome other gentlemen have approved of them as ſubſtitutes for oats.

" When predilections for old cuſtoms are ſubdued, I hope to ſee the Potatoe admitted in the conſtant courſe of crops, by every ſpirited huſbandman. The moſt beneficial effects will, I am certain, accrue from ſuch a ſyſtem. The advantages in my neighbourhood are apparent; I cultivated, and fed my own children upon them, and my poorer neighbours ſenſibly followed the example. A great proportion of every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent ſubſtitutes for peaſe in ſoups and broths, allowing double the quantity."

In addition to Mr. Cloſe's excellent and inſtructive leſſon, we give the account of Mr. John Bywell, of Aglethorp in Yorkſhire, on the uſe of Potatoes in feeding cattle. Annals of Agriculture, vol. I. page 402.

USE OF POTATOES IN FEEDING CATTLE.

By Mr. John Bywell, of Aglethorp, Yorkſhire.

" Four pecks, eight quarts to the peck, are ſufficient for a large beaſt, with a little hay, for 24 hours; they are ſuperior to turnips in feeding, one third, both uſed in equal time. They are given to milch cows with great advantage, and are healthy fother. They are very good for draught horſes, to give them half a peck a day with hay; I never had my horſes in ſo good condition as when fed with Potatoes: they are a certain remedy to a horſe with ſwelled legs, or out of condition (in other caſes and diſorders inwardly one peck a day) they are accounted good for hunters the day after they have had a ſevere run, to give them eight or ten large Potatoes. The number of buſhels of Potatoes grown on one acre are, upon an average, 360. I give them to cattle raw as taken out of the ground.

" The manner of management for potatoes, is to give the land three or four ploughings, and as many harrowings, 24 cart loads of horſe dung to an acre; when the furrow is drawn, the plants to be planted at 12 inches diſtance one from another, the labourers to ſpread the dung by hand, along the top of the plants, with a little lime: if lime cannot be had at the time of planting, it is proper to ſpread a little over the ground as they make their firſt appearance out of the earth, alſo to give them a light harrowing to mix the lime.

April 2, 1784. J. B."

Mr. Bywell likewiſe obſerves, a little hay is of great ſervice to the Potatoes in feeding cattle, and that half a peck of Potatoes, with hay every day, will keep a working horſe in good order.

Doctor James Anderson, by his ingenious experiments, has ſucceſsfully diſtilled Potatoes, and drawn from 72 pounds weight of that root a gallon of pure ſpirit conſiderably above proof, and a quart of a weaker kind a good deal below proof. This was, he obſerves, " the fineſt and moſt agreeable vinous ſpirit I ever ſaw. In taſte it reſembled very fine brandy, but was more mild than any brandy I ever taſted, and had a certain kind of coolneſs upon the palate peculiar to itſelf."

The following is an abridged account of the proceſs. The Potatoes were firſt boiled till they came to a pulpy ſtate, then bruiſed and made to paſs through a ſtrait riddle along with ſome freſh water, the ſkins being by this means ſeparated, were thrown away. The pulp was then mixed with cold water, till the whole amounted to about 20 gallons; this, when in a proper heat, had ſome yeaſt put to it, as for brewing. In the ſpace of ten or twelve hours a fermentation began, which continued twelve hours, and then abated. I warmed it a little, but in vain, then ſtirred it briſkly, which had the deſired effect, as the fermentation was renewed by that means. I uſed the ſame means every day, and it fermented a fortnight, and then ſtopped. The liquors having acquired a ſlight acidity, it was put into the ſtill, and ſtirred till it boiled; the ſtill head was then put on; it was then diſtilled with due caution, and produced the valuable ſpirit abovementioned.

As a further proof of the uſe of Potatoes, we give the following by John Kirby, Eſq. of Ipſwich, from Mr. Young's Annals, vol. I. p. 285.

EXPERIMENTS ON POTATOES.

By John Kirky, Esq. of Ipswich.

" IN the ſpring 1782, an old lay near Ipſwich was ploughed; the firſt plough ſkinned off the turf about an inch and half deep; women followed and laid the Potatoe ſets (the *Globe-white*, called alſo the *Champion*) in that furrow; then came another plough that cut as deep as poſſible, covering the ſets nine inches deep. There is no danger of burying them as they riſe freely. In this manner, without any manuring, planted every third or fourth furrow; part one, and part the other: in the firſt, the rows were 27 inches aſunder; in the latter, three feet. The former yielded the greater crop. They were all kept clean by horſe and hand-hoeing; were taken up with three-pronged forks, at the expence of a halfpenny a buſhel. The crop 400 buſhels an acre; and ſold at 2s. a buſhel, or 40l. an acre, gained at a very trifling expence.

"Not having any cluſter Potatoes of my own, I bought ſome of a neighbour, to try them in horſe-feeding, and from the reſult, prefer them to carrots. They were given raw, but waſhed, to ſaddle-horſes, each having a peck a day, and no oats whatever. The horſes were worked moderately, the ſame as on oats, did their work very well, and were in good order. At firſt they ſcoured, but it ſoon went off, and did no more than keep their bodies gently open.

"To aſcertain from this trial, the value of the Potatoes, that of oats will decide it; reckoning half a peck of oats a day to be equal feeding, and the price 16s. a quarter, the value of the Potatoes will be 1s. a buſhel.

TO MAKE YEAST FROM POTATOES.

BOIL Potatoes of the mealy ſort, till they are thoroughly ſoft, ſkin and maſh them very ſmooth, and put as much hot water as will make the maſh of the conſiſtency of common beer Yeaſt, but not thicker. Add to every pound of Potatoes two ounces of coarſe ſugar or treacle, and when juſt warm ſtir in for every pound of Potatoes two ſpoonfuls of Yeaſt, keep it warm till it has done fermenting, and in 24 hours it may be uſed. A pound of Potatoes will make near a quart of Yeaſt, and when made will keep three months. Lay your bread eight hours before you cake it. I have ſeveral times tried this receipt in a hard froſt when Yeaſt was ſcarce, and found it to anſwer the purpoſe ſo well, as not to be able to diſtinguiſh the bread made from the one or the other.

This, if practicable, is an invention of material conſequence to thoſe who bake and brew in their own houſes, and tends to ſhew the unlimited uſe of Potatoes.

SECT. XIV.

CARROTS AND THEIR CULTIVATION.

CARROTS are a root lately brought into uſe as food for cattle, and has been ſucceſsfully cultivated in the county of Suffolk and others adjoining. The following method of their management we preſent.

ON THE CULTURE OF CARROTS.

IN A LETTER TO THE BATH SOCIETY, BY JN. KIRBY, ESQ.

"I Have been favoured with your letter, enquiring after the method adopted in this county for the cultivation of Carrots; and ſhall think myſelf particularly happy if the intelligence I am enabled to communicate upon that ſubject, ſhould be thought worthy the attention of your very reſpectable ſociety, or in the leaſt degree tend to promote the good intentions of ſo laudable an inſtitution.

"The ſoil proper for the cultivation of this uſeful root is a ſandy loam, of about ſeven or eight ſhillings per acre; that on which I have uſually grown them is of a ſharper nature, and not ſo valuable. I have variouſly ſown them after turnips, ſummer-land barley, and peaſe ſet upon a rye-graſs ley; the crop upon the firſt has generally been moſt productive; next to that I ſhould prefer the latter. In the firſt inſtance we feed off the turnips by the beginning of February, and then lay the land up on ſmall balks or furrows, in which ſtate it remains until the ſecond week in March, when it his harrowed down, double-furrowed to the depth of about twelve inches, and the ſeed ſown thereon, at the rate of four pounds and an half to the acre. As ſoon as the plants appear diſtinctly, they are ſet out with a ſmall hoe, at the diſtance of ſix inches from each other; they are afterwards hoed twice more at different times, according as the crop ſeems to require it; and it is not unuſual to harrow them between the hoeings, which does no injury to the root, and frequently ſaves the expence of a third hoeing: for theſe three hoeings I commonly pay from fifteen to eighteen ſhillings per acre.

"When Carrots are intended to be ſown after peaſe, I uſually plough the ſtubble as ſoon as the harveſt is over, in order that the land may purge itſelf of weeds: in December it is laid up in ſmall balks to receive the benefit of the froſts; in February it is harrowed down, and manured at the rate of fifteen loads per acre; the manure is ploughed in to the depth of about four inches, and in the middle of March the land is double furrowed, and the ſeed ſown. By purſuing of this method, the manure lies in the centre of the ſoil, and not only affords nouriſhment and ſupport to the carrot in its perpendicular progreſs, but renders it eaſy to be turned up by a ſingle ploughing, and greatly promotes the growth of the ſucceeding crop of barley. With this crop I uſually lay down the land with rye-graſs, in which ſtate it remains for two years before it is again ploughed up, and ſometimes longer.

"The Carrots being fit to take up, I put them out to my labourers, ſometimes by the acre, and ſometimes by the load, containing forty buſhels; for the former, if a good crop, I pay for taking up and topping ten ſhillings and ſix-pence per acre; for the latter, from one ſhilling to one ſhilling and two-pence per load, taking particular care of the tops, which are equally valuable with the roots for cows, ſheep, and ſwine. After the Carrots are taken up, I lay them in an out-houſe, and cover them well with ſtraw, to guard them againſt the froſt, though it is not unuſual for ſome farmers to let them continue in the ground until they are wanted, which is leſs expenſive; and the weather muſt be extremely ſevere to injure the crown of the root, which is more hardy than either a turnip or potatoe. There is only one objection to which this practice appears to be liable, viz. that of the ground being ſometimes rendered too hard by the froſt to admit of their being taken up; but this may eaſily be obviated, by a little care and attention in the grower.

"Reſpecting the weight of an acre of Carrots, I confeſs my curioſity has not yet extended ſo far as to determine that point; but as to quantity, I uſually grow from 200 to 500 buſhels per acre, which we ſell at ſix-pence per buſhel.

JOHN KIRBY."

The ſoil on which Carrots grow to moſt advantage is a ſandy loam, of conſiderable depth, and to plant them on ſoil where they cannot ſtrike downward, for nouriſhment is throwing away labour and expenſe to little purpoſe. From the collected opinions of thoſe who have cultivated Carrots as food for cattle, they ſeem to poſſeſs more nutriment than any other root propagated for that purpoſe, particularly for horſes; that 40 buſhels will maintain ſix working horſes a week, allowing them hay, and that half the quantity of hay uſually given when horſes are fed on oats, will be ſufficient. Oxen are fed with Carrots quicker than with either turnips or potatoes; they increaſe milk in dairy cows, and contrary to cabbage or turnips, make butter ſweet and of a fine flavour: the quantity neceſſary for a cow that gives milk, is half a peck at night and the ſame in the morning; and with this quantity of Carrots, and good freſh ſtraw, they will be kept in better order, and produce more milk, ſuperior in goodneſs to cows fed with the beſt hay. Sheep are likewiſe very fond of Carrots, for which they are eſteemed a very wholeſome food.

SECT. XV.

MANGEL WURZEL AND OTHER ROOTS AND PLANTS NOT IN GENERAL CULTIVATION.

MANGEL Wurzel, or Root of Scarcity, firſt introduced into this kingdom, by Sir Richard Jebb, Bart. and preſented to the Society of Arts, from whom Dr. Lettſom obtained ſome of the ſeeds, and has cultivated them, according to his own account, to great advantage: and to whoſe induſtry we are indebted for the following information.

The ſeeds may be ſown as early in the ſpring as the weather will permit, on rich land well prepared, and tranſplanted from the ſeed bed, ſometimes in the month of May, on a loamy ſand, or rich hollow loam, at a diſtance of 16 or 20 inches from each other, at a depth of 4 or 5 inches.

At the end of June, or beginning of July, when the outward leaves are become about a foot long, the firſt crop of leaves is to be gathered, breaking them off near the root, which may be done at the end of every twelve or fifteen days, and are an excellent vegetable for the table, ſuperior to ſpinage.

ADVANTAGES RESULTING FROM THE CULTIVATION OF THE ROOT OF SCARCITY.

"THE numerous experiments that I have made, eſpecially in the year 1785, relative to the culture, the produce, and the uſe of the root of Scarcity, have convinced me, that it deſerves to obtain a decided preference over all other roots, and even over turnips. Whether I am partial, or enthuſiaſtick in my attachment to it, may be determined by conſidering the reaſons which I am now about to enumerate.

1. This vegetable may be eaten by men during the whole year: it is agreeable and wholeſome, and does not cauſe flatulencies, as turnips do.

2. As it is not attacked by the caterpillar, or by any other inſect, its ſucceſs is certain every where: it ſuffers nothing from the viciſſitude of the ſeaſons. Neither our own turnips, nor thoſe of England, poſſeſs theſe advantages.

3. The leaves of the root of Scarcity afford an excellent food for all kinds of cattle, during four months in the year; whilſt turnips produce leaves only once a year, and even then are tough, and injured by inſects.

4. The root of Scarcity may be well preſerved during eight months in the year, and is not ſubject to become rotten, as is the

caſe with turnips; which, from the end of the month of March, become ſtringy, tough, and ſpungy.

5. There is no kind of turnips which ever ſucceeds perfectly; they often fail entirely, eſpecially in hard lands; they require a light, good, and ſandy ſoil; but the Root of Scarcity will ſucceed every where; the cultivators of different kinds of lands may be equally aſſured of ſucceſs; and farmers and labourers may therefore be greatly benefited by this reſource.

6. The milk produced by cows who have been fed for ſome days together with turnips, contracts a ſtrong, ſour, and diſagreeable tallow-taſte; but thoſe, who are fed with the Root of Scarcity, produce both milk and butter of an excellent quality.

" The Root of Scarcity is never diſliked by cattle; they eat it always with the ſame avidity and the ſame pleaſure; and they have nothing to fear from thoſe unhappy accidents, which ſometimes reſult from the uſe of turnips.

" I ſhall eſteem myſelf happy, if the truths which I have ſtated ſhould encourage the cultivation of a Root, which may increaſe the riches of the ſtate, and contribute to the eaſe, and to the happineſs of the people.

" After having given the public every uſeful information in my power, reſpecting the Mangel Wurzel, or *Beta Hybrida*; and after having, at much labour and expence, diſtributed many millions of ſeeds, for the purpoſe of experiment, time muſt determine how far my endeavours, directed to the good of the community, will prove ſo eventually. It remains with me, however, publicly to thank my numerous correſpondents, among whom I may include many of the firſt in national rank, who have condeſcended to favour me with their approbation.

" To thoſe invectives, which ſome of the public prints have exhibited againſt me, I make no reply. However eſtimable the regard of virtuous characters may be, he will involve himſelf in diſappointment and remorſe, who acts merely, to gain the applauſe even of the good, or to deprecate the cenſure of the envious. If my conduct have acquired the former, my motives render me indifferent to the latter.

" I ſhould conclude this letter with regret, in being under the neceſſity of informing the public, that I am now exhauſted of all the ſeeds of the Mangel Wurzel which I raiſed myſelf, or procured from abroad, were it not in my power to add, that the ſeedſmen in London are now in poſſeſſion of a quantity to diſpoſe of.

" As I wiſh fully to appreciate the value of this vegetable, any future information reſpecting it will be acceptable to

" JOHN COAKLEY LETTSOM."

The worthy and reſpectable Dr. LETTSOM has beſtowed much trouble and expence in the cultivation and diſtribution of this plant, and doubtleſs from the pureſt philanthropic motives: his zeal has raiſed up a hoſt of illiberal and anonymous opponents, ſome to diſplay their wit, and others their ignorance; but all have failed in their attempts to hurt the feelings or character of ſo good a man. We cannot but think the Doctor too warm in his commendations of the Root of Scarcity, before he had ſufficiently made experiments; but we hope his ſanguine hopes will be gratified. As a further account of this *ſtranger*, which is ſo lately ſettled amongſt us, we give Sir THOMAS BEEVOR's, Bart. Letter to the Bath Society.

" MY ſeeds were ſent me very late, two months nearly after the moſt proper time of ſowing them; however, I ventured to commit them to the ground, on the 12th day of June laſt; and in a few days had the ſatisfaction to find them all riſe well, and in a vigorous ſtate of growth. I have ſince gathered their leaves twice, and find their roots of ſuch ſize as to promiſe a conſiderable and profitable production. The meaſure of ſome of them is now 15 inches round; the length (of a few I pulled up on this occaſion) is 13 inches, and the weight of them on an average 4℔. The ſeeds and plants are not, I think, to be diſtinguiſhed, at their firſt growth, from ſome beets; but in order to aſcertain the difference, (if ſuch there was) I ſowed on the ſame bed of mould, on the ſame day and hour, ſome ſeeds of the real beets; and find that, under the ſame management, the Roots of the Scarcity plant are four times as big, and the leaves of it much larger than thoſe of the real beets. I have offered a few of the leaves of the Scarcity plant to the cows whilſt going in exceeding good paſture in my park, which they readily ate; I did the ſame to ſome horſes which were ſtanding in a waggon in the harveſt field, who as readily ate the broad tender part of the leaves, but rejected the thick parts of the ſtalks. I have alſo had dreſſed the leaves of each of the above-mentioned plants, and brought boiled to my table; and think, as did ſome other gentlemen who ate of them, that there is a manifeſt difference in their taſte; thoſe of the Scarcity plant being ſo like ſpinage, as hardly to be diſtinguiſhed from it; whilſt thoſe of the beet were both harder and drier.

" What further obſervations I ſhall be able to make upon the growth and application of this plant, in the courſe of the winter, I will tranſmit to you, as it certainly promiſes to be of the firſt importance in the article of food for cattle. In the meanwhile let me not omit to inform you, that I ſaw a few weeks ago at Lord ORFORD's place at ERISWELL, near Barton-Mills, in Suffolk, ſome of the plants, which were nearly twice as big as mine: and I have been told, that at Mr. DASHWOOD's, of CLEY, in Norfolk, there are ſome which meaſure two feet in circumference; but the two laſt-mentioned parcels were, I am informed, ſown at leaſt ſix weeks ſooner than mine were."

JERUSALEM ARTICHOKES.

As all plants for agricultural purpoſes are valuable in proportion to the ſimplicity of their mode of cultivation, and their readineſs to grow on poor ſoils, the Jeruſalem Artichoke claims our attention; although it is at preſent a novelty in the farmer's Kalendar, it is probable, in a ſhort time, it may become uſeful and familiar. The following account of the cultivation and produce of the Jeruſalem Artichoke by N. BARTLEY, Eſq. near Briſtol, tranſmitted to the Bath Society, is the only one we have ſeen on ſo large a ſcale, and which does Mr. BARTLEY great credit as a friend to Agriculture.

At a conſiderable expence and trouble, I procured of theſe roots ſufficient to plant half an acre of ground, but I have them now in great plenty. I find the produce to be about 480 Wincheſter buſhels per acre; and I think they are about equal in value to potatoes for feeding ſtore pigs, ſuch as are not leſs than five or ſix months old. For fatting hogs, I do not find they are near ſo valuable as potatoes. But their chief recommendations are, the certainty of the crop, that they flouriſh in almoſt any ſoil, and do not require any manure, at leaſt for ſuch a produce as I have ſtated. They are proof againſt the ſevereſt froſt, and may be taken out of the ground as occaſion may ſerve. Whereas potatoes are ſoon affected with froſt, and muſt therefore be ſecured before the winter ſeaſon ſets in. I generally plant three or four acres in a ſeaſon.

Expences per acre, drills 3½ feet aſunder, ſets nine inches—time, beginning of March.

	£.	s.	d.
Rent	1	10	0
Two ploughings, at 5s.	0	10	0
Four ſacks of ſets, at 2s.	0	8	0
Flat hoeing	0	2	6
Farthing up twice, at 2s. 6d.	0	5	0
Digging 120 ſacks, at 3d.	0	10	0
	£. 4	5	6
PRODUCE.			
One hundred and twenty ſacks, at 2s.	£. 12	0	0
Deduct expences . . .	4	5	6
Profit .	£. 7	14	6

What is here adduced in favor of this plant will certainly ſtimulate thoſe who wiſh to improve Agriculture; to try experiments, we can only recommend them not to begin too expenſively. The time to plant Jeruſalem Artichokes is in March, or April, as you do potatoes, and the Michaelmas following they are at full growth.

CHICORIE SAUVAGE, OR WILD ENDIVE.

THE Chicore Sauvage is a plant very little known in England, but bids fair to become an acquiſition of great conſequence to the *rural œconomics* of this country. The Rev. Mr. COOKE, inventor of the well-known Patent Drilling Machine, has favoured Mr. C. Cooke, the publiſher of this work, with the following valuable information reſpecting the plant now under our conſideration.

" SIR,

" IN my tour through Normandy, Piccardy, and the Iſle of France, in October 1787, I had an eye to the reſpective Syſtems of Agriculture, as practiced in thoſe parts of the country, and was ſurprized to find the conſtruction of the implements in huſbandry, as well as the methods of cultivating the ſoil, rotation of crops, &c. &c. ſo much behind the common practical Syſtem of Agriculture in Great Britain. I think I could with ſafety pronounce them two hundred years behind us, both in theory and practice. I was alſo ſurprized, but very agreeably, at the ſight of ſeveral acres of land, covered with a ſucculent luxuriant herbage for cattle, of the plant called CHICORIE SAUVAGE, or Wild Endive, belonging to Mr. CRETE, of *Dugney*, near St. *Denis*, about 7 miles from *Paris*; eſpecially when I was informed, that upwards of forty tons, the produce of one ſeaſon, had been cut as green herbage for cattle, from one Engliſh acre, previous to my ſeeing it in the above flouriſhing ſtate in October.

" I was alſo informed, that the herbage of this plant, (which is perennial,) withſtood a moderate froſt in the beginning of winter, and that it begun to vegetate early in the ſpring. That this plant flouriſhed upon a dry, thirſty, gravelly ſoil, was ſelf-evident to me; it alſo ſtruck me very forcibly, that if this plant would flouriſh equally in our climate, the introduction of it might prove an acquiſition to this country. On which account, I was induced to requeſt of Mr. Crete, a little ſeed, which requeſt was very liberally complied with.

"This ſeed I brought to England, and diſtributed it in ſmall portions, to a number of my agricultural friends and correſpondents, ſuch as I apprehended would give it a fair trial upon different ſoils; and I have the ſatisfaction to ſay, that as far as I have ſeen of the cultivation of this plant upon a very ſmall ſcale, and heard of from others, its luxuriancy appears to equal, if not, ſurpaſs, that which I ſaw at Mr. Crete's; particular information of which I have already had from Wm. Whitmore, Eſq. of Dudmaſton, near Bridgenorth, in Shropſhire, from Mr. Crook, of Tytherton, near Chippenham, in Wiltſhire, and from Mr. May, of Perdis, near Ipſwich, in Suffolk. It is well known, that the ſoil of Mr. May's farm is a poor light unproductive ſand, not worth 4s. per acre; and if one half, nay, if a fourth part of Mr. Crete's produce can be obtained from the ſoils in this iſland, ſimilar to Mr. May's, the cultivation of this plant may be truly ſaid to be an acquiſition to this country, and worthy of every attention. In the preſent infant ſtate of the cultivation of this exotic, I have only to obſerve, that if it really begins to vegetate luxuriantly in the month of March, as I have been informed it does, the advantages to the farmer will be ineſtimable; in the time of ſcarcity of food for cattle, in the ſpring, when hay, turnips, cabbages, &c. are expended, and common graſſes not yet begun to vegetate, he will have a plentiful ſupply; in which caſe, the formidable month of April, and the beginning of May, will ceaſe to be any longer dreaded by the huſbandman.

"I have thus briefly communicated to you the information I have received of the plant called Chicorie Sauvage, in hopes of inducing cultivators of different ſoils to give it a fair trial.

Mr. C. Cooke, "And am,
Pater-noſter Row, "Your moſt humble ſervant,
Oct. 23, 1788. "JAMES COOKE."

The great ſervices this gentleman has already rendered the Agriculture of this kingdom, by his ingenious and uſeful inventions, are conſiderably increaſed by his introducing this promiſing and uſeful plant, and his making us the happy inſtruments of firſt communicating this acquiſition to the public, is a diſtinction we are not a little proud of. From the ſame ſource, we likewiſe learn the following particulars: That the proper time to ſow it is early in the ſpring broad-caſt with corn, as you do other graſs ſeeds, or plant it in rows with a drill, twelve or fifteen inches diſtant from each other; that broad-caſt, one buſhel and half is ſufficient to ſeed an acre, and drilled half the quantity. In France it may be cut as green food four times in a year, and all kinds of cattle eat it readily; it grows with a tap root, and ſtrikes a conſiderable depth into the earth; of courſe it ſhould be planted on a ſoil capable of giving it admiſſion.

Whatever tends to improve poor land is of the moſt material importance to Agriculture: of that deſcription the *Chicorie Sauvage* bids fair to ſtand foremoſt, and we make no doubt but in a few years its cultivation will become widely extended in this kingdom.

SECT. XVI.

HOPS AND THEIR CULTIVATION.

HOPS from their appearance in hedges, in a wild and uncultivated ſtate, are probably natives of this iſland; they naturally twine themſelves round whatever ſupport preſents itſelf, and without ſuch aſſiſtance will not flouriſh. It is ſomething remarkable that the Hop and ſcarlet kidney, or French beans, entwine round their ſupporters in oppoſite directions, notwithſtanding every effort to direct them contrary; we mention this as a curious phenomenon in natural hiſtory.

The uſe of Hops are abſolutely eſſential in England, as they conſtitute a very material part of the liquor which is the general drink of the inhabitants; this makes their cultivation very extenſive.

The Hop-planters buſineſs is very precarious, ſometimes the profits are immenſe, and at others, a great loſs for ſeveral ſucceſſive years; as an inſtance of the firſt, we have known a Worceſterſhire farmer make 1200l. profit from 20 acres of Hop ground in one year; the expence of tillage being very heavy, a failure of the crop for ſeveral ſucceſſive years occaſions a very great annual loſs.

Hops cannot be cultivated to advantage, except on ſtrong rich land of conſiderable depth of ſoil, which muſt be conſtantly manured, otherwiſe little advantage is to be expected. Land freſh broke up from paſture is preferable for Hops; if they are planted on ground, previouſly in tillage, it ſhould be as well cleaned, and in as high condition as it is poſſible to bring in by labour and manure.

Hops are planted early in ſpring, ſometimes in rows, of ſeven or eight feet diſtance from each other, the intervals of which are occaſionally ploughed, to pulverize the ſoil and deſtroy weeds, this cauſes the expence to be ſmaller; but planting them in hills is by all means to be recommended to thoſe who wiſh to cultivate them to advantage.

If you break up a paſture, the turf ſhould be firſt pared thinly off by a paring plow, and then followed and buried by the furrow-plow, at leaſt ten inches deep; if arable, the ridges on which the Hops are to be planted, ſhould be double plowed, or trenched with the ſpade; the latter method, though moſt expenſive, is certainly the beſt. This ſhould be done early in the winter, about which time the ground ſhould be marked out on which the hills are to be formed, and on theſe ſpaces a thin coat of well mellowed dung ſhould be laid to remain the winter. The vacant ſpaces have no need of dung, nor ſhould any be uſed but ſuch as is well rotted.

As ſoon after a hard froſt as the earth becomes dry and mellow, plow into a three-bout ridge the lands on which your ſetts are to be planted, leaving the intermediate ſpaces unplowed. But before this is done, meaſure out your ground and ſquare it, leaving the inequalities at the ſides or ends to be managed as hereafter directed. By ſquaring it, I do not mean that all the ſides ſhould be equal, only that they be ſtreight in order to add neatneſs and beauty to your plantation. The three-bout ridge ſhould meaſure four feet nearly, and by leaving an interval of ſeven feet in breadth, you will ſo manage, that your hills will all fall on the tops of the ridges, which will be of great advantage to your plants.

The ground being thus prepared and harrowed down ſmooth, your next care is to mark out your hills. The readieſt way of doing this, is, to have four painted ſticks about ſix or ſeven feet long; two of which ſhould be ſet upright with a plummet at each end, exactly at the diſtance you intend your alleys to be. Two men ſhould be employed in this operation, each with an eight feet ſtick (for that is the diſtance I would adviſe your hills to be placed) and a ſpade. Suppoſing the men to beat the oppoſite ends, they begin one from one pole, and the other from the other pole; and each directing his eye to the pole that is exactly oppoſite to that at which he began, with his ſtick and his ſpade he meaſures the ſpace from hill to hill, and throws up a ſpadeful of earth at each for a mark. In this manner both working alike, by meeting and croſſing one another, they arrive at oppoſite ends nearly at the ſame time; and then meaſuring and moving their poles, they proceed again in the ſame manner, and ſo continue to do till the whole plantation is marked. In forming your alleys eleven feet will be found a due proportion.

This operation completed, let them next begin to prepare the mould for the hills, which I would adviſe to be ſkimmed lightly from the ſurface of the intervals or once ploughed lands, taking that only which is perfectly fine, and gathering it into heaps; theſe ſhould lie juſt oppoſite the holes out of which the ſpadefuls were thrown, and thoſe ſpadefuls ſhould be turned up and laid upon the oppoſite ſides of the holes to where they lay when firſt thrown up. If froſt or ſnow ſhould intervene before the time of planting ſtir the mould again, and throw it up nearer to the place where the plants are to be ſet.

Thus every thing being in readineſs before the month of March, eſpecial care ſhould be taken to provide a ſufficient number of good ſetts, for which the younger planter muſt rely on the fidelity of ſome friend, as he cannot himſelf be a competent judge by any directions that can be given him on paper. The number of ſetts that will be neceſſary for an acre, according to the method here directed, is 2500, that is five plants to a hill, and about 500 hills to an acre: according, therefore, to the number of acres you intend to begin with, muſt be the number of plants you provide.

March, the proper month for planting, being come, the plants prepared, the ground moiſt, and the weather favourable, begin by filling up the marking holes, and juſt chopping the ground round them to looſen it, and then proceed to make up your hills with the fine mould already mentioned. This done, let the planter with his dibble make five holes in this manner : · : each about twelve inches a-part from the other, and rather inclining outwards towards the baſe of the hill than quite down-right, into which let him place his ſetts, which then will all point towards one another a-top, the uſe of which will more clearly appear hereafter; this done, let him with his hand hollow the hill like a diſh a-top, preſſing the earth cloſe to each plant with his dibble, and leaving the hole open for the reception of the firſt rain that falls. This done, let the two men proceed, one making up the hills, and the other planting till the whole plantation is completed.

Thus having completed your plantation, you have little elſe to do till the weeds begin to appear, and then inſtead of hoeing, dig up your once ploughed intervals, and throw the earth out equally on both ſides, ſo as to cover the ridge on which the Hops are planted, and ſmother the riſing weeds; this will add to the natural warmth of the ſoil, and help to enrich it; and when this is done, weed your hills, and, if the mould is fallen down, new dreſs them.

It is now the univerſal practice in Kent to pole the Hops, the firſt year with poles about 12 or 14 feet high. Theſe poles are either aſh, willow, poplar, maple, or aſp: the young planter muſt content himſelf with ſuch as the country he lives in affords; the poplar and willow are the ſooneſt raiſed; in Kent poles for the firſt year coſt about 10l. per thouſand; but poles twenty feet high for the ſucceeding years, ſometimes, coſt double. The common practice is polling as ſoon as the vines begin to riſe and bend; nature directs that they ſhould ſeek for help as ſoon as they begin to creep, and there ſeems to be a reciprocal attraction between the plant and pole, which it were in vain to attempt to explain, though daily experience confirms its exiſtence. This, however, will want the aſſiſtance of art to direct it properly, and the ſhoots muſt be led to the poles to which they ſeem moſt inclined, and lightly tied to them, to prevent their ſtraying. Three poles are uſually ſet to a hill; they are firmly fixed in the ground by means of an iron crow made for that purpoſe: the willow and poplar will frequently take root, if not well ſeaſoned before uſing, for which reaſon they are generally cut early in the winter, and expoſed to the air to harden, it not being found ſo proper to let them put forth leaves. In placing them they contrive to ſpread them a little a-top, as well for the convenience of air, as for preventing the vines from intermixing, which, without this precaution, they moſt certainly will do. No more than two vines are ever ſuffered to riſe upon a pole, the reſt are carefully trimmed from the ſtocks, and either uſed for raiſing new plantations or converted into dung. After the firſt year, however, I would adviſe the followers of theſe inſtructions to add one pole more to a hill, and let two vines approach every pole. The ground, managed as before directed, will nouriſh them, and by parting the poles properly at ſtaking them, they will want neither ſun or air to ripen them to perfection. Great care, however, is neceſſary, after poling, to watch the ſtraggling vines, to rectiſy the poles, and to replace whatever may by accident be thrown into diſorder. It is likewiſe uſual about Midſummer to top the vines upon the poles, that is, to pinch off the buds, in order to check their upright growth, and to promote their branching. This is done by means of a ſtay ladder, ſuch as gardeners uſe to cut trees.

Hop grounds ſhould be always kept clean from weeds, and the earth in fine tillage; to fix ſtated periods for labour to be performed would be impoſſible, and he who does not know when ſoil ſtands in need of ploughing or digging is unfit to be a farmer. About the beginning of Auguſt Hops are in bloſſom, after that the leafy ſubſtance forms itſelf, which is called the Hop. The general ſymptoms of their ripening are, a change of colour from a pale green to a yellowiſh hue, after this they ſmell fragrant and ſtrong, and the ſeeds will on examination be turned brown and begin to ripen; the ſmall leaves which compoſe the Hop ſeparate and open; this is a ſure criterion that the crop is fit to gather, which ſhould be immediately attended to, as delays are dangerous.

The methods of picking varies in different counties in England; in Kent they are picked in baſkets at a certain price per meaſure. In Worceſter and Herefordſhire they gatherers work at a price per day and their maintenance.

A ſpace is formed in the Hop ground, and a moveable article, called a crib, conſtructed ſomething reſembling in ſhape a hamper or crate, ſuch as glaſs is uſually packed in, but a great deal larger; this being fixed, the inſide covered with a cloth, it is the buſineſs of a man to cut the Hop wires near the ground, pull up the polls, and bring them with the wires upon them to the crib; the pickers ſtanding all round pull off the Hops into the cloth before deſeribed, which when full is carried to the kiln to be dried, and another put in its place for the like purpoſe.

Hops are dried on kilns built for the purpoſe, and muſt be carefully attended during the drying, particularly that the fire is not too ſtrong, and that they are duly turned.

Hops are dried with coal made into charcoal, generally called coke.

After Hops are dried, they ſhould be laid together in a room to cool; if they are baged hot from the kiln, the operation of baging reduces them to powder.

SECT. XVIII.

FLAX AND HEMP, AND THEIR CULTIVATION.

FLAX is cultivated to great advantage on rich land, and all attempts to plant it on ſoil, not of that deſcription, ſeldom turn out profitable. The plant has a beautiful appearance, growing with a ſlender upright ſtalk, ſmall leaves, and a blue bloſſom; on a minute examination each flower appears to ſtand in a ſmall green cup, compoſed of five pointed leaves, the flower in like manner conſiſts of five leaves; the whole of which reſembles the ſhape of a bell.

Freſh broke up paſtures are frequently appropriated to the growth of Flax, and which it is neceſſary to pulverize and reduce very fine; a crop of beans, previouſly taken, are by no means improper, and ſerve to pay rent and labour.

The month of April is the proper time to ſow Flax, the ſoil being dry and in fine tillage; from two to three buſhels are uſually ſowed upon an acre: and drilled, a buſhel or 5 pecks; much depends upon the goodneſs of the ſeed: drilling in rows 10 or 12 inches diſtant is preferable.

Linſeed is eſteemed good when it is large, oily, heavy, and of a bright brown colour; to know whether it be oily, a few grains are thrown into a red hot fire ſhovel, and if they are good they crackle almoſt inſtantly, and blaze briſkly.

If it be ſufficiently heavy, it will ſink to the bottom of the water; and to judge whether it be new, a number of ſeeds exactly counted ſhould be ſown on the end of a hot bed, and notice taken whether they all grow or not.

Flax is valuable for the ſeed, as well as for the product of the ſtalk, which by a proceſs is converted to linen.

Flax ſeed is well known for making oil, and its uſe as food for cattle is equal, if not ſuperior, to any ſeed that grows: from a pint to a quart of linſeed infuſed in two quarts of water, and given daily to a feeding ox or cow, will bring them forward very expeditiouſly, and is much more nutritious than barley meal.

When the ſeed of Flax is ripe the ſtalk is paſt its perfection; it is therefore commonly pulled before the ſeeds become quite ripe, when the head begins to droop and change colour; this ſhould be particularly attended to: the future proceſs belongs to the manufacture of Flax.

HEMP.

Hemp, like flax, muſt be cultivated on rich land; its appearance, while growing, very much reſembles the common nettle, and the part manufactured for cloth, cordage, &c. inſtead of being incloſed in the middle of the ſtalk like flax, forms the outward covering or peeling.

Hemp is ſowed about the ſame time as directed for flax; ſowed, about three buſhels to the acre, and drilled in rows 12 or 14 inches diſtant, one buſhel, or one buſhel and an half to the acre: drilling is certainly the moſt eligible method, as, without the land is in fine tilth, it is by no means proper to plant hemp.

Particular care ſhould be taken to procure freſh, bright, and heavy ſeed, and it ſhould be planted ſhallow in the ſoil: it ſhould be carefully weeded, or if drilled, the intervals between the rows ſhould be hoed three or four times in the ſeaſon.

Hemp is of different kinds, male and female, and ripens one before the other; the male firſt, which is known by the leaves changing colour and falling, and the ſtalk alſo becoming whitiſh. The female plant produces the ſeed, and ripens later than the male; which renders it proper management to pull them at different periods; this makes drilling more eſſential, as one ſpecies may be collected without injuring the other.

When pulled, care is taken to dry the ſtalks, which are generally tied in bundles.

Neither Hemp, or flax, will anſwer any profitable purpoſe, except on good land, which they very much exhauſt.

SECT. XVIII.

MADDER AND WOAD, AND THEIR CULTIVATION.

MADDER is a plant cultivated for its root, which is uſed by dyers; ſome ſmall quantity is alſo ſold as a drug. It appears an inſignificant running plant; the root being the object, the ſoil ſhould be rich, and deep, by no means of a ſtiff, clayey nature.

The ſoil on which Madder is intended to be planted ſhould be ploughed deep, and laid perfectly dry in autumn; and after ſufficient ſpring ploughing and harrowing, the time to plant it is in April: the ſets are procured from an old plantation, and taken off when they are about two inches above the ſurface; they ſhould be ſlipped from the plant at as great a depth as you can, as they will then have the better chance to grow; and as ſoon as they are taken off, it is proper to throw them into water to keep them freſh.

The method of planting them, as generally practiſed, is in equi-diſtant rows, two feet four inches diſtant from each other: women or children drop the ſets, and men immediately follow after and depoſit them in the earth.

If planted in the month of April there is little danger of their growing, eſpecially if the land is well prepared, and watering them will ſeldom be found neceſſary.

Great care is to be taken in weeding and hoeing, both to keep down the weeds, and pulverize the ſoil.

The root is not to be taken up for ſale till the autumn after planting, twelve months; as before that time they are not grown of a ſufficient ſize.

When the roots are taken up, they ſhould be gently dried upon a kiln, or other place adapted for the purpoſe; after which they are marketable. The intervals between the rows are planted the next year, and managed in the ſame manner as the preceding.

WOAD

WOAD.

Woad is a plant uſed by dyers, the leaves of which are valuable, and in colour are of a blueiſh green: a rich dry ſoil ſuits it, and on no other ſhould it be planted: the roots likewiſe ſtrike deep, and ſhould be accommodated with a ſufficient depth of good ſoil.

All thoſe plants which require a fertile ſoil, require alſo much ploughing and harrowing to prepare the land before ſeed time.

Woad is ſometimes ſowed in February or March; but the moſt proper ſeaſon is Auguſt: four quarts will ſow an acre broad-caſt, and drilled, half the quantity.

When the plants are two or three inches high, they ſhould be hoed from weeds, and left ſtanding about one foot diſtance from each other, and ſo remain during the winter, except the crop was drilled, in which caſe horſe-hoeing may be performed.

When the leaves take their firſt ſhoot in ſpring, the intervals between each plant ſhould be well cleaned, and ſtirred as much as poſſible, as it will cauſe them to ſhoot more vigorouſly.

The leaves of Woad are gathered when they are full grown, and continued from time to time during the ſummer, picking thoſe leaves only which are plump and juicy, and of a fine ſage green colour. As ſoon as they are gathered they are ſent to the mill, which is a branch of the manufactory.

Keeping the earth mellow by frequent hoeings greatly aſſiſts the growth of this plant, as well in its quality as quantity.

SECT. XIX.

MEADOW AND PASTURE, OVERFLOWING, DRAINING, AND CLEANSING DITTO.

MEADOW and Paſture are generally applied as ſynonimous terms, and, in ſome reſpects, they are ſo. All kinds of Meadow land may, with the greateſt propriety, be called Paſture, but all kinds of Paſture cannot, with equal propriety, be deemed Meadow.

By Meadow, we mean ſuch graſs land as lies level, or nearly ſo, and on which the traces, or appearance of the plough, are not viſible.

Paſture is graſs land ſituate on the ſides or tops of hills, and in vallies, always appropriated either to the purpoſes of growing hay, or depaſturing cattle; but which bear evident marks of cultivation.

Theſe we conceive to be the definite meanings of Meadow and Paſture, by which it muſt be underſtood, that Meadow, by being converted to tillage, and afterwards laid down graſs, becomes Paſture; but Paſture cannot be re-inſtated in its priſtine condition of Meadow.

This we muſt confeſs ſavours ſomething of ſylogiſtic argument, not tending to eſtabliſh any uſeful criterion by which the huſbandman can be benefited; but having made uſe of the terms Meadow and Paſture, we could not delineate the ſubject without making ſome remarks upon the outlines.

Meadow land frequently lies contiguous to rivers or brooks, and is liable, in wet ſeaſons, or by art, to be overflowed: this Mr. Young, and ſeveral of his correſpondents, calls irrigation, the word being of a curious dictionary conſtruction, and as Mr. Young, and ſome of his facetious correſpondents, laugh at the farmers when they are "puzzled and ſcratch their heads." we mention this for the benefit of thoſe who may not have had an opportunity of conſulting Dr. JOHNSON, previous to their attending the *Agricultural Society*, or the *Farmers Club*: for our parts we ſhall content ourſelves with uſing the familiar appellations of flooding, overflowing, or watering.

As the watering of Meadow and Paſture land is of the utmoſt importance to Agriculture, the improvement being generally great, and the expence often trivial, we here preſent our readers with certain abſtracts tranſmitted to the Bath Society, which cannot fail of inſtructing thoſe who attentively peruſe them.

"That water running from a ſpring, or out of a rock, is often preferred to water from a river that has paſſed ſome way. I apprehend, however, that this is not always the caſe; but ſometimes quite the reverſe. Springs coming immediately from a rock, or from the earth, are, I apprehend, of very different qualities. A ſpring coming from a lime-ſtone rock, I ſhould think by much the beſt for watering meadows, which is the caſe at Orcheſton in Wilts, where that famous graſs grows, which produces an amazing crop in thoſe ſeaſons when the meadow can be watered with the ſprings guſhing out of the lime-ſtone rocks. At other times, when the ſprings are low, the land does not produce more than a third of the quantity.

"It is underſtood by the farmers here, that water is very much impoveriſhed by watering a great many meadows on the ſame ſtream; and that thoſe meadows at the head of the ſtream are much the beſt on that account, except where there are a great number of farm-yards draining into it; which, in my opinion, makes up in part at leaſt for the deficiency.

"Water ſeldom, if ever, promotes vegetation, unleſs it be in a mixed or hetorogenious ſtate. It is therefore neceſſary, previous to the flooding of Meadows, to examine of what nature and quality your water is. All water that paſſes through beds or veins of minerals, or which contain calcarious nitre, copperas, allum, &c. is highly prejudicial to graſs lands. But water that iſſues from chalk cliffs, or lime-ſtone rocks, or ſand and gravel, is in general friendly. The beſt teſt is its ſoftneſs, which may eaſily be known.

"The quantity of water that is let over the land ſhould be in proportion to the nature of the ſoil, and the heat of the ſeaſon. If the ſoil be ſandy, gravelly, or chalky, and the declivity conſidcrable, the more water is wanted, and it ſhould remain the longer, eſpecially if the weather be warm, and it be a ſouth aſpect.

"If your water has run a long courſe above ground, the fouleſt is the beſt; but that coming immediately from chalk or lime rocks is warmeſt, and much to be preferred to foul muddy water in general. I muſt however obſerve, that water in a ſtate of putrefaction is poiſon to vegetables, and therefore ought never to be uſed for this purpoſe.

"Water, when carried over meadow lands after heavy rains, depoſits a fertilizing ſediment, which enriches the ſoil, and turns the mould blackiſh. It alſo promotes the ſpeedy putrefaction of every vegetable and animal ſubſtance found in the earth, and thereby contributes to the melioration of the ſoil under the ſward or turf.

"Care ſhould, however, be taken, that the quantity of water brought on the land be only enough to give vigour to the plants, without overcharging their veſſels. Never water your lands in very hot weather, for when the veſſels of the plants are filled, by the heat cauſing it to aſcend ſuddenly, a ſudden cold morning will greatly injure the herbage.

"If the ſpring proves dry, paſtures may be watered as ſoon as the froſty ſeaſon is over. But if the winter has been ſevere, and the earth remains moiſt, no current of water ſhould be admitted till the earth is ſettled, and the ſurface becomes dry; for the gentleſt ſtream would carry off the fine mould looſened by the froſt. After the graſs ſhoots, and the ſeaſon becomes mild, water ſparingly. In the ſummer never water but in great drought, nor even then, unleſs the water bc perfectly clear and ſweet; for muddy water would render the graſs foul, and give it a bad taſte.

"I conſulted my Meadow-floaters, who are unanimouſly of opinion, that the ſooner the water is thrown over the Meadows after it ariſes out of the ſprings, the more efficacious it will be.

"We have no ſprings on the hills in this part of the country, as in the neighbourhood of Bath; but our meads are full of them, and we apply the water iſſuing therefrom as ſoon as poſſible to the lands. We find ſpring water is better for this purpoſe than river water, on account of its being warmer in winter, and cooler in ſummer.

"I have a range of meads lying nearly on a level by the ſide of a little river, which runs near thirty miles before it reaches my lands. And in the upper part of my meadows a ſpring riſes of very clear ſoft water. Being deſirous of proving which would be moſt beneficial to the land, I have divers times, in different years, tried both.

"In a wet winter I can eaſily, at flood time, when the river is very foul and muddy, float all my meads by opening the bank by the river ſide. This I have done ſeveral times, and a great deal of ſediment has been left behind on the retiring of the water. In this caſe, I have generally had a large crop of graſs the ſucceeding ſummer, but I have always found it more rank, and the hay leſs ſweet, than at other times.

"When I have turned the water of my ſpring over the land, I have found the produce equally great, and the hay much finer and ſweeter than in the other inſtance. I have alſo obſerved, that thoſe meads which firſt received the water from the ſpring, were moſt luxuriant; and thoſe which it ran over laſt the leaſt ſo. I am therefore of opinion, that the beſt and moſt fertilizing water for Meadow land is that which iſſues immediately from warm ſoft ſprings.

"I formerly occupied ſome water-meadow not many miles diſtant from this place, where there is a great deal of land watered from the Kennet, a very conſiderable river which riſes at a village of that name not far from Marlborough. The occupiers of thoſe lands are uniformly of opinion, that the more thick, turbid, and feculent, the water is, the greater will be the benefit to be derived from the uſe of it: and the opinion is certainly well ſupported both by reaſon and experience. Haſty ſhowers, and very heavy rains, dilute the manure, and waſh away the fine pulverized earth from the adjacent lands for many miles round; ſo that as the waters increaſe, and become more rapid, they alſo become more replete with fertilizing matter, as is viſible to the eye by the quantity of ſcum, mud, and fine earth, remaining on the ſurface when the water is drawn off. The benefit derived from flooding may in general then be computed, *cæteris paribus*, from the quantity of feculent matter depoſited by the water, for it is, I believe, invariably found to be in proportion thereto.

"The effects of the water of land-ſprings muſt depend upon the nature of the ſtrata through which it paſſes, and may be beneficial or otherwiſe to vegetation, as that might be if applied in ſubſtance. Calcarious earths, in general, are friendly and conducive to vegetation; and from thence it ſeems probable, that water iſſuing from limeſtone rocks would promote the growth of vegetables in proportion to its impregnation by the calcarious matter.

"The effects of limeſtone water have never fallen within my obſervation; but from what I have obſerved of land ſprings, I have often thought the benefit from them was nothing more than from the ſimple fluid as a conſtituent part neceſſary to the accretion of all bodies, abſtracted from every principle of nutriment but what is contained in water as ſuch only.

"However, there cannot be a doubt, but different ſprings are impregnated with different qualities, the particulars of which cannot be known but from obſervations of their effects."

As the uſe of clear ſpring and river water, is greatly neglected by numbers who have it in their power to improve their paſture at an inconſiderable expence; the foregoing obſervations being the opinions of various ingenious gentlemen, will, we hope, be regarded with that attention ſuch rational ideas deſerve.

There is a material advantage in thoſe meadows which are liable to accidental overflowings, and thoſe which are capable of being overflowed at pleaſure, and are at all times out of danger. In the firſt the water may come at a wrong ſeaſon, and often does, to the entire loſs of a crop; but in the latter it never can come, but when the huſbandman thinks proper

Water running in a briſk manner over paſture in the winter, enriches it materially; but ſtanding water, which does not run off till diſperſed by the warm dry weather in the ſpring, does a great injury.

The methods of over flooding, practiſed in Gloceſterſhire and Wiltſhire, are very curious; large flood gates, or wines, are erected on the rivers, and channels cut to introduce the water over the land, which are contrived in a manner capable of flooding or laying dry any part you think proper.

DRAINING.

The Draining of paſture is an improvement of great conſequence, and on lands which lie with a proper deſcent, is very eaſily effected; we mean by Draining, ſuch Drains as are covered; for digging a ditch and letting it remain uncovered is not a ſubject worth mentioning; nor does it deſerve to be ranked with improvements.

Hollow or under Draining is generally attended with a great expence, and if well performed the improvement is permanent; for this reaſon, it ſhould by no means be done at the expence of a tenant; indeed, no gentleman poſſeſſing a particle of generoſity, would permit his tenant to throw away his property on ſo uncertain and precarious a foundation. When a ſwampy, or boggy place, is ſituate in the midſt of a field, the cauſe may juſtly be attributed to a ſpring in the upper part of ſuch wet place; the firſt circumſtance to be conſidered is to fix on a place for the drain to empty itſelf; this being done, begin there, and work up to the ſpot you purpoſe Draining.

Springs uſually lie on a bed of clay, for which reaſon it will be neceſſary to dig the drain of ſufficient depth, which need no deſcription to a perſon in the leaſt converſant with the buſineſs. Various methods are uſed in conſtructing the Drains; wood tied up in ſmall bundles is ſometimes placed at the bottom of the Drain, ſometimes ſtones are thrown promiſcuouſly together at the bottom; it is to be obſerved, that in both thoſe methods the Drains are brought to a point at the bottom, the ſides forming an acute angle; in either of thoſe inſtances, when the wood or ſtones are placed at the bottom, the turf which was taken from the ſurface is placed upon them with the graſs downward. For further information, we inſert from Mr. Young's Annals, Vol. 3. p. 378, the following,

ON DRAINING.

By R. H. Clarke, Eſq. of Bridwell, near Cullompton, Devon.

"No branch of huſbandry is attended with greater ſucceſs, in ſoils naturally wet and ſubject to ſprings, than underground drains, which are called with us, French gutters; the uſual method of making them, is with ſtone, but where there is a ſcarcity of that material, alder poles are ſubſtituted; and where wood is ſcarce, that method alſo becomes expenſive. I have a farm ſubject to all three of the above inconveniencies, and my tenant was adviſed to the following mode, viz. when the line is marked out where the drain is to be cut (which muſt be directly through the ſpot where the ſpring riſes, and fully at the head of it) with a ſpade of 12 inches wide, take the turf carefully up in ſquares, with a conſiderable ſubſtance of earth to it, and lay it by on one ſide of the intended drain; then cut the drain of the ſame breadth, three feet deep; take the earth out clean, leaving the bottom ſmooth; then, with a ſpade three inches wide, cut a channel in the middle of the bottom part, ſix inches deeper; when that is done, lay the turf in flat, with the graſſy ſide downwards, that will have a bearing of four inches and a half on each ſide, and leave a clear Drain, of three inches by ſix, to carry off the water; then fill the Drain to the ſurface with the earth that remains, and at the mouth, or where it is deſigned to diſcharge the water, ſecure it with a few bricks or ſtones. You will pleaſe to obſerve, that the depth prevents their being injured from any ſuperficial preſſure, and the only objection I have ever heard made to the plan, is, that they may be liable to be choaked by the moles; but I believe they ſeldom or never work at that depth."

Of all hollow Draining, that done with ſtone is to be preferred where they can be obtained; but where ſtones are not to be procured without a conſiderable expence, black thorn or elm bundles are a good ſubſtitute; otherwiſe, the ſides of the Drain being made nearly perpendicular; when you reach the clay, dig a channel about 4 inches wide, and 6 or 7 deep, in the middle of the bottom of the Drain, and cover it with the turf which was taken from the ſurface, and put on one ſide for that purpoſe, obſerving to lay the graſs ſide downwards, then fill up the Drain as uſual.

CLEANING PASTURE.

Paſture ground, of an inferior quality, is ſubject to become moſſy, ſometimes to a degree which renders it of little value; various methods have been deviſed to deſtroy moſs on Paſture. Scarrifying it in ſpring with a ſtrong harrow made on purpoſe has been practiſed, and ſtrongly recommended; but we by no means think it conſiſtent; it is true, if a dreſſing of coal aſhes, lime compoſt, ſoapers aſhes, or other ſuitable manure, has been freſh laid on, harrowing with heavy harrows may be uſeful, but without manure it cannot.

Paring, burning, and ſpreading, the aſhes on greenſward, overrun with moſs, is good management; but particular care ſhould be taken to pare the turf extremely thin, otherwiſe the Paſture is a long time before it recovers itſelf.

A ſlight dreſſing of mud, or loamy mould, is very ſerviceable to ſpread over the land at the time you ſpread the aſhes; they ſhould be well harrowed on with a thorn buſh, loaded with ſtones or a harrow with ſhort tines or teeth. The proper time to pare and burn moſſy, and coarſe greenſward, is as early in the ſpring as poſſible.

Cleaning Paſture ground from anthills, is certainly good huſbandry, although numbers object to the practice, and will tell you they know the injury attendant on the ſyſtem from experience; and with them we readily agree, provided the buſineſs is badly managed. We have ſeen great benefit from digging away anthills, in the following manner: As ſoon in autumn, as you can poſſibly ſpare time, dig up the anthills rather deeper than the ſurrounding ſurface, and having a cart ready, throw them into it, and immediately carry them off to a convenient place to make the compoſt heap; as ſoon as poſſible after, get if you can about one load of lime freſh from the kiln, to every five loads of the anthills, and mix it well together; if it has been properly mixed, the compoſt will be in condition to ſpread in the land the next ſpring; by this means the inſects will be all killed, and the land will be benefited.

If lime cannot be procured, ſoot, ſoapers aſhes, or animal manure, ſhould ſupply the place, obſerving to throw ſome of the compoſt on the bare places which were made by removing the hillocks. The ground ſhould be harrowed as ſoon as the dreſſing, which was put on, is in a condition to break to pieces in a proper manner.

SECT. XX.

HAY AND ITS MANAGEMENT.

The making and management of Hay has been learnedly diſcuſſed by many able theoriſts, ſome of them, in order to preſerve its virtues, diſapprove of expoſing it to the ſun; and we rather wonder that we have never ſeen it recommended in print to the farmer, to take his Hay home and dry it in the chimney corner.

The Editors of the Scotch Encyclopædia ſay, the beſt method of haymaking ſeems to be that recommended by their own countrymen, Dr. Anderson, as follows:

"Let the Hay-makers follow the mowers, and make the graſs
"into cocks about three feet high, giving each of them a ſlight
"kind of thatching, by drawing a few handfuls of the Hay from
"the bottom, laying them lightly upon the top, with the ends
"hanging downwards."

Had the learned Doctor and the Editors of the Encyclopædia been Iriſhmen, the reader would have laughingly called this method of Hay-making a bull; but as thoſe gentlemen are natives of a country, whoſe inhabitants are famous for their ſcientific learning, and accurate mode of expreſſing themſelves, we muſt content ourſelves with charitably ſuppoſing the Doctor meant to give a receipt for making dung inſtead of Hay, and hope no one will be credulous enough to try the experiment.

Hay made from clover, ſaintfoin, or other graſſes of the ſame kind, ſhould be treated in a different manner from natural or meadow graſs; but to preclude it from the influence of the ſun, is not the proper method to make good Hay.

The firſt object is the proper ſeaſon to mow graſs for the purpoſe of making Hay, and when that period arrives depends more on the practical judgment of the farmer, than any theoretic deſcription can convey.

Graſſes of all kinds are in their higheſt perfection juſt before they bloſſom, and that is the criſis which ſhould be the huſbandman's guide in mowing; a perſon who has a great deal of buſineſs, which will neceſſarily take up three weeks or a month, be the weather ever ſo fine, ſhould begin that he intends to mow firſt earlier than we have directed.

Graſs grown old in the field is of little more nouriſhment to cattle than ſtraw; and the land is materially exhauſted by bearing the crop till its virtues are evaporated.

From cutting graſs of all ſorts early, every advantage which can accrue, from good Hay, ſtrong and luxuriant aftermath, the ſoil not impoveriſhed, and every other good circumſtance that can be wiſhed, may be expected.

With reſpect to the making of Hay, graſs cut young and with its juices in perfection, requires much more making than that which is overgrown before it is mowed.

Saintfoin, clover, and other artificial graſſes of the like kind, ſhould be once turned in the ſwarth, and as ſoon as poſſible made into very ſmall cocks, the ſmaller the better, and from time to time turned till they are fit to be put together in rows for the purpoſe of carting to the ſtack or rick.

Natural meadow and paſture graſs being mowed in its proper ſeaſon, ſhould be ſpread in the morning, and before the evening raked in ſmall rows, and thoſe rows made into ſmall cocks: they cannot be made too ſmall, provided they are put together in a round ſnug manner: on the morrow the cocks ſhould be throwed and ſpread in rows, and turned and raked together as may ſeem neceſſary, and in the evening made into larger cocks than thoſe the preceding day: thus the proceſs ſhould be continued till the Hay becomes fit to carry together, which may be known by its handling light; and on twiſting a ſmall whiſp as hard as you can with both hands, obſerve that no moiſture appears, or the Hay is not ſufficiently dry to put together in a rick.

It is a cuſtom to make Hay into ſmall ſtacks of about a ton each, and letting them ſtand in that condition till the field, or the quantity deſigned to make the rick, is made ready, and then the rick or ſtack is made without intermiſſion. This prevents Hay heating immoderately, and, judiciouſly conducted, anſwers many convenient and good purpoſes.

SECT. XXI.

DIVIDING AND INCLOSING, WITH THE MANAGEMENT OF FENCES.

DRAINING and Incloſing, with the planting and management of Fences, being circumſtances of the moſt important conſequence to the flouriſhing and improved ſtate of Agriculture in this kingdom, and conſequently require to be treated rather at large; and as this ſection does not immediately come under Practical Agriculture, or the buſineſs of a tenant, we refer our readers to the article INCLOSURE, where they will meet with the theory and practice of one of the beſt informed men of the age.

SECT. XXII.

HORSES AND OXEN AS USED FOR HUSBANDRY.

ARthur Young, Eſq. has collected, from various quarters, the expence of keeping horſes for the purpoſes of Agriculture, and, on an average, finds about 16l. the expence of keeping a farmer's horſe one year, half the year in the ſtable with hay and corn, and the other half with green food, or turned to graſs.

Theſe calculations, or accounts, which may be ſeen in the Annals of Agriculture, vol. IV. p. 124, not meeting with the ideas and practice of Mr. WILLIAM PITT, of Pendeford in Staffordſhire, he writes the following on the ſubject, Vol. IV. page 423, Annals, &c.

ON THE EXPENCE OF KEEPING HORSES, AND COMPARISON OF HORSES AND OXEN,

By MR. PITT.

SIR,

"I make the following remarks on your expence of keeping horſes, alſo on the compariſon betwixt horſes and oxen, which if you think worth attention, may ſerve to fill a corner of your Annals.

"Firſt, it appears to me that you charge the full market price for hay conſumed at home, which is not fair: hay, if even fold to be conſumed on the farm, by no means deſerves the ſame price, as if carried clean off; the dung of cattle, or horſes, which eat ſuch hay, and the manure raiſed thereby, is a very material object: it is not eaſy to find data from which to calculate this difference of value; but from ſeveral correſponding circumſtances I conjecture, that Hay conſumed at home ought not to be charged at more than half the price of hay delivered at market; more eſpecially if carriage out be taken into the account; if this point be admitted, it makes a very conſiderable deduction from your eſtimate.

"Upon the average of nine years the value of Hay conſumed per horſe in your eſtimate is 6l. 2s. if one half be taken off for the advantage of home conſumption, it makes a deduction per horſe per annum of 3l. 1s. for Hay only.

"Secondly, allowance of oats being ſo various, is a proof at leaſt, that leſs than the largeſt allowance will ſuffice: I find the average (beans included) equal to 23 quarters per annum for four horſes, or 46 buſhels each horſe, and average price 2s. 3d. per buſhel.

"I have converſed with ſome very liberal horſe-keepers, who allow three quarters of a peck per day each horſe, when they bait at noon, and go out again at ſix at night; two quarters per day when they go out but once, and lay in the ſtable at nights; and one quarter per day at graſs: ſuppoſing theſe intervals of equal length, each one third of a year, it gives 45 buſhels and an half each horſe per annum, which very nearly equals your average. I allow leſs, viz. one buſhel per horſe per week in ſpring and autumn feed time; half a buſhel per horſe per week at other times, when they lay in the ſtable; and only half the latter quantity at graſs, but always mixed with plenty of chaff, or cut ſtraw; the above intervals are 16 weeks, 16 weeks and 20 weeks reſpectively, which makes only 29 buſhels per annum each horſe.

"Upon the other articles of expence I remark as follows: chaff cutting charged 1d. per buſhel, the price here, a half-penny and beer; ſhoeing very high, the average being double the price of this country; a common price here for ſhoeing huſbandry horſes is 7s. 6d. and 8s. per head per annum; I paid for ſeveral years 9s. per head per annum, on account of working them cloſer than other people; I am in doubt whether wheat-chaff ought to be charged, as being in few places a marketable article; and the extreme ill luck in 1768 is ſuch as I think ought not to join the general account.

"The following is the calculation of the expence of keeping eight horſes, upon an average of the laſt three years; which have generally been healthy, and equal to their buſineſs:

16 acres of clover mown for hay, at 1l. 15s. per acre, the rent of land and tythes being the half, viz. 17s. 6d. per acre	£. 28	0	0
Oats 240 buſhels, at 2s.	24	0	0
20 weeks ſummer food, from the beginning of June to about the middle of October, at 1s. 6d. per horſe per week	12	0	0
Shoeing 9s. per head	3	12	0
Decline of value at 1l. per horſe per annum	8	0	0
	75	12	0

"Chaff and farrier may bring it up to 10l. a Horſe per annum; and I am of opinion, that by œconomy and good management, Horſes for Agriculture buſineſs may be, and are kept in many places fit for conſtant work, without exceeding that ſum, upon the general average of many years.

"A breeding mare in a team of 7 or 8, may and does frequently prevent decline of value from being at all felt.

"The ſuperiority, or even equality of Oxen to Horſes, is, I think, by no means aſcertained; Oxen were half a century ago, much more in uſe in this country than at preſent. As an improved agriculture, and more extenſive cultivation took place, they by degrees gave way to Horſes; I have no doubt but Horſes thus gradually eſtabliſhed themſelves in conſequence of a decided ſuperiority, both with reſpect to docility and diſpatch; and be it ever remembered, that Oxen are by no means capable of thoſe quick exertions, ſo naturally and advantageouſly made by Horſes in critical times of ſowing and harveſt.

"Seven draught Horſes I look upon as a very complete ſet; they keep on three carts in carrying either dung or marl; they make occaſionally a waggon team and a plough team; are ſufficient for two plough teams in the ſtrongeſt work, and will occaſionally make three in barley or turnip feed time, or keep on a plough and two pair of harrows for ſowing at the ſame time; this number will do a vaſt deal of work, and will never want more attendance than a man and two boys, whoſe wages ſhall not exceed five ſhillings per week and board; I am perſuaded the ſame work cannot be done by any number of Oxen whatever, with the ſame attendance; nor probably without an extra man, whoſe wages and board will in its turn, "prove a moſt heavy burden," in a caſe where, by the uſe of Horſes, it might have been diſpenſed with.

"Again: upon wet ſoils and in wet ſeaſons, the treading of Oxen drawing the plough would be very injurious. What could have been done for more than a month, of rainy weather the preſent autumn, upon many wheat fallows, with four or ſix Oxen, when the ground would ſcarcely bear half the number of Horſes, notwithſtanding the advantage from the natural make of their hoofs, and ſmallneſs of number.

"I have never yet ſeen Oxen docile enough to be managed at the plough by one perſon; a holder and a driver, as far as I have obſerved, always attended them; on the contrary, three Horſes at a wheel plough require only a boy of twelve or fourteen, and will undoubtedly do more work."

"W. P."

As this gentleman, in his correſpondence with Mr. Young, ſeems to acquit himſelf in an ingenious and practical manner, we have given his letter at large, but do not in every reſpect agree with him.

The manure made from horſes kept in a ſtable, and well fed, is an object of great weight with a farmer who has it not in his power to purchaſe manure of equal value.

Horſes alſo are adapted for all kinds of buſineſs, in a manner that oxen are not: theſe circumſtances make it neceſſary that every farmer ſhould keep a team of Horſes; but thoſe who have a great deal of ploughing, and other buſineſs requiring either Horſes or Oxen, will greatly find it to their advantage to keep Oxen to perform part of the buſineſs.

Oxen are kept at much leſs expence than Horſes, are bought at half the value, ſubject to fewer accidents, and, properly managed, will do nearly as much work.

The cuſtom of drawing Oxen in the old method with bows and yokes is nearly exploded: the prevailing method at this time is to harneſs them as you do Horſes; the collar being cut open at one end in order to put it on their necks: Oxen uſed in this manner are of great ſervice to cultivators in general, and in particular to thoſe whoſe buſineſs for the plough is on a large ſcale.

We ſhall finiſh this ſubject with the following letter to the Bath Society, which does the writer the greateſt credit.

ON THE COMPARATIVE UTILITY OF OXEN AND HORSES IN HUSBANDRY.

"About five years ago, I took ſome land into my occupation, and having found the expence of Horſes very great, I determined, ſomewhat more than two years ago, to make trial of Oxen, and bought one pair. At that time, I am almoſt certain, there was not an Ox worked in this county; on which account my workmen added much to the trouble of breaking them, by their obſtinate prejudices againſt the uſe of them.

"At laſt I was fortunate enough to ſelect a labourer, who, though totally unuſed to them, was willing to take proper pains to break them. By his good treatment and temper, they ſoon became tractable, and as handy both at ploughing and carting as any Horſes.

"Being well ſatisfied with their performance, I reſolved to diſpoſe of all my draft Horſes, and ſubſtitute Oxen in their ſtead.

"I have now compleated my plan, and have not a ſingle cart-horſe; but the work of my farm (which conſiſts of upwards of one hundred acres of arable land, and ſixty of paſture and wood) is performed with eaſe by ſix Oxen; together with my ſtatute-duty on the high-ways, timber and corn, carting, harrowing, rolling, and every part of rural buſineſs. They are ſhoed conſtantly: their harneſs is exactly the ſame as that of Horſes, excepting the neceſſary alterations for difference of ſize and ſhape, they are drove with bridles, and bits in their mouths, and anſwer to the ſame words of the ploughman or carter as Horſes, and as readily. A ſingle man holds the plough, and drives a pair of Oxen with reins; they will regularly plough an acre of land, every day, and in leſs than eight hours time; I believe they will do it in ſeven, but I would not aſſert more than I know they perform.

"I have a ſmall plantation, in which the trees are planted in rows ten feet aſunder; the intervals are ploughed by a ſingle Ox with a light plough, and he is drove by the man who holds it. I mention this as an inſtance of their great docility.

"My Oxen go in a cart ſingle, or two, three, or more, in proportion to the load. Four Oxen will draw eighty buſhels of barley, or oats, in a waggon, with eaſe; and if they are good in their kind, will travel as faſt as Horſes with the ſame load.

"I frequently ſend out eighty buſhels of oats with only three Oxen, and one ox with forty buſhels in a light cart, which I think of all others the beſt method of carriage. My workmen are now perfectly reconciled to the uſe of oxen; and the following reaſons determine me to prefer them greatly to Horſes:

"1ſt. They are kept at much leſs expence. Mine never eat corn or meal of any ſort. During the winter, they are kept in good order for work upon ſtraw, with turnips, carrots, or cabbages; for want of either of the three latter, I allow one peck of bran a day to each Ox, whilſt in conſtant work. When my ſtraw is finiſhed, and the ſpring advances, they eat hay; and if they work harder than common in the ſeed time, they have bran beſide. When the vetches are fit to mow and give them in the ſtable, they have nothing elſe. After the day's work in the ſummer, they have a ſmall bundle of hay to eat, and ſtand in the ſtable till they are cool, and are then turned into the paſture.

"I am of opinion, that the annual difference of expence in keeping a Horſe and an ox, each in condition for the ſame conſtant work, is at leaſt four pounds.

2dly. The value of a Horſe declines ever year after he is ſeven years old; and is ſcarcely any thing if he is blind, incurably lame, or very old. But if an Ox is in any of thoſe ſituations, he may be fatted, and ſold for much more than the firſt purchaſe; and will always fat ſooner after work than before.

3dly. They are not ſo liable to illneſs as Horſes. I have never had one indiſpoſed.

4thly. Horſes (eſpecially thoſe belonging to gentlemen) are frequently rode by ſervants without their maſter's knowledge, and often injured by it. Oxen are in no danger of this kind.

5thly. A general uſe of Oxen would make beef, and conſequently all other meat, more plentiful; which I think would be a national benefit.

"That it may not be thought, that a pair of Oxen will plough an acre of land in a day only upon a very light ſoil, I muſt add, that the greater part of my arable land is too heavy to grow turnips to advantage. When my lighter lands are in fine tilth, I make uſe of a double plough; a ſingle man holds it, and drives one pair of Oxen, and will plough two acres a day.

"I am well aware, that the method of working Oxen with a yoke ſpares a conſiderable expence in the article of harneſs; but they move ſo much more freely with collars, and can be uſed with ſo much more advantage ſingly by the latter method, I think it far preferable.

"After experience has inclined me to give the preference to Oxen, I will not omit in my account the only material inconvenience I have found in working them; which is, they are troubleſome in ſhoeing, at leaſt I have found them ſo in this county; and, I believe, chiefly becauſe my ſmith never ſhoed any before. I have them confined in a pound whilſt they are ſhoed, and a man attends the ſmith. However, I think this diſadvantage amply recompenſed by more material advantages; and can with great truth affirm, that the longer I have worked Oxen, the better I have been ſatisfied with them.

"With great reſpect, I am, Gentlemen,
"Your moſt obedient, ſervant,
"R. KEDINGTON."

With reſpect to the diſeaſes of Horſes, Oxen, and all other kinds of cattle, we refer the reader to the Syſtem of **Farriery**, where they will ſee the ſubject copiouſly and practically managed.

SECT. XXIII.

COWS AND DAIRY.

THIS ſection we have appropriated to the articles Cows and Dairy. By Cows we mean all of the ſpecies of the Cow kind; and with reſpect to Dairy, we intend to treat of it here no farther than we think it is connected with the labours of the field, conſidering the making of butter and cheeſe as an independent Syſtem. Therefore, to the article **Dairy** we refer our readers, aſſuring them, however high their expectation may be raiſed, they will not be diſappointed in peruſing a production the reſult of long and extenſive experience, to which the author's name is affixed.

Almoſt every county in this kingdom have their reſpective breeds of cattle, of that ſpecies called the Cow kind: the diſtinction is generally to be obſerved in the length or ſhape of the horn, except in one kind, which are without horns.

The juſt proportion and due ſymmetry of make, in horned cattle, is in truth confined to a few ſimple obſervations, which we ſhall attempt to deſcribe.

In the firſt place, a round, tight carcaſe, wide in the hips and ſtrait in the back, filled up level behind the ſhoulders, the neck long and fine without any protuberant ſkin underneath, or what is commonly called throaty, the horns long, ſmall and taper, bending downwards, the head fine and ſmooth, long and yet ſmall, legs ſhort, ſtanding wide and firm, the tail fixed neither too high or too low, but growing in a right line with the back bone, the ribs formed in a regular convexity, particularly that called by the graziers the firſt rib, but which in fact may with propriety be called the laſt, it being the hindmoſt.

This is an outline of what the curious in cattle call a good beaſt; and we by no means think ſuch a Bull or Cow undeſerving the appellation; at the ſame time we would wiſh to be underſtood that there are good beaſts which do not tally with the above deſcription; ſome with ſhort horns, and others without any, are qualified to rank with the greateſt favourites belonging to either the Leiceſterſhire Mr. **Bakewell**, or the Oxfordſhire Mr.

Fowler. Theſe celebrated breeders have carried the improvement of live ſtock to the greateſt perfection.

Mr. Bakewell, taking him for all kinds of cattle, ſtands highly exalted; his name is doubtleſs foremoſt on the liſt.

But with reſpect to Horned Cattle, we can venture to pronounce Mr. Fowler, of Little Rollright, in the county of Oxford, proprietor of the fineſt breeding ſtock of beaſt that are in the poſſeſſion of any individual in this kingdom: to effect this has been a work of time and great expence.

It has always been thought neceſſary to mix and change the breed of Cattle, at leaſt ſo far as related to blood or conſanguinity; but the gentlemen we have juſt noticed have ideas totally oppoſite to thoſe old-faſhioned prejudices: they without ſcruple permit the dam, or ſire, and its offspring, to breed together, holding it an invariable maxim, that a complete Bull, and a Cow equally ſo, ſtand the faireſt chance to propagate a perfect calf.

This has been the practice of thoſe we have been ſpeaking of for a number of years, and the reſult has anſwered their moſt ſanguine expectations.

With theſe celebrated improvers of live ſtock, two or three hundred guineas is not deemed an uncommon price for a Bull or a Ram: this is certainly improving at an immoderate expence, and tends to ſhew the world that there are *connoiſſeurs* and *virtuoſi* beſides thoſe who deal in pictures, medals, or other antient relics.

There is undoubtedly truth in the notion that an Ox or Cow will feed more readily and with leſs expence, when they are kind and pleaſant in their nature and touch, or handle with a mellow ſoftneſs: it is not the grazier only will be benefited by purchaſing cattle of this deſcription; but the butcher, and even the perſon who eats the beef, will receive every advantage that can be deſired.

In buying cattle either for the purpoſes of the Dairy, or oxen to work or feed, it is of material conſequence to purchaſe thoſe which bid fair to turn out uſeful; ſome ſorts may be more ſo than others; there is no particular kind but what are liable to objections in ſome reſpects: beaſt bred on a farm generally are more healthy, and are ſubject to fewer caſualties than thoſe of another kind brought from a different ſoil.

As the weaning or rearing of calves for the uſe of the Dairy, or other purpoſes, is a particular and expenſive branch of Huſbandry, we preſent the following letter to our readers, written by the illuſtrious **Duke of Northumberland**; alſo with Mr. Young's Obſervations. Annals, vol. I. p. 293.

METHOD OF REARING YOUNG CATTLE.

By his Grace the Duke of Northumberland.

SIR,

"I AM to acknowledge the receipt of your letter on the ſubject of rearing calves in a leſs expenſive manner than has hitherto been practiſed, and, in anſwer to it, I muſt deſire to acquaint you, that I have for ſome time entertained an idea that ſkimmed milk might be prepared with proper ingredients effectually to anſwer that purpoſe, at about a third of the expence of feeding calves with new milk; the articles to be added to the blue or ſkimmed milk, are treacle and the common linſeed-oil cake, ground very fine, almoſt to an impalpable powder, and the quantities ſo ſmall, that to make 32 gallons would coſt no more, excluſive of the milk, than about ſixpence. It mixes very readily, and almoſt intimately with the milk, making it more rich and mucilaginous, without giving it any diſagreeable taſte.

"I have ſent you the receipt for making the *linſeed-milk*, which may be varied at diſcretion; and, though I have not yet had much experience of its good effects, I am inclined to believe, that under your care and direction there is a very great probability of its ſucceſs; it will afford me great pleaſure, if the hint I have here given, ſhould be found any way uſeful in promoting your laudable wiſhes to ſerve the public; and be aſſured I ſhall find great ſatisfaction, on all occaſions, in teſtifying the great regard and eſteem, with which I am,

Sir,

Your moſt obedient,

And moſt humble ſervant,

NORTHUMBERLAND."

"Take one gallon of ſkimmed milk, and in about a pint of it add half an ounce of common treacle, ſtirring it until it is well mixed; then take one ounce of linſeed-oil-cake finely pulverized, and with the hand let it fall gradually, in very ſmall quantities, into the milk, ſtirring it in the mean time with a ſpoon or ladle, until it be thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole be made nearly warm as new milk when it is firſt taken from the cow, and in that ſtate it is fit for uſe.

"N. B. The quantity of the oil-cake powder may, from time to time, be increaſed as occaſion may require, and as the calf becomes inured to the flavour of it."

OBSERVATIONS,

By A. Young, Eſq.

"THERE are two objects in rearing calves, each of which is of the greateſt importance: *firſt*, to effect it without the aſſiſtance of any milk at all; and, *ſecond*, to improve ſkim-milk in ſuch a manner as to render it more nutritious, it being well known that there is a prodigious difference in the growth and thriving of the animal when fed with *new* or *ſkimmed* milk. The Society of Arts at London offered for ſome years premiums for the firſt of theſe objects, and rewarded an account from Mr. Budd, of Wandborough, in Surry: his method was to feed them with a gruel made of ground barley and oats, the particulars of which are to be ſeen in the third volume of *Doſſie's Memoirs of Agriculture.* On this method I ſhall only obſerve, that I followed it with the greateſt exactneſs laſt year with two calves, both of which, ſo far from being reared, were ſo reduced, that, though I changed their diet to milk upon finding it would not do, yet I was too late with the change, and they both died. I will not generally condemn the method from one experiment, but I muſt own, I have many doubts of its ever proving a *real* and entire ſubſtitution for milk.

"During my reſidence in Ireland, I had the opportunity of buying calves at three days old for the price of 20d. to 3s. which induced me to make many experiments in this enquiry. Knowing before I went, the cheapneſs of calves, I had collected various receipts for weaning them, among others hay-tea; bean-meal mixed with wheat-flour; barley and oats ground, nearly, but not exactly, in Mr. Budd's proportion; but principally flax-ſeed boiled to a jelly and mixed with warm water: this being recommended more than the reſt, I tried it on more calves. The reſult of the experiments on above thirty calves was regiſtered regularly, but the minutes loſt, with other papers, in packing up and moving from one kingdom to another: the general reſult, however, I well remember. In above thirty calves, I reared not above three or four, and I was convinced as ſtrongly as the experience of one ſeaſon could convince me, that none of the methods tried deſerved reliance. Barley and oat-meal, with a very ſmall quantity of flax-jelly, reared the few that eſcaped, except one, on which a trial was made at the ſuggeſtion of my coachman, who had reared many calves. He deſired to mix two-thirds ſkim-milk, and one-third water, with a ſmall addition of flax-jelly well diſſolved; that calf recovered quickly from the low condition it had been reduced to, and afterwards throve well.

"Upon the whole, I have no ſlight reaſon to think, that this firſt object remains nearly in as great ſtate of uncertainty as ever: I am far from pronouncing that it cannot be done, and intend multiplying my experiments in the enquiry as often as I am able; all I can aſſert is, that I have hitherto had no ſucceſs.

"I now come to the ſecond object, that of improving ſkim milk, a deſideratum as much to be deſired as the former.

"The moment I received the above very ſatisfactory communication from that great patron of every patriotic endeavour to ſerve the public, **the Duke of Northumberland**, I tried it exactly according to the receipt, and, at the ſame time, recommended to two farmers in different parts of the kingdom, who I knew were ſolicitous for diſcoveries of this kind. It anſwered with me as well as I could wiſh the firſt ſeaſon, and has ſtood a ſecond teſt; the farmers to whom I communicated, report alſo favourably of it: in all caſes it has appeared to do better than ſkim-milk alone. Thus one material point is gained; not the compleat eſtabliſhment of the method, which can only follow multiplied and varied experiments; but a proof that it may very ſafely be recommended to thoſe who are the moſt cautious, and the moſt fearful of incurring expence.

"Being able to declare thus much in its favour, I lately wrote to His Grace, informing him of the ſucceſs, and requeſting his permiſſion to publiſh it, which, by another letter conceived in the handſomeſt terms, he allows me to do. I can only add, that ſuch a liberality of ſentiment gives a luſtre to exalted rank; ſets an example of attention to the welfare of the loweſt claſſes; and connects greatneſs with its right baſis, THE PEOPLES GOOD.

A. Y."

Young calves are ſubject to various diſeaſes, which will be noticed under the word **Farriery**, as we have taken the liberty to claſs the diſeaſes of all domeſtic animals in different ſections under one head.

SECT. XXIV.

SHEEP.

SHEEP, like cattle of the neat kind, are of different ſorts, generally adapted in their ſize to the poverty or richneſs of the paſture on which they feed.

Small Sheep yield the beſt mutton and the beſt wool, but there are advantages which ariſe from a breed of large Sheep which makes the ſcale preponderate entirely in their favour.

AGRICULTURE.

On large extenſive commons the Sheep are generally ſmall, and of little value; on thoſe places Sheep are liable to a number of caſualties which thoſe in incloſures are eaſily defended from.

The great improvement which has been made in this kingdom in the breed of Sheep muſt be attributed to incloſures; by incloſing every perſon becomes independent of his neighbour, as far as reſpects his buſineſs, and if a ſpirit for improvement is his wiſh he can exerciſe his will uninterrupted.

A few years paſt a committee of tradeſmen of the City of London met to enquire into the cauſes of the high prices of proviſions, and to petition and requeſt parliament to paſs ſome act to redreſs the grievance.

This wiſe experienced committee attributed every thing to the numerous incloſures which had recently taken place; their Secretary, Mr. Deputy Leekey, was deſired to write to Arthur Young, Eſq. to procure his opinion, which Mr. Young very politely complied with; and as we think it does the greateſt credit to the author's heart and underſtanding, we preſent it to our readers as a maſter-piece of the kind; the high price of mutton being the principal thing complained of, it appears with propriety in this place.

ON THE HIGH PRICE OF PROVISIONS.

By Arthur Young, Eſq;

SIR,

"I HAVE attended for more than twenty years to various complaints in and out of parliament, which have been made on *high* prices of proviſions, as they have been called; but I never ſaw the leaſt good reſult from any ſuch meaſures, though ſeemingly no more than enquiries; and when laws have been made in conſequence, they have always done miſchief. There is no inconſiderable reaſon for believing that whatever *is* the price, *ought to be* the price; ſince price can be formed by nothing but quantity, demand, and competition. If quantity does not exiſt, nobody I ſuppoſe can expect cheapneſs. If demand does not exiſt, the farmers can never expect a good price; and if competition does not take place, trade cannot be free or the price fair. Now the only point on which laws or regulations can bear is the laſt, to prevent monopolies: but if by proviſions you mean bread and meat, a little reflection will prove how impoſſible monopolies are. What capital does it take to ſet up a butcher or a baker? at ready money prices an hundred pounds will do either. How then can profits riſe too high when competition ſo eaſily takes place! and when do you hear of enormous fortunes made by butchers and bakers? I am rather inclined to think them among the pooreſt of the claſſes; certainly the bakers; and when butchers are in good circumſtances, it ariſes generally from a very fair intereſt on ſome tolerably good capitals. The misfortune of theſe enquiries is, that if you miſtake the cauſe, and, inſtead of attributing it to want of quantity, think it owing to a want of competition, and in conſequence of that idea take meaſures to eſtabliſh it—— miſchief is ſure to reſult; of which we have formerly ſeen various inſtances in laws againſt foreſtallers, regraters, &c. all which raiſed prices inſtead of ſinking them. Perfect freedom of trade is the only means of ſecuring the neceſſary competition. If the corporation of London give certain privileges to a butchers' company —if there are laws that enforce long apprenticeſhips that are unneceſſary, whatever regulations you may have of this ſort among yourſelves, they all tend to reſtrain and regulate what ſhould be as free as air, and as far as ſuch regulations take place muſt certainly have ill effects; for there can be no doubt but all corporations and all companies are mounds raiſed againſt freedom of trade, and conſequently public nuiſances.

"But give me leave, Sir, to aſk what reaſon any perſon can have to expect cheap proviſions at preſent, if by that term *meat* is underſtood? Laſt winter, hay, ſtraw, and fodder of all kinds, were ſcarcer and dearer than ever known in this kingdom. Severe froſts deſtroyed the turnips; cattle of all kinds, and ſheep ſuffered dreadfully; many died, and the reſt were in ill plight to fatten early in this ſummer; would you, in ſuch a caſe, have had meat cheap? that is only aſking whether you would have thoſe farmers ſtarve, whoſe wealth alone can feed you; you might as well burn all the ploughs to make corn cheap.

"Such, Sir, are my ideas on the preſent enquiry; they call for no exertions, becauſe the leſs that is attempted the better; and *doing nothing*, in this caſe, as in many others, is the beſt policy.

I am,
Your obedient and devoted Servant,
ARTHUR YOUNG."

Sheep, which at this time go under the denomination of Leiceſterſhire Sheep, are unqueſtionably the moſt profitable of any breed that are known; they grow to a large ſize, and will live nearly as hard as ſome others which do not weigh more than two-thirds of their weight; if the fleece is not worth ſo much per pound, its weight makes it of three times the value; and the mutton which epicures think inferior, we will defy them to diſcover any difference, provided they do not ſee the ſize of the joint from whence it was taken. We think ourſelves juſtified in the prediction, that, in a few years, there will be ten Leiceſterſhire Sheep kept in this kingdom to one of any other kind.

The profits on a flock of ſheep have lately been a matter of contention between Mr. Macro, of Barrow, in Suffolk, a gentleman farmer, whoſe productions we have ſeveral times in the courſe of our Syſtem taken notice of, and are ſorry we cannot, on the preſent occaſion, the ſubject being taken up on ſo large a ſcale; and his Grace the Duke of Grafton. When a nobleman of ſuch political conſequence and poliſhed manners as the Duke of Grafton condeſcends to correſpond with a plain ſenſible Farmer, the public muſt anxiouſly wiſh to ſee the ſentiments of ſo high a character, on ſo humble a purſuit as that of Agriculture; we therefore lay the Duke's excellent letter before the public.

ACCOUNT OF A FLOCK OF SHEEP.

By His Grace the Duke of Grafton.

"The account, given by Mr. Macro, of his Flock of Sheep, is, as you obſerve, ſo very complete on that point, that I have waited in expectation of ſeeing ſo good an example, (which has been given by my neighbour) taken up by others of intelligence and experience, and that we ſhould have been furniſhed with the means, before this time, of weighing, on juſt and ſatisfactory grounds, what are the benefits, or diſadvantages ariſing from Sheep, on each ſeparate kind of land, and to which particular breed of Sheep, the preference ought to be given in every different ſort of country.

"Though Mr. Macro has deſired that it may be obſerved, this account is confined to *his own* farm, to breeding from *ſtout* ewes, on *that* farm, *great* lambs; he, at the ſame time, has fairly intimated, that, on a farm, different in nature, and on land lower rented than his own, the advantage and profit may conſiderably increaſe; yet, notwithſtanding this candid and reaſonable declaration from him, many perſons, who, have either haſtily caſt their eyes over his account, or, who have heard it ſtill more indiſtinctly related by others, have run away with the notion, that Mr. Macro has proved, that no farmer could ever find his account in having a large flock, indeed any flock of Sheep; and that Sheep were unneceſſary in farming moſt lands, if neceſſary on any. As an article of the firſt neceſſity, and as a moſt beneficial one to the nation, as well as to individuals, in trade and manufactures, we are all concerned to prove the fallacy of ſuch an opinion. And here we may always rely on one excellent ſecurity againſt this and moſt other wild projects, which is, the private intereſts of individuals, among a people ſo active and induſtrious as we are; for, I will venture to anſwer, that the very attempt to lower the quantity of Sheep in the iſland, or even, that the expectation alone of ſuch a ſtep, would at once raiſe the price of the article, and quickly call back the grazier and farmer from ſuch a deſign. On the ſame ground of reaſoning, I have always made myſelf eaſy on the conſideration of the poſſible conſequences that might ariſe from the incloſure of ſo many common fields; conſequences, which, at firſt ſight, I acknowledge, were alarming, but, which experience has ſhewn to have been more frightful at a diſtance than they have proved to be ſo in the event. It may be depended upon, as a maxim, in Agriculture, as in trade, whenever any article becomes, by accident, or by the nature of it, to bear a higher price, that more induſtry will be uſed inſtantly to provide you with that commodity. Butter, corn, cattle, &c. all ſtand on the ſame ground, and, in proportion, as one gains upon the other, or becomes more ſought after, than the others, ſo will it be found, that more land will be turned to the produce of that article, which is moſt demanded.

"Theſe ideas alſo, relative to Sheep, I am ſatisfied, will ſpread but little; they can have no weight with thoſe who are informed: but ſtill, there are certain objects ſo neceſſary, and of ſuch conſequence to the community, that I am always ſorry to hear ſuch ſubjects looſely diſcuſſed; and I cannot think it politic or wiſe, ever to bring it in doubt, whether Sheep are, or are not, a beneficial part of farming. They underſtand Mr. Macro very ill, who draw this inference; ſo far from ſaying ſo, I am perſuaded, that, if the queſtion was put to him, he would readily anſwer, that, if he had even found the balance of the account much againſt him; yet, "he conſidered the advantage "the farm received from the flock was ſuch, that, on that very "farm, he could not go on, nor pay his rent, without his "Sheep, although he ſhould be a loſer by that article, taken "ſeparately." If ſo, they become upon *his* farm as neceſſary an article as any utenſil belonging to it.

"Another opinion, I underſtand, is, now much propagated, and it is, as I hear, with the authority of a gentleman, whoſe merits, as a breeder alone, call for the general thanks of the nation, beſides the good qualities, and knowledge, which render his character ſo reſpectable. This opinion is ſo readily and eaſily confuted, if wrong, that, I am not much alarmed for any bad conſequence that may happen from the notion, "that Sheep, "by being folded regularly, are of no more advantage, or leſs, "than if the ſame were on the grounds, or lands at liberty "without folding." I own that this poſition is, or may be more problematical than the other; and though I differ extremely in opinion from the gentleman alluded to, I would wiſh to refer any perſon to the moſt experienced, and who are the moſt thriving in their neighbourhoods, and to aſk fairly from ſuch farmers, whether they could have gained what they were poſſeſſed of, without having folded their Sheep on the lands, which were preparing for a crop; and to deſire them likewiſe to make enquiry within their reach, whether the moſt thrifty amongſt theſe farmers were not preciſely thoſe, who had the beſt opportunity of folding, and had practiſed it the moſt. If he ſhould receive for anſwer, contrary to my expectation, that ſuch farmer preferred other means, and had not followed this method; may I, without preſumption, ſay, that I conceive that ſuch an anſwer can only come from one, who has carried on farming near a capital town, or within reach of ſome adventitious manure; or elſe from one, who has farmed on a bargain, where the arable has borne no proportion to the paſture, or meadow; and where the ſtock fed upon the latter two produced all the manure he could want for his crops of grain? But, if the report of ſuch men as theſe ſhould ſtill not ſatisfy, I think, that it would be no difficult matter to prove the fallacy of ſuch an idea, by argument firſt, and if that failed, by fair experiment. However, ſir, my buſineſs at preſent only relates to the profit of a Flock of Sheep kept on a farm, differing in ſoil, &c. from Mr. Macro's; and confining myſelf to the account of this ſingle Flock, and that my own, I ſhall give it to you, to diſpoſe of as you may judge beſt, who thought that the communication might be of ſervice. I had been deferring from time to time, (on account of one avocation or another,) to make out an accurate account, *debtor* and *creditor*, of this flock; and I do not know, but the ſame cauſe might have kept me much longer, if your viſit to me, at Euſton, for a few days, had not rouſed me to undertake it. The materials were all at hand, and capable of being referred to, in the moſt accurate manner, as you know: the heat of the weather made in-door amuſements very deſirable, and I ſat down heartily to the buſineſs, which you will recollect took up a good part of one day, and ſeveral hours of the next; and, I can venture to deliver this as an accurate account: but, as this comprehended the laſt year alone, you were not ſatisfied, without following it through the ſix preceding ones, and from thence, ſtriking the balance of each article, on an average of ſeven years.

"It is a conſtant, and juſt remark, that the numerous publications, on the various branches of Agriculture, contribute but little to the improvement of that ſtudy; that few of the experiments, though delivered therein, almoſt under the colour of demonſtration, are brought into uſe, or common practice, to which end all ſuch writings ought to direct. To what is this to be imputed? though of theſe many may be given to the world, and certainly are, without ſufficient conſideration; yet among the number of writers, whoſe zeal calls them forth on theſe occaſions, there muſt alſo be many, who are very able, undoubtedly, to give the beſt leſſons on the ſubject they treat, and to juſtify them by experiments of their own. However, too often it happens, that the particular deſcription of the lands, and ſoil, as well as of the general nature of the farms on which theſe have been tried, are omitted; and this is ſo material a point, that no one muſt expect to be followed, without it: or elſe, the writer, captivated with his own ſucceſs on a ſingle ſpot, gives it to the kingdom in general, hoping to ſee it adopted, when, probably, it was calculated only for that ground on which the experiment was made, and might become of no uſe, if tried on the other ſide of the next hedge. Agriculture, I believe, admits of deciding rules leſs than any other purſuit; for almoſt each piece of land requires ſome one particular to itſelf. Let all experiments, and even precepts, be deſcribed as exactly as poſſible, with every dependent circumſtance; and then, I am perſuaded, the rational ones will never want curious perſons to give them a ſufficient and candid trial.

"In order that I may not fall into the ſame error, from which I have preſumed to warn others, I muſt ſtate, that my farm is chiefly on that ſort of ſandy ſoil, which is to be found in the neighbourhood of Thetford, and reſembles moſt of the farms thereabout, in the nature of the land, as well as in the Sheep walk and heath: in many or moſt parts of which, chalk lies at no great depth; and in a few ſpots a good loam appears, ſurrounded by theſe light ſands. The more valuable and fruitful parts have been made ſo at the expence of a thorough coat of clay, found in many places on it. Theſe lands, thus improved, are moſtly incloſed with good quicks, and admit of the three ſhift huſbandry; while the reſt is quite open, and lies four or five years, before it comes again under the plough. Beſides the turnips allotted to the Flock, as mentioned underneath, about ſixty or ſeventy acres more are grown annually for the fattening Scotch beaſts, and for the cows alſo at particular times. In making out this account, you know that we have delivered it, in the way that might correſpond as nearly as poſſible with the articles contained in that of Mr. Macro, and followed his method; thereby allowing every one to make the compariſon with leſs trouble to himſelf."

SECTION XXV.

PIGS.

PIGS, either wild or domeſtic, are animals more univerſally exiſting in all parts of the globe, than any other kind whatever, although ſo conſiderable a part of the inhabitants of the earth are, from religious motives, forbid taſting their fleſh. In our country they are in great eſtimation, as they yield the food on which huſbandmen chiefly ſubſiſt; they are very prolific in their nature, as a Sow generally produces from ſix to twelve Pigs at a litter.

The breed of Pigs have been greatly improved, both in the hardineſs of their nature, and the goodneſs of their fleſh, by the introduction of thoſe commonly called the Chineſe, or Tonquin, Pigs, thoſe being put to breed with the large long-legged, large eared-kind of our own country, have produced, in all reſpects, a great improvement. In various parts of the kingdom, young growing Pigs are put to feed on clover, during the ſpring and ſummer, a method very profitable, and deſerving of general practice; it ſhould be remembered a few beans or peas ſhould be given in the morning, to keep them healthy; but an inconſiderable quantity will be ſufficient.

As faithful recorded experiments are the only documents which can be confided in, and the feeding of Pigs the expenſive and material circumſtance which belongs to them, we tranſcribe the following from the Annals of Agriculture, vol. III. page 482.

EXPERIMENT ON FATTENING HOGS.

By Alexander Baxter, Esq.

"SIR,

HAVING been long deſirous to know, with preciſion, what profit ariſes from the fattening of Hogs, as a very eſſential branch that relates to the ſupport of man; I was very happy to find, in the firſt volume of the Annals of Agriculture, the account of a ſet of accurate and well-conducted experiments by Mr. Young, the worthy editor of that valuable publication.

From the example of ſo great a man, I was induced to follow out my idea, by making experiments on this ſubject occaſionally; and I have now the honour of producing before you, and this honourable ſociety, the following

Experiment in fattening four Hogs.

Nov. 24, 1784. Bought four Hogs of the Chineſe breed, mixed with the Engliſh, about nine or ten months old, for 5l. 5s.

Having been driven five miles, and faſted till next morning, they were weighed,

Hog, Nº	1	——	119½ lb.
——	2	——	112½
	3	——	109¼
	4	——	118¾
		Total	460 lb.

Which is very near 2¼d. per lb. alive at 5l. 5s.

Dec. 16. Weighed them in the morning faſting, having fatted juſt twenty days ſince laſt weighing.

		lb.	oz.
Nº. 1	weighed	162	14
2	——	154	0
3	——	146	0
4	——	160	6
		623	4

Nº.		lb.	oz.		lb.	oz.
So that 1	gained in 20 days	43	6	per day	2	$2\frac{14}{20}$
2	—	41	8	——	2	$1\frac{4}{20}$
3	—	36	12	——	1	$13\frac{8}{20}$
4	—	41	10	——	2	$1\frac{6}{20}$
Total gain in 20 days		163	4	per day	8	$2\frac{17}{20}$

And, one with another, each has gained per diem, 2 lb. ½oz.

During theſe twenty days, they have coſt

				£.	s.	d.
Nov.	24,	prime coſt, -	-	5	5	0
	25,	Expences -	-	0	0	11
	26,	Five buſhels grains	5d.	0	2	1
		One ditto beans	33s.	0	4	1½
		One ditto barley, ground	28	0	3	6
	29,	One ditto beans	33	0	4	1½
Dec.	1,	Three buſhels barley gr.	29	0	10	10½
	6,	One quarter ditto	29	1	9	0
		Total expences, at 6th December		7	19	7½

Which makes the price at this period, nearly 3d. per lb. live weight.

And if, as I find afterwards, the proportion of the dead weight is to the living nearly as 14 to 20‖, the dead weight of the whole would be 436$\frac{2}{20}$ lb. which, at 7s. 9d. per ſcore, the ſelling price, would come to 8l. 8s. 1½d. or nearly 4½d. per lb. a very comfortable profit, at this period of twenty days, eſpecially when corn is ſo dear.

Jan. 5, 1785, Hog N°. 4, weighed alive 199 lb. 8 oz. ſo that he gained in twenty days, ſince laſt weighing, 39 lb. 2 oz. which, as formerly, is near 2 lb. per diem. It is, however, here to be obſerved, that he did not get ſo much in this, as in the former twenty days, having in the firſt period gained 41 lb. 10 oz. and in the laſt, only 39 lb. 2 oz. Difference 2 lb. 8 oz.

N°. 4 was now killed, and his weight, as ſold for bacon, was - -	146 lb.
Weight alive - - -	199½
Or, - - -	14$\frac{2032}{3192}$

That is, 20 lb. alive yielded 14 lb. 67, or 14 and near $\frac{2}{3}$, or better than one half.

			£.	s.	d.
The expence of the four Hogs, at December 6,			7	19	7½
17th, 1 qr. barley		- -	1	9	0
24th, 2 buſhels ditto	29s	-	0	7	3
29th, 2 ditto ditto	27	-	0	6	9
30th, 2 ditto ditto	do.	-	0	6	9
31ſt, 1 ditto ditto	do.	-	0	3	4½
			10	12	9
Grinding 27 buſhels barley, 3d.			0	6	9
Total expence of four Hogs, to Jan. 5,			10	19	6
146 lb. bacon, or ſeven ſcore 6 lb. at 7s. 9d. per ſcore			2	16	6
¼ of 10l. 9s. 6d. which is his ſhare of the total expence, is - -			2	14	10½
Profit on Hog N°. 4, -			0	1	7½
			2	16	6

I weighed no more of them alive, as they were become too unweildy for the tackle I had.

		£.	s.	d.
The total expence of the four Hogs at the 5th Jan. was - - - -		10	19	6
Deduct the proportion of expence of Hog N°. 4, then killed - - -		2	14	10½
Expence at the 5th January, upon the remaining three Hogs - - -		8	4	7½
January 5th, three buſhels barley	27s.	0	10	1½
6th, Two ditto peaſe	40	0	10	0
Two ditto barley, mixed with peaſe		0	6	9
15th, Two ditto ditto	26s.	0	6	6
One ditto peaſe, to mix,	40	0	5	0
		10	3	0
Add grinding ten buſhels of barley and peaſe, at 3d.		0	2	6
Total expence of the three Hogs at the 27th Jan. when N°. 1 was killed - -		10	5	6
Jan. 27, ⅓ of 10l. 5s. 6d. the proportion of the expence of Hog N°. 1 -		3	8	6
Hog N°. 1, killed, weighed eight ſcore 16 lb. ſold at 7s. 9d. - -		3	8	2
Loſs on N°. 1, - -		0	0	4
Coſt of the three Hogs 27th January, as above - - -		10	5	6
Deduct ſhare of expence of N°. 1, -		3	8	2
Expence of two remaining Hogs, Jan. 27,		6	17	4
From Jan. 15, to March 22, 16 buſhels barley, at 26s.		2	12	0
One ditto ditto, 24s. - -		0	3	0
Four ditto peaſe, 40s. - -		1	0	0
Grinding 21 buſhels, at 3d. - -		0	5	3
Total expence of two Hogs, 22d March, -		10	17	7
Hogs N°. 2 and 3, when killed, weighed 25 ſcore, at 7s. 9d. - -		9	13	9
Loſs on two Hogs - -		1	3	10

It appears, as the general reſult of this experiment, that no profit ariſes from feeding Hogs with corn, when the prices of grain are high, except, perhaps, in the ſuperior quality of the bacon. The ſame general reſult was found by Mr. Young, in his Experiments, for which ſee Annals of Agriculture, vol. I. p. 333 to 353.

It is further to be obſerved, that, after attending twenty days there would probably have been a conſiderable profit on the four Hogs. After forty days, Hog N°. 4, that was then killed, yielded very little, to wit, 1s. 7½d. In twenty-two days more, that is, from the 5th to the 27th of January, there is a little loſs, 4d. to wit, on N°. 4. And upon the remaining two that were kept to the 22d of March, four months, there is the conſiderable loſs of 1l. 3s. 10d. ſo that there would appear to be an increaſe of loſs in proportion to the time they are kept; which is directly contrary to the common maxim of this country, which ſays, that Hogs pay beſt the laſt days or weeks of their feeding.

From this experiment, other calculations may be made. If the bacon had been ſold at 8s. per ſcore, there would ſtill have been a loſs of about 10s.

Had barley been at 24s. and the bacon at 7s. per ſcore, there would have been little loſs. And ſuppoſe the bacon at 7s. 6d. there would have been ſome profit; ſo that from this, and other experiments of the kind, a pretty accurate table may be made of the proportions of the prices of bacon, to thoſe of barley, or other grains.

In general, I ſuppoſe, if a farmer can fat his Hogs with corn, without loſs, though no apparent gain, at the market prices, that he will have a conſiderable, or very comfortable profit, in a ſure market for his corn at home, without trouble or expence; and in making, by that means, a quantity of very valuable dung, while he has the very beſt bacon for his table, or for ſale.

I did intend to have tried other Hogs upon ſoured meat, a method fallen upon by Mr. Young to profit, but circumſtances having prevented me, that ſhall be for another year—when, perhaps, other members of this ſociety may make the like, or other experiments in this way.

A. B.

The minute inſpection into the increaſe of animals during the time they are feeding, is inſtructive and curious; and thoſe who have never made ſuch experiments, nor attended to them made by others, will, on an attentive peruſal of Mr. Baxter's ingenious labours, greatly improve themſelves.

SECT. XXVI. AND XXVII.

SECTION XXVI, relates to Apples, Pears, and the making of Cyder. As we are promiſed, ſince the commencement of this Syſtem, the aſſiſtance of a Gentleman Farmer, reſiding near the city of Worceſter, whoſe abilities and extenſive practice enable him to treat this ſubject in a manner ſuperior to any thing of the kind ever ſubmitted to the public eye; we ſhould think ourſelves deficient in point of gratitude to our Subſcribers if we neglected ſo favourable an opportunity of communicating to them ſuch valuable information.

We therefore refer the reader to the article HUSBANDRY, where a variety of other detached matters relative to Agriculture will be duly noticed.

SECTION XXVII relates to Timber and other trees connected with Agriculture.

As the planting and management of all kinds of trees and ſhrubs are analagous to each other, and form a ſyſtem diſtinct and complete, had we divided the ſubject, it would have cauſed a troubleſome and diſagreeable difference; and to enter fully into it in this place, would be annexing that to Agriculture which has little to do with it; on this account we refer to NURSERY, and have engaged Mr. KERSHAW, of Shipſton, in the county of Warwick, whoſe abilities in ornamental and uſeful planting, and likewiſe in the management of a Nurſery, we can venture to aſſert will do credit to our choice, and give ſatisfaction to thoſe who wiſh to be well inſtructed on the ſubject.

SECT. XXVIII.

IMPLEMENTS USED IN HUSBANDRY.

WE at firſt intended to introduce the Huſbandry Implements previous to the ploughing, ſowing, &c. of land, but the REV. MR. COOKE having entirely new modelled his Drilling Machine, and rendered it at once the moſt ſimple as well as uſeful implement ever invented, it may now with juſtice be pronounced perfect. Mr. COOKE has alſo promiſed us a complete deſcription of this improved machine, which he is now preparing for the preſs. We are likewiſe favoured with various other new and uſeful Agricultural Implements invented and manufactured by the ingenious Mr. WINLAW, of Margaret-Street, Cavendiſh-Square, deſcriptions of which are not finiſhed. Theſe circumſtances obliged us to paſs this Section, which we can without the leaſt impropriety. We therefore inform the reader, that deſcriptions and the uſes of all the new and uſeful Implements in Agriculture will follow SECTION XXX of this Syſtem.

AGRICULTURE.

SECTION XXIX.

PLOUGHING, HARROWING, AND CLEANING LAND.

PLOUGHING, Harrowing and Pulverizing the Soil in a proper manner, are circumſtances which conſtitute an eſſential portion of the knowledge of a good huſbandman. It is deemed an error to plough land in very wet weather, and we think no emergency whatever ſhould induce a farmer to purſue a method ſo contrary to reaſon and experience. Stiff loams and clay cannot be laid too rough, and expoſed to the froſt and ſun during the time they are under a courſe of ploughing, in order to be cleaned from weeds, and meliorated, either by the intenſe heat of the ſummer's ſun, or the no leſs fertilizing influence of winter's froſt.

SAND, and looſe gravelly loam, require but little plowing; too much generates weeds, particularly thiſtles of various kinds.

As a particular deſcription of the various ſorts of thiſtles, with obſervations on their nature, and the methods of extirpating them, will doubtleſs prove a treat to our Agricultural readers, we preſent them with the following by the ingenious

MR. WILLIAM CURTIS, of LAMBETH MARSH.

SOME OBSERVATIONS ON THISTLES AS INJURIOUS IN AGRICULTURE, MORE PARTICULARLY THE SERATULA ARVENSIS OF LINNÆUS.

"There are no plants over which the œconomical farmer ought to keep a more watchful eye than the Thiſtle tribe. He is ſenſible that they are not only uſeleſs, as reſiſting the bite of moſt animals, the hardy aſs excepted, but that they occupy much ground; and being furniſhed with downy ſeeds, are capable of being multiplied to almoſt any diſtance. Hence in many parts of the kingdom, the farmers whoſe lands are contiguous unite in preventing the increaſe, by cutting them down before they ſeed; but this operation, though deſtructive to ſome ſpecies, will only palliate the bad effects of others.

"To be acquainted with the qualities of each kind, we muſt obſerve them with much attention, and view them in a botanical and philoſophical light: this alone will enable us to judge with certainty how far and by what means their deſtruction may be effected.

"The Engliſh Thiſtles meriting notice, as more or leſs noxious, are,

1. The Carduus Lanceolatus, or	Spear Thiſtle
2. Carduus Nutans,	Muſk Thiſtle
3. Carduus Paluſtris,	Marſh Thiſtle
4. Carduus Marianus,	Milk Thiſtle
5. Carduus Acanthoides,	Welted Thiſtle
6. Carduus Criſpus,	Curled Thiſtle
7. Onoperdum Acanthium	Cotton Thiſtle
8. Seratula Arvenſis,	Curſed Thiſtle

"The Spear Thiſtle is a large ſtrong plant, about four feet high, the extremity of each leaf running out into a long point; its heads are large, and it grows very commonly by the ſides of roads, near dunghills, and not unfrequently in fields and paſtures.

"The Muſk Thiſtle grows to the height of 2 or 3 feet, the heads hang down, and the flowers ſmell ſomewhat like Muſk; it is often found occupying whole fields, particularly on chalky or barren land.

"The Marſh Thiſtle is very tall and prickly; its heads are numerous, ſmall, and of a red colour; it grows abundantly in wet meadows, alſo in woods.

"The Milk Thiſtle has very large leaves, which are moſt commonly beautifully marbled with white. Near London it appears frequently on banks by road ſides: in which ſituation we alſo meet with

"The Curled and Welted Thiſtle. Theſe three ſeldom intrude into fields and paſtures.

"The Cotton Thiſtle is diſtinguiſhed by its ſize, (being perhaps the largeſt of the Britiſh herbaceous plants) and its white woolly leaves. It grows in the ſame ſituation as the three laſt-mentioned.

"The Curſed Thiſtle is more general in its growth than any of the others, being found not only by the ſides of the roads univerſally, but alſo in arable land, and is not uncommon in meadows, even in ſuch as are yearly mown. It is remarkably prickly, grows about three feet high; its heads are ſmall, the flowers purple, and frequently white. The ſcales of the heads are ſmooth, and may in a particular manner be diſtinguiſhed from all the others before-mentioned, by having a perennial root about the ſize of a gooſe-quill, which runs deep into the earth, and afterwards creeps along horizontally.

"Of theſe Thiſtles, all except the laſt are either *annual* or *biennial*; that is, remain in the ground not more than one or two years, unleſs renewed by ſeed. The laſt having a perennial root, continues in the earth, increaſing, and throwing up new ſhoots every year.

"Hence it will appear obvious, that if the firſt ſeven ſpecies of Thiſtles are cut down before they perfect their ſeed, the ground will be entirely cleared of them; and that the laſt-mentioned can no otherwiſe be deſtroyed, than by rooting it out, a proceſs which the following experiments will ſorrowfully convince the rural œconomiſt to be impracticable in large fields, and ſcarce to be performed even in an incloſed garden.

EXPERIMENT FIRST.

To aſcertain the effects of mowing the Seratula Arvenſis.

"The Hon. Daines Barrington, who is ever anxious to promote uſeful enquiries, deſired me to try whether this kind of Thiſtle could not be deſtroyed by mowing. A ſmall patch of them, about two feet ſquare, was accordingly planted in a good garden, in the year 1777. In the courſe of the ſummer they were mown three ſeveral times, but without any other good effect than that of preventing their ſeeding; for inſtead of being deſtroyed, the next ſpring they came up extremely vigorous, not only on the bed where they were firſt planted, but all around it to the diſtance of ſix feet.

EXPERIMENT SECOND.

To aſcertain the annual Increaſe of the Root of the Seratula Arvenſis.

"April, 1778, I planted in a garden a piece of the root of this thiſtle, about the ſize of a gooſe-quill, and two inches long, with a ſmall head of leaves, cut off from the main root, juſt as it was ſpringing out of the ground. By the 2d of November, 1778, this ſmall root had thrown out ſhoots, ſeveral of which had extended themſelves to the diſtance of eight feet; ſome had even thrown up leaves ſix feet from the original root. Moſt of theſe ſhoots which had thus far extended themſelves were about ſix inches under ground, others had penetrated to the depth of two feet and a half; the whole together, when dug up and waſhed from the earth, weighed four pounds.

"In the ſpring of 1779, contrary to my expectation, this thiſtle again made its appearance on and about the ſpot where the ſmall piece was originally planted. There were between fifty and ſixty young heads, which muſt have ſprung from thoſe roots, which had penetrated deeper than the gardener was aware of, although he was particularly careful in extracting them.

"From theſe experiments it appears deducible, that no plants are more eaſily deſtroyed than the generality of thiſtles, or with more difficulty than this one; there being no ſoil, however poor, in which it will not vegetate, nor earth ſo ſtiff but it will penetrate; in proportion, however, as the ſoil is rich, will be its increaſe.

"It were much to be wiſhed, that an inveſtigation of this evil had afforded a remedy: at preſent, none appears. It is, therefore, to be feared, that ſpudding or cutting them down cloſe to the ground, once or twice in the ſpring, is the only operation the farmer can perform to prevent their bad effects in deſtroying his crops on arable land, and rendering his paſtures unſeemly.

"As nature in the preſervation of this plant ſeems to have exerted her greateſt powers, it is poſſible that in ſome future period, uſes may be diſcovered to which it has not yet been applied.

"To the aſs it is the higheſt treat; and I have been credibly informed, that in ſome parts of Scotland, it is cut down as food for horſes.

"It would be well, if a plant ſo noxious in ſome reſpects could be rendered beneficial in others."

Some kinds of ſoil require deep ploughing, and others light; we have heard huſbandmen aſſert that they were friends in every reſpect, and on all ſoils, to light or ſhallow ploughing; and others profeſs themſelves advocates to a deep furrow where the rock were no impediment: theſe are aſſertions without reaſon; as where the ſoil or ſurface-earth is of a conſiderable depth, to ſometimes fetch up freſh mould may undoubtedly be an improvement, particularly if it has by means of a fallow, a crop of roots, or any other meliorating management, the opportunity of being in cultivation a ſeaſon previous to its being ſowed with corn.

The following inſtance of Deep Ploughing, by Mr. N. BARTLEY, near BRISTOL, contains ſomething ſatisfactory on the buſineſs.

EXPERIMENT ON DEEP PLOUGHING.

"FROM the experiments and reaſoning of Monſ. CHATEAUVIEUX, DU HAMEL, and others, I was determined to try the effects of Deep Ploughing; for this purpoſe I provided myſelf with a very ſtout plough, and began with a piece of land of about five acres on Briſlington Common, to which my experiments have been moſtly confined. The ſoil a rich loamy ſand, the colour that of a hazel-nut when fully ripe; the uppet ſtratum of a pretty uniform quality, to the depth of from 2½ to 4 feet. In the firſt place, I had to contend with the prejudice of the ploughman, who, for what reaſon he knew not, very ſtrongly objected to deep ploughing; however, I ſoon brought him to ſubmiſſion, and, not without much labour, he performed the buſineſs to my entire ſatiſfaction: the general depth was about nine inches.

"During the operation, the ground was viſited by moſt of the farmers in the neighbourhood, and the method univerſally exploded. By ſome it was ſaid I ſhould uot plough for them, though I would do it for nothing; by others, that it would not recover for ſeven years; and again, that it would be quite ruined. From all this I was not diſcouraged; and after giving the land two other ploughings, which were performed with eaſe and pleaſure to the ploughman, it was cropped with Lammas Wheat, and the produce was eſtimated, by ſome of theſe very farmers, at forty buſhels per acre. The next year it was manured with twenty cart-loads of a compoſition of half hog dung, and half virgin earth, part of the ſame field, and planted with potatoes. This crop was kept free from weeds, well hoed and earthed up, the produce not leſs than 140 ſacks, or 560 Wincheſter buſhels per acre. Next it was ſown with flax-ſeed, and produced two packs per acre, the pack 240lb. After this two ſucceeding crops of hoar-wheat, both good, ſay about 30 buſhels each crop per acre.

"The laſt ſeaſon it was ſown with black oats, and laid down with clover and rye-graſs ſeed. The oats I eſtimate at 64 buſhels per acre, which will appear moderate in compariſon of an experiment upon that grain, which I ſhall note in the ſequel.

"I attribute greatly to deep and frequent ploughing, the ſucceſs of theſe crops, and I perſiſt in the ſame method. It is probable, however, that ſome degree of caution may be neceſſary on particular ſoils."

Lands, which lie level, have evidently the advantage of thoſe which are in high ridges with reſpect to cleaning; croſs ploughing is impracticable on high ridged lands, without which ſtiff ſoils cannot be ſufficiently pulled to pieces. The old cuſtom of throwing land of a wet nature into very high ridges was certainly an error, particularly on the ſides of hills, or where there was a proper deſcent to admit of draining.

In grounds that require ridging, an error prevails, that ridges cannot be raiſed too high. High ridges labour under ſeveral diſadvantages; the ſoil is heaped upon the crown, leaving the furrows bare; the crown is too dry, and the furrows too wet; the crop, which is always beſt on the crown, is more readily ſhaken with the wind, than where the whole crop is of an equal height: the half of the ridge is always covered from the ſun, a diſadvantage which is far from being ſlight in a cold climate. High ridges labour under another diſadvantage in ground that has no more level than barely ſufficient to carry off water: they ſink the furrows below the level of the ground; and conſequently retain water at the end of every ridge. The furrows ought never to be ſunk below the level of the ground. Water will more effectually be carried off by leſſening the ridges both in height and breadth: a narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater ſlope than a very broad ridge where the difference is three or four feet.

To attempt to level land, that has lain in high ridges a long time, on a ſudden, is by no means judicious; as experience ſufficiently ſhows, that even the beſt vegetable mould, if buried for any length of time ſo far beneath the ſurface as to be deprived of the benign influences of the atmoſphere, become an inert, lifeleſs maſs, little fitted for nouriſhing vegetables; and conſtitutes a ſoil very improper for the purpoſes of the farmer. It therefore behoves him, to preſerve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermoſt, and rendered fertile by the meliorating influence of the atmoſphere. But, if he ſuddenly levels his high ridges by any mechanical contrivances, he of neceſſity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoveriſhes one part of his field, without rendering ſervice to the other; inſomuch, that it is a matter of great difficulty, for many years after, to get the field brought to an equal degree of fertility in different places; which makes it impoſſible to get an equal crop over the whole of his field by any management whatever. We have frequently ſeen fields that have been thus levelled, in which, after thirty years of continued culture and good management, the marks of the old ridges could be diſtinctly traced when the corn was growing, although the ſurface was ſo level that no traces of them could be perceived when the corn was off the ground.

With carefully caſting the furrow, high ridges may, in the courſe of ſix or ſeven years cultivation, be brought almoſt on a level and without a material injury, by impoveriſhing the top or convex point of the lands.

Large ragged ſtones are frequently a great impediment to the plough; oftentimes people plough ſhallow, purpoſely to keep clear of them, and by that means are precluded from the benefits which deeper tillage would produce.

Stones above the ſurface may be avoided by the ploughman, though not without loſs of ground; but ſtones below the ſurface are commonly not diſcovered till the plough be ſhattered to pieces, and perhaps a day's work loſt. The clearing land of ſtones is therefore neceſſary to prevent miſchief. And as the blowing, when gunpowder is furniſhed, does not exceed a halfpenny for each inch that is bored, theſe ſtones come generally cheaper than to dig as many out of the quarry, for repairing roads and other purpoſes. In the next place, as the ſoil round a large ſtone is commonly the beſt in the field, it is purchaſed at a low rate by taking out the ſtone. Nor is this a trifle; for not only is the ground loſt that is occupied by a large ſtone, but alſo a conſiderable ſpace round it, to which the plough has not acceſs without danger. A third advantage is greater than all the reſt; which is, that the ploughing can be carried on with much expedition, when there is no apprehenſion of ſtones: in ſtony land, the plough muſt proceed ſo ſlow, as not to perform half of its work.

To clear land of ſtones, is in many inſtances an undertaking too expenſive for a tenant, and requires the aſſiſtance of the proprietor.

In cleaning land from weeds, particularly couch graſs, ploughing is neceſſary as ſoon as harveſt is over, and another croſs ways before the ſeverities of winter commence; taking care to drain off water, it lying in this ſituation till ſpring, a heavy harrow or drag ſhould be drawn over the land to pull it to pieces; the weight of the implement and other circumſtances according to the ſtrength of the ſoil.

It is a prevailing practice in the weſtern and midland parts of this country to breaſt-plough the ſurface of ſtubbles, and let them lie in that condition during the winter, this certainly anſwers a good purpoſe, as what was pared off becomes rotten, and mixes with the ſoil when the land is ploughed for oats or peas in ſpring. The expence attending this paring, or breaſt-ploughing, is generally about five ſhillings per acre; was a good horſe-plough uſed for the purpoſe, it would not be half ſo much; we know of no plough ſo well adapted for the purpoſe as one made by Mr. **WINLAW**, a deſcription and engraving, ſee under **IMPLEMENTS**.

The preſent altercation amongſt thoſe who mix philoſophy with ploughing and ſowing, reſpecting fallows, is in moſt reſpects ridiculous; no man in his ſenſes would wilfully ſuffer his land to be at reſt, and under expenſive ploughings and other management, if it was in condition to produce a crop. The antifallowiſts have entered their proteſt againſt the enriching influence of the ſolar rays, and declare that ſoil derives more fertility and vigour from being covered with ſucculent vegetables, than from the moſt judicious and beſt conducted ſummer fallow. If that is the caſe, why do thoſe who purſue the horſe-hoeing ſyſtem place ſuch confidence in ploughing between the rows of corn in ſummer, in lieu of manure? Moſt kinds of ſoil, if the ſpring happens to be dry may be cleaned before the proper time to ſow turnips arriving, or in time to plant late cabbage; this method renders fallowing for wheat unneceſſary, and the turnips or cabbages may be conſumed on paſture or arable, where they will be of great ſervice.

When land becomes full of couch graſs and other weeds, there is as much neceſſity for time and labour to clean it, as there is for water to waſh a garment when it is dirty: whether winter and ſpring ploughings will effect it, or a ſummer fallow is neceſſary, we muſt leave to the diſcretion of thoſe who pay the expences.

SECT. XXX.

SOWING, DRILLING, AND OTHER MEANS OF DEPOSITING SEED IN THE EARTH.

SOWING is the operation of diſtributing ſeed on the earth, from a veſſel or meaſure of a diſtorted oval conſtruction, adapted in ſhape to the ſide of the ſower, and called a ſeed lap, or ſeed lip, which in all probability owes its derivation to the ancient method of carrying the ſeed in an apron, or a lappet of the ſowers garment. The general practice is to deliver each caſt of ſeed from the hand of the ſower, at the time he advances his left leg; as in the action of walking, and to proportion the diſtance he ſteps, and the quantity of ſeed he throws each time, to the width of the land he is ſeeding.

This is the mode called broadcaſt; the ſeedſman going twice over the ſame ground; thoſe that are dexterous, ſow both right hand and left, which is a practice very convenient, and to be recommended to every young perſon's notice, as it is acquired with eaſe, if practiced early in life. On ſtubbles and fallows, when they are in a mellow, friable condition, all kinds of grain ſhould be ſowed under furrow, that is, before the land is ploughed, and ſo turned in with the furrow: it is a practice very cuſtomary to ſow one caſt before ploughing, and another after; but we cannot think it eligible, as the advantage, if any, muſt belong to one mode independent of the other, conſequently none can derive from uſing both. On land freſh broke up from graſs, and commonly called a ley, corn is generally ſowed after ploughing and harrowed in, except beans or peas which are not eaſily buried, and for that reaſon commonly ſowed under furrow. The quantity of ſeed neceſſary to ſow an acre of land, is generally more or leſs, according to the quality of the ſoil; the richer the ſoil the leſs ſeed, and the poorer the greater the quantity.

This is a maxim generally attended to, and by multitudes invariably purſued, but certainly liable to exceptions, if not totally founded in error.

No perſon ſhould invariably adhere to preſcribed rules, but deviate by making ſmall experiments and taking notice of the reſult, this only can correct error and lay a good foundation for improvements.

Thomas Le Blanc, Eſq. of Caveſham, in Suffolk, relates the following experiments in Mr. Young's Annals, Vol. I. p. 111.

EXPERIMENTS ON THE SEEDING OF SAND LAND.

1. ON one acre of poor Sand, worth about 3s. 6d. an acre, were ſown two buſhels of barley.

2. On the next adjoining acre three buſhels.

3. On the next four buſhels.

The reſult was, that the crop was beſt from two buſhels; next beſt from three; and the worſt from four.

The experiment was afterwards repeated on Sand, worth 7s. an acre, in which two buſhels produced 4½ quarters.

Three buſhels produced four quarters two buſhels, and

Four buſhels produced three quarters ſeven buſhels.

It is the obſervation of the farmers in the neighbourhood on the ſame Land, that where the chalk lies very near the ſurface, there the quantity of Seed muſt be increaſed.

As we have given theſe intereſting experiments on a poor ſandy ſoil, the following we think equally ſo on a **Cold Clay**. Annals, Vol. VII. p. 28.

EXPERIMENTS ON THE QUANTITY OF SEED ON COLD CLAY LAND.

By Mr. **Solomon Norman**, of **Cleveland, Yorkshire**.

I Have been a ſeedſman many years; the firſt oats that I ſowed, broad-caſt, was at the rate of nine pecks per acre; my acres are 10 great chains, and Wincheſter buſhels, the produce 40 buſhels; this field contained nine acres, had been in tillage 24 years, in the Cleveland courſe of oats, fallow, and wheat. At the ſame time, or nearly, I ſowed eight acres, an adjoining field, that had been in tillage eight years, in the ſame courſe as the former, with three buſhels per acre, the produce but 40 buſhels; the ſtaple of the latter being much deeper, and freſher than the former field, and ought to have produced double the former field. I am ſenſible, there is not a more pernicious practice than loading poor ſoils with too much ſeed; the nine acres, three years before, was ſown with three buſhels per acre, the produce only two quarters; as to the quantity of ſtraw, I could carry the produce of an acre on my back. I ſhould at once condemn ſix or ſeven buſhels, ſo large a quantity, mentioned in your tours, as would deſtroy our clay ſoils; their height would not exceed 10 or 12 inches, and be as light as chaff, their produce, perhaps, the ſeed again.

In 1785, ſowed 10 pecks per acre in April; at May-day, ſowed clover-ſeed on four acres, on two of which, I harrowed in the ſeed; the oats were in fine leaf, they were torn up a ſhame to be ſeen, and laid upon the ground thick. The other two acres, I bruſhed over, by putting a buſh of thorns into the harrows, which did not hurt the oats. The produce was, two acres harrowed, ſuperior to any four acres in the field, which contained 12 acres in all; ſome parts of this field was rank with wild oats, ſuch places did not exceed one foot high, and were as light as chaff, their ſtalks produced no more than a corn or two. I always increaſe the quantity of ſeed oats, on rich ſoils, in order to keep them from running too much into ſtraw, which is generally the caſe on rich land; otherwiſe to ſmother the weeds, for ſuch land will grow ſomething. I likewiſe find two buſhels of barley a ſufficient quantity on Clay Land, that is free from weeds.

"I have frequently ſown two buſhels of wheat on one acre, and two buſhels and a half on another, in order to compare the difference on cold-bottomed Clay Land, but found no difference. If two buſhels, broad-caſt, will not produce a good crop, there is no forcing the land with too much ſeed. As to ſteeps for wheat, they are of no ſervice at all. My mode of pickling wheat ſeed, is to ſprinkle urine, otherwiſe clean water, on the heap until thoroughly wet, then ſprinkle quick lime over it till thoroughly covered and white as duſt, then it is fit for ſowing. I recommend lime; but as to ſteeps, there is no health in them, the crops will be juſt as large a quantity without them.

"As to beans, we uſually ſow four buſhels per acre on Cold Clays; and the produce in general, is not one half ſo much as in Eſſex, where they ſow two buſhels per acre, and hoe one half of them up.

"In ſhort, I am an advocate againſt too much ſeed."

When the land is in proper condition to receive Seed, is an object of the firſt importance; to ſow dry and ſet wet, is proverbial; but as the huſbandman cannot influence the weather, nor always have ſuch as meets his wiſhes and convenience, he muſt be careful to let no favourable opportunity paſs.

When ſoil is eaſily pulverized, it is then beſt adapted to cover the Seed; ſeize this opportunity, and patiently leave the reſt to providence and nature.

DRILLING.

Drilling is the operation of depoſiting Seed in the earth in rows parallel to each other at any given diſtance, or at any depth beneath the ſurface; this may be effected by manual labour, but the proceſs is ſo tedious and expenſive, that the advantages gained by this ſuperior method do not yield an equivalent compenſation for time and labour. To remove this obſtacle, various machines have been conſtructed to facilitate the operation, and to render this valuable branch of Agriculture as profitable in practice, as it is rational in theory. The great inconveniencies attending implements for Drilling ſeeds have been the complexity of their conſtruction, and the difficulty of keeping them in repair, as the force with which a horſe moves a machine, is certain to derange ſome part or other of the work if it meets roots, large rag ſtones, or other powerful obſtructions, which occaſions diſappointment and loſs of time; very diſagreeable circumſtances to a farmer in the time of ſeeding. To obviate thoſe impediments a Drill machine ſhould poſſeſs ſimplicity of deſign, and ſtrength in its conſtruction, a regular delivery of the ſeed according to the quickneſs or ſpeed with which it is drawn; and ſo contrived as the ſeed may be ſtopped or let run in a moment, at the pleaſure and convenience of the perſon who attends it: and laſtly, the price of the Drill ſhould be ſuch as to render it within the purchaſe of thoſe who follow Agriculture from neceſſity. Without a combination of thoſe eſſential qualifications Drilling will never become general; and with them, we make not the leaſt doubt, no perſon will neglect the practice, whoſe ſoil is adapted to that mode of cultivation. This method of depoſiting ſeed is moſt certainly attended with many great advantages, when practiſed with diſcretion; and when hoeing is neglected, is the worſt management that can be purſued. Many have been kept from Drilling by the great expence of hoeing; an objection now we hope removed, by the Rev. Mr. Cooke's new conſtructed Horſe-hoe, which being an appendage to, and conſtituting part of the Drill, makes the practice cheap and expeditious.

We have attentively examined ſeveral Drill machines, and likewiſe have attended to the report of others from verbal accounts, and likewiſe written teſtimonials, and without heſitation acknowledge that the *Drill Machine, invented and made* by the Rev. Mr. **Cooke**, is, in its preſent plain and ſimple conſtruction, an implement which ſeems to render further improvement unneceſſary; this we are further warranted in aſſerting by letters received from two gentlemen of extenſive experience, who on reading our Syſtem wrote to the publiſher—theſe letters are annexed to the deſcription of the machine. We could not avoid making this declaration, thinking it our duty to the public, to exhibit merit to view wherever we find it. We ſhall alſo give deſcriptions and repreſentations of every other Drill machine worthy of notice.

When a perſon is in poſſeſſion of a Drill which will anſwer every purpoſe he could wiſh, it is not to be ſuppoſed every other mode of ſeeding is to be exploded; rather let him conſider the ſituation the land is in, and other obvious circumſtances, and judiciouſly follow that method which appears moſt eligible; this deliberate conduct will ſeldom diſappoint the expectation, and will make thoſe difficulties attendant on novelty, eaſy and familiar.

SETTING OR DIBBLING.

This method of planting grain we have every reaſon to believe lays claim to the greateſt antiquity, and is on ſtiff loams or clay greatly practiced at the preſent time; the mode of performing it, is with a ſtick about a foot long in one hand to make the hole, and immediately drop in the ſeed with the other, which ſhould be carried in a bag or apron, tied round the waiſt for that purpoſe. One particular advantage attend ſetting grain, it may be performed in rainy weather when other means cannot. As we were under the neceſſity of noticing this method under the article Wheat, Beans, &c. it will be uſeleſs to take further notice of it here.

The following ideas on Drilling, Hoeing, and other matters relative to this mode of huſbandry, which were never before publiſhed, were communicated to us by the Rev. Mr. **Cooke**, to whom we have been previouſly indebted for the account of the *Chicorie Sauvage*. As this gentleman's abilities and experience render him ſo well qualified to enlighten the uſeful Art of Agriculture, we ſhall lay his information before our readers without further preface.

AGRICULTURE.

OBSERVATIONS ON PRACTICAL DRILLING AND HORSE-HOEING.

By the Rev. James Cooke.

" FROM the extraordinary ſucceſs which has attended a proper uſe of the ſyſtem of drilling and hoeing in general, individuals, in hopes of equal ſucceſs, have been induced to adopt the ſyſtem, under ſuch abſurd practices as could only ſerve to bring it into diſrepute, not only by uſing the drill upon land ſhamefully exhauſted, and otherwiſe ſo foul and out of condition, as to afford no hopes of ſucceſs whatever, but alſo by neglecting the uſe of the hoe entirely.

" To thoſe who wiſh to adopt the drill ſyſtem with ſucceſs, it is ſtrongly recommended never to let two exhauſting crops together, but an exhauſting and an ameliorating one alternately. Wheat, rye, barley and oats are called exhauſting crops; beans, peaſe, vetches, turnips, cabbage, potatoes, and all kinds of artificial graſſes, are called ameliorating ones. It would be abſurd to ſuppoſe that one particular rotation of crops, ſelected from the above, ſhould be invariably adapted to all ſoils. It muſt remain with the cultivator to diſcover whether a better proceſs can be found out, than a bean fallow, &c. as a preparation for wheat upon ſtrong clays, and a turnip fallow, &c. as a preparation for barley upon light ſoils; and whether one or the other may be better adapted to the cultivation of wet or dry, light or ſtrong loams, as times, ſeaſons, and circumſtances may point out.

" The following hint for obtaining four valuable crops in two years, from the ſame land, is ſubmitted to the conſideration of active cultivators of ſtrong productive ſoils, to make the experiment, by drilling beans in rows at two feet apart, the land being previouſly manured and properly cultivated. In the month of June the ſpaces between the rows of beans being perfectly cleared from weeds, and the ſoil pulverized by repeated horſe-hoeing, two rows of turnip ſeed may be drilled in each ſpace at twelve inches apart, by the above drill machine, particularly as the direction of the coulters is now ſo readily influenced; or if the crop of beans ſhould be too high to admit of the uſe of the machine for drilling the turnip ſeed as above, a ſmall hand drill may be made and uſed for the purpoſe. When the beans are drawn and carried, the land will be ſtocked with a young crop of turnips in rows at twelve inches apart, which will admit of the uſe of the horſe-hoe, in clearing the ſpaces between the rows of turnips from weeds, &c. In the middle of theſe ſpaces wheat may be drilled in October, or any other period previous to the turnip crop being ſo luxuriant as to exclude the proceſs. In the ſpring the turnips and young crop of wheat may be fed off together by ſheep, or the turnips may be drawn; by which means the turnip crop will be extirpated, but the young plants of wheat will remain, to go on for a crop, in drills or rows at twelve inches apart, which will admit of horſe or hand hoeing as in other inſtances: at the laſt hoeing of this crop of wheat, turnip ſeed, rape, or cole, &c. may be diſtributed in the intervals, which will afford great plenty of food for ſheep or cattle in the winter. This proceſs of obtaining four crops in two years has but lately occurred to me; it will ſpeedily be put in practice, and in the hands of activity and induſtry I have no doubt of its ſucceſs ſuperior, perhaps, to any other rotation of crops heretofore adopted.

" Practical as well as ſcientific agriculturiſts in the drill ſyſtem have differed, and ſtill differ, in their opinions reſpecting the moſt advantageous diſtance at which grain ſhould be depoſited in rows or drills. If it is in my power to throw any light upon this undetermined point, I ſhall eſteem the attention I have paid to the circumſtances not altogether uſeleſs.

" In the year 1784, I made an experiment in order to aſcertain the moſt advantageous diſtance for drilling, by depoſiting wheat in rows at different diſtances of from 4 to 24 inches apart, varying 2 inches each diſtance; ſo that the progreſſive order of the different diſtances ſtood 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 inches. During the growth of the experiment, the ſpaces between the rows were all hoed at ſeaſonable times, as well as the reſpective diſtances would admit of. At harveſt the rows were ſeparately reaped, when it appeared that the produce from the rows No. 10 and 12 were nearly equal, but ſuperior to any of the others. As I intended to make the public acquainted with the reſult of this experiment, I was very particular in ſtating the exact produce of each reſpective row, but the paper is now loſt or miſlaid, on which account I am induced to ſubmit to the conſideration of the curious a mathematical plan for aſcertaining the moſt approved diſtance for drilling and hoeing, in hopes of exciting a number of practical drillers to make experiments, in order to aſcertain upon different ſoils, the moſt advantageous diſtance.

" It is univerſally allowed by ſcientific and incontrovertibly proved by multitudes of practical drillers, that their crops have been conſiderably improved, by the ſoil being thrown up to the rows of corn, ſo as to cauſe fibres to iſſue from the firſt joints of the ſtems above the ſurface of the land, which, without much accumulation of the ſoil to the plants, would never have exiſted.

" This premiſed, it appears reaſonable to diſcard drilling at every diſtance which will not admit of the ſoil being earthed up to the plants as above; which happens to be the caſe with drills at every diſtance under 10 inches apart, ſuppoſing the firſt joints of the ſtems to be formed two inches above the ſurface of the land, and the depth of the hoeing to be performed two inches under the ſurface.

" Where it is ſelf-evident that half the quantity of ſoil diſplaced by the hoe, and contained in the triangle DEF, *pl.* I. *fig* 1. will be required to fill the triangle GHI, ſo as to reach the firſt joints of the ſtems C above the ſurface of the land; but ſoil in a dry, pulverized ſtate as it ought to be when it is earthed up by the hoe to the rows of corn, will not reſt or remain ſtationary at an angle greater than 45 degrees, or the inclination G F. Therefore, in order that fibres may be encouraged to iſſue from the firſt joints of the ſtems above the ſurface of the land by means of the ſoil being diſplaced by the hoe, and earthed up to the ſaid joints C: the ſpaces between the rows of corn muſt be ſuch that the triangle DEF and GHI will be equal, as in fact they will be when the ſpaces between the rows of corn are 10 inches apart.

" On the other hand, if the ſpaces between the rows of corn are leſs than 10 inches, ſay 7 inches wide, *fig*. 2, and I here allude to the diſtance of 7 inches for Mr. Winter's ſerious and candid conſideration, ſince he avers it to be the moſt advantageous diſtance: in which caſe, if fibres muſt be encouraged to iſſue from the firſt joints of the ſtems C, above the ſurface of the land, a column of ſoil equal to the triangle GHI will be required to earth up the plants to the ſaid joints C; but as the triangle GHI exceeds the triangle DEF, ſo will be the deficiency of ſoil required for earthing up the plants to the joints C, at leaſt it will not reach the joints C; in which caſe the idea of cauſing fibres to iſſue from the ſaid joints C, by means of the ſoil, of the ſpaces drills at 7 inches apart, being earthed up, as above, is manifeſtly abſurd.

" Individuals have wounded the reputation of the Drill ſyſtem materially, and retarded its progreſs, by attempting to introduce it upon their lands, with an eye to the circumſtance of Drilling only, for ſucceſs, without paying the leaſt attention whatever to the circumſtance of hoeing; whereas nothing could be more abſurd.

" When the hoe is conſidered as the immediate and moſt eſſential cauſe of ſucceſs in Drilling, and the machine as an accommodation to the hoe, the extraordinary ſucceſs which has attended a proper and ſeaſonable uſe of both in numberleſs inſtances, will ceaſe to appear any longer myſterious to thoſe who have made an improper uſe of the Drill, and totally neglected the uſe of the Hoe.

" If weeds are ſuffered to grow all over the ſpaces between Drills at 12 inches apart, the chance of their choking the corn will be in their favour, nearly as 11 to 1; whereas, if the weeds are all cut up in their infancies, by the Hoe, the triumphant ſtate of the crop over weeds will then be as 12 to 0.

" Wheat and rye cannot be hoed too early in the ſpring, provided the ſoil is dry enough to admit of being previouſly rolled. Nothing facilitates and expedites Hoeing ſo much as rolling, by pulverizing the ſoil, and levelling the ſurface; but ought by no means to be done, when the ſoil is not dry enough to quit the roller.

" The wings, or molding plates of the Hoe, which are calculated to earth up the ſoil to the rows of corn, ſo as to cauſe roots to iſſue from the firſt joints of the ſtems above the ſurface, which otherwiſe would not have exiſted, ſhould never be uſed for the firſt hoeing; ought always to be uſed for the laſt hoeing, except when land is to lie down with ſeeds; and uſed or not uſed, at the option of the farmer, when any intermediate hoeing is performed.

" The laſt Hoeing, or earthing up, ſhould not take place till the crop is eight or ten inches high, or till the young ears of corn are ſo far advanced in the ſtems, as to be above the ſurface of the ſoil, when the earthing up is finiſhed. The young ears of corn will, on diſſecting a few ſtems, be found to exiſt (in embryo as it were) much ſooner than is generally apprehended.

" The abſurdity of rolling any crop after the young ears are formed, and of earthing up the ſoil before they are advanced in the ſtems above the ſurface of the ſoil, muſt be ſelf-evident. In the former inſtance they will be cruſhed by the roller; in the latter they will be ſmothered by the ſoil. The young ears of corn will be found to exiſt, as ſoon as the ſecondary or coronal roots are formed.

" The above obſervations on Hoeing wheat and rye, are applicable to the Hoeing of ſpring-crops; only the firſt Hoeing of barley, oats, &c. ſhould take place as ſoon as the ſecond blade or leaf of the young ſtem appears. And of beans, peaſe, &c. as ſoon as the plants may be diſtinguiſhed in the rows.

" The beſt ſeaſon for Hoeing, is two or three days after rain, or ſo ſoon after rain as the ſoil will quit the inſtrument in Hoeing. Light dry ſoils may be hoed almoſt any time; but this is far from being the caſe with ſtrong clay ſoils. The ſeaſon for Hoeing ſuch is frequently very ſhort and precarious; every opportunity, therefore, ſhould be attentively watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in ſtrong clay ſoils; the bad effects of the former, though difficult to guard againſt, are nevertheleſs to be remedied, in ſome meaſure, by ploughs of a better conſtruction, and more properly conducted, than ſuch as are commonly met with in moſt ſtrong ſoils. For if the wing or feather of one plough-ſhare was made nearly as wide as the intended furrow, and fixed ſo as to work parallel to the ſurface of the land, the underſide of every furrow would be cut parallel to the ſurface; and a ſmooth under-floor, poliſhed by the bottom of the plough, would be found beneath every furrow, forming a regular plain, with an uniform deſcent from the top of the ridge into the water furrows; upon which poliſhed floor, all ſuperfluous water, after filterating through the looſe ſoil, or furrows turned over by the plough, would readily find its way in the water-furrow, which would prevent its ſtagnating in the ſoil, at leaſt ſo as to ſtarve the plants. But ſo far from guarding as much as poſſible againſt the ill effects of ſuperfluous water thus ſtagnating in clay ſoils, the conſtruction of the ploughs, commonly made uſe of in ſtrong clays, and the method of conducting them in many parts of this kingdom, have a direct tendency to the contrary; this is done by working their ploughs in ſuch a poſition, that the wing or feather of the ſhare, being neither ſo wide as the intended furrow, nor parallel to the ſurface when at work, but forming an angle of forty or fifty degrees with the ſurface; or in other words, moving in an oblique direction to the ſame, turns over, not a ſquare or parallel, but a triangular furrow: in which caſe it is ſelf-evident, that ſuch lands are only half ploughed; that there will be ſo many ridges of faſt undiſturbed ſoil, as there are furrows, forming ſo many troughs or trenches; and that of all the ſuperfluous water that ſhall fall upon ſuch lands, ſo much only as ſhall remain over and above filling the trenches, will be able to find its way into the water furrows; for ſome clay ſoils, indeed all ſoils when puddled, will hold water, conſequently ſo much water as the above trenches ſhall contain, will remain there, till it is evaporated by ſun and air, ſtarving the plants, and puddling the ſoil to ſuch a degree, that the nutritive quality in the food of plants becomes ſo far impaired, as not to be reſtored; or if it ſhould, the tender fibres of the roots of plants may be turned to putrefaction, ſo as to be incapable ever after of anſwering their intended purpoſe in promoting vegetation.

"As to the bad effects of ſtrong clay ſoils caking in dry weather, nothing is more eaſy to prevent; for there is a period, between the time that clay ſoils run together, ſo as to puddle, by ſuperfluous wet, and the time of their caking upon the ſurface, that they are as tractabe as need be; now this is the period, this is the juncture for hoeing; and ſo much land as ſhall be thus ſeaſonably hoed, will not cake or cruſt upon the ſurface, as it otherwiſe would have done, till it has been ſoaked, or drenched again with rain; in which caſe the Hoeing is to be repeated, as ſoon as the ſoil will quit the inſtrument, and as often as neceſſary; by which time the crop will begin to cover the ground, ſo as to act as a ſcreen to the ſurface of the land, againſt the intenſe heat of the ſun, and thereby prevent, in a great meaſure, all the bad effects of the ſoil's caking in dry weather.

"When land is to be laid down with ſeeds, the ſeeds muſt not be ſown as uſual when the grain is ſown, but the day the laſt Hoeing is to be performed. If ſeeds are ſown when barley is ſown, Hoeing is excluded, conſequently the great advantages of Drilling are loſt; but not being ſown till the laſt Hoeing is juſt going to take place, every purpoſe is anſwered. For the crop is not only improved by Hoeing, but the ſoil in the ſpaces between the rows of corn, being cleared from the weeds, and pulverized by Hoeing, will be in much better condition to receive the ſeeds; and the ſeeds being ſown broadcaſt juſt before the laſt Hoeing, will be incorporated with the ſoil by the action of the hoe, ſo as to vegetate better, and produce a much ſuperior crop. A ſmall and ſimple apparatus being added to the machine, graſs ſeeds may be depoſited in the ſame Drills with the barley, and at the ſame time; alſo in the ſpaces between the rows of corn, at the laſt Hoeing.

"Such ſtrong weeds as may grow in the rows of corn, and out of the reach of the Hoe to cut up, ſhould be plucked up by hand, to prevent their coming to maturity, and dropping their ſeeds upon the ſoil, that has been previouſly made clean by Hoeing.

"It is here obſerved, that where this method of ſowing graſs-ſeeds before the laſt Hoeing is intended to be put in practice, the crop (which is generally barley) ſhould be ſown early, at leaſt within the month of March, or by the middle of April, that the graſs-ſeeds may have time to vegetate before the hot weather commences, otherwiſe they may be burnt up by the intenſe heat of the ſun, as they ſpring out of the ground; which has been the caſe in a few inſtances, where the barley was not ſown before the month of May: and the cauſe of a failure in graſs ſeeds has been very erroneouſly attributed to the above proceſs of ſowing them before the laſt Hoeing: whereas the true cauſe of the failure has ariſen from ſowing the barley crop too late, and thereby poſtponing the ſowing of the graſs-ſeeds at the laſt hoeing ſo long, that the intenſe heat of the ſun has burnt them up as they have vegetated.

"Where a crop from the graſs-ſeed is of the utmoſt conſequence to a farmer; and the barley cannot poſſibly be ſown early enough to admit of the graſs-ſeeds being ſown at the laſt hoeing; it is recommended to ſow the graſs-ſeeds as in the uſual way, when the barley is ſown, and forego the advantages of hoeing. In this inſtance it may be aſked, Wherein conſiſt the advantages of drilling, if hoeing is excluded.

"In this caſe the advantages of drilling will conſiſt in ſaving more than half the ſeed, and producing a crop ſuperior to broadcaſt or hand ſowing, though not ſo great as if hoeing had taken place.

"To inſure ſucceſs in Drilling it is of the greateſt conſequence that land be reduced to a proper ſtate of cultivation previous to the time the proceſs of Drilling takes place; in which caſe, a crop equal to the production of the ſoil may reaſonably be expected, provided the buſineſs of Hoeing is properly attended to, and ſeaſonably performed.

"In ten days or a fortnight, more or leſs, after ſpring corn is ſown, the tillering or multiplying of the additional ſtems or offſets will commence, the number of theſe additional ſtems or offſets will uniformly be in proportion to the quantity of pabulum or food of plants contained in the ſoil at the time the above tilluring of the ſtems commences; and the net produce of any given crop will generally be in proportion to the number of ſtems ſo tillured; conſequently, in order to obtain the beſt crop of corn, which any given land is capable of producing, it is eſſentially neceſſary, that the ſoil ſhould be in the beſt ſtate of cultivation, of which it is capable, at the time the grain or ſeed is depoſited in the land.

"On the contrary, if grain or ſeed is ſown when the ſoil is out of condition, i. e. not properly pulverized and ameliorated for the reception of the ſeed, which frequently happens when the ſowing of the ſeed takes place immediately after the plough, on a freſh, waxy furrow; in which caſe, if a dry ſeaſon ſhould ſet in, the greateſt part of the pabulum or food of plants, will, during the dry ſeaſon, be ſet faſt and locked up in the dry hard clods: the tilluring will nevertheleſs begin to take place at the uſual time, viz. in ten days or a fortnight after the ſeed is ſown, without waiting for ſo much of the pabulum or food of plants, as was ſet faſt in the dry clods, being ſet at liberty to aſſiſt vegetation, and will conſiſt of ſo many ſtems or offſets, as the pabulum or food of plants, contained in the looſe pulverized ſoil only, ſhall be able to ſupport and bring to maturity. Afterwards, when rain comes, and ſets at liberty ſo much of the pabulum or food of plants as was locked up in the dry clods when the above tilluring was performed, there will be a ſurplus of pabulum to ſpare, over and above what was neceſſary to bring to maturity the number of ſtems tillured as above; this additional pabulum will prompt an additional number of ſtems at an unſeaſonable time, which ſo far from adding to the crop at large, will amount to a conſiderable drawback upon it; this is eaſily obviated, and many advantages derived, by ploughing up all ſtrong ſoils, intended for cropping before Chriſtmas, or as ſoon after as may be, in order to have the benefit of froſt and ſnow, which will, by pulverizing and ameliorating the ſoil, prepare it for the reception of the ſeed, much better than all the ploughing and harrowing in the world can poſſibly do, at, or juſt before, the time of ſowing grain or ſeed.

"It is well known, that all ſoils, and eſpecially ſtrong wet ſoils, are pulverized and ameliorated by froſt. If the cauſe of theſe effects were as well underſtood, as the effects themſelves are viſible, one would think there could not be found a ſingle cultivator of land who would not gladly avail himſelf of the means of his land being thus pulverized and ameliorated, without the labour of men and horſes, or any other expence but that of ploughing up his land before winter.

"It is not by reaſon of the effects which froſt has upon the ſoil, (for upon a dry ſoil froſt has no power at all) but upon the water contained in the ſoil, that the ſoil becomes pulverized and ameliorated. It is very eaſy to conceive, a given quantity of water, contained in a given quantity of ſoil, to be divided into an almoſt infinite number of globules or particles, each capable of being conſiderably enlarged and expanded by froſt. But before one of theſe particles of water can become conſiderably expanded and enlarged by froſt, ſo as to occupy a larger ſpace in its congealed ſtate than it occupied in its watry ſtate; the texture of the particles of ſoil contiguous to, and ſurrounding the ſaid particle of congealed water, muſt be torn to pieces in giving way to the enlarged particle of congealed water.

"In like manner, the whole given quantity of water, contained in any given quantity of ſoil, by being enlarged and expanded by froſt, will break and tear to pieces the texture of the whole ſoil, in yielding to the ſuperior force of the congealed water, as it expanded; by which means the ſoil, by being thus torn to pieces, will not only become pulverized and ameliorated; but in proportion as the pores are thereby opened, ſo will be the quantity of pabulum, or food of plants, imbibed from the atmoſphere.

"From whence it may be juſtly and truly ſaid, that if land is only ploughed before winter, it will become more or leſs tilled and manured without labour or expence, ready for the reception of ſeed in the ſpring.

"For the above reaſons I apprehend it is, that ſeveral of my

BRITISH 18 MR 63 MUSEUM

New Invented Patent Drill Machines.

See System of Agriculture.

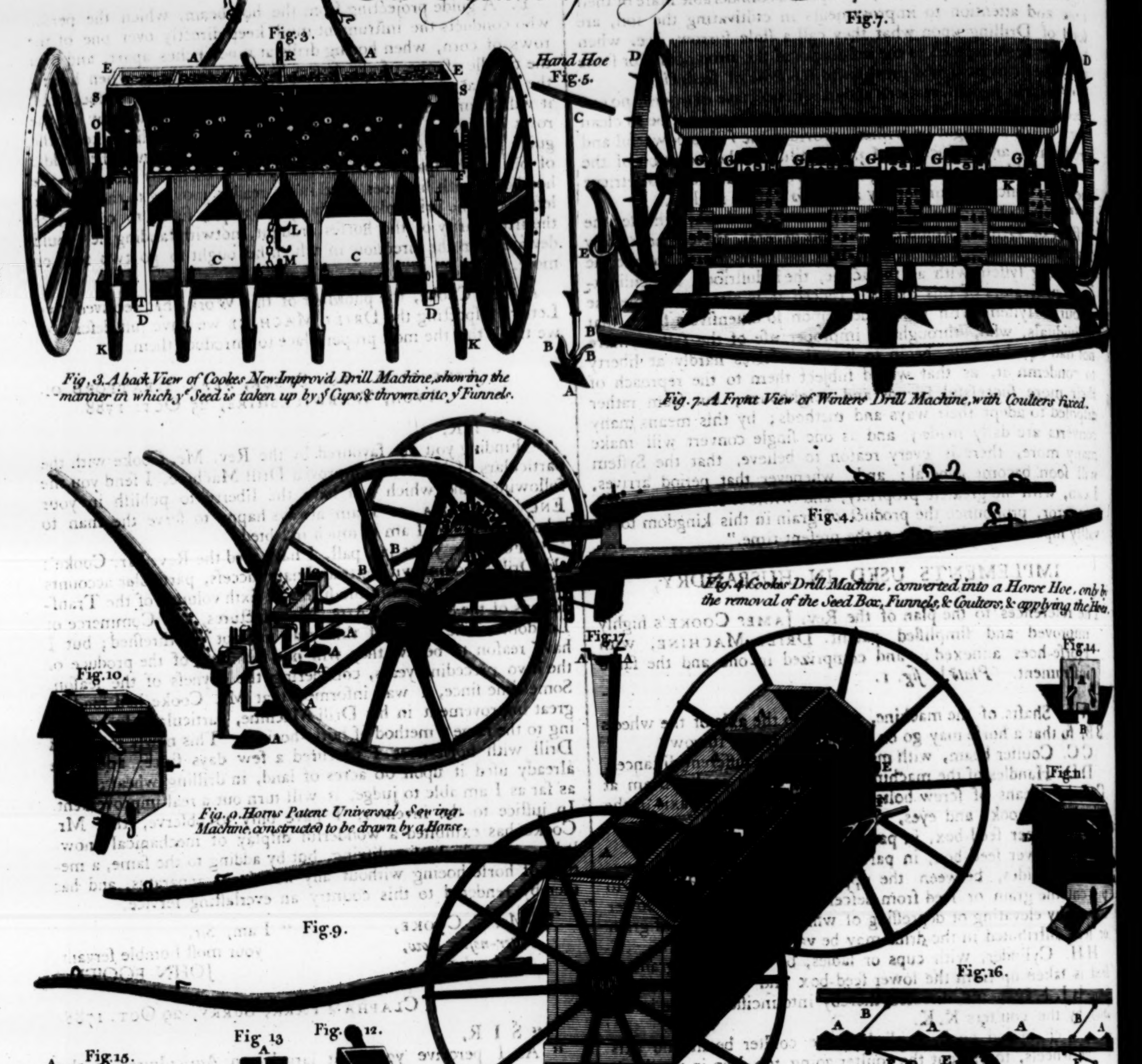
Fig.3.
A
R
A
E
E
S
S
O
C
C
L
M
D
K
K
Hand Hoe
Fig.5.
C
E
B
B
A
Fig.7.
D
D
G
G
G
G
K
Fig.4.
B
B
A
A
A
Fig.10.
Fig.11.
Fig.14.
Fig.9.
Fig.16.
A
B
A
A
E
F
C
Fig.15.
A
B
C
Fig.13.
Fig.12.
H
F
E
B
D
Fig.8.
Fig.1.
Fig.1.
Fig.2.
Fig.2.
Drill of Ten Inches wide.
Drill of Seven Inches wide.
Angle of 45 Degrees
Surface of the Land
H
I
E
D
F

Fig. 3. A back View of Cookes New Improv'd Drill Machine, showing the manner in which ye Seed is taken up by ye Cups, & thrown into ye Funnels.

Fig. 7. A Front View of Winters Drill Machine, with Coulters fixed.

Fig. 4. Cookes Drill Machine, converted into a Horse Hoe, only by the removal of the Seed Box, Funnels, & Coulters, & applying the Hoe.

Fig. 9. Horns Patent Universal Sowing Machine, constructed to be drawn by a Horse.

Fig. 8. Horn of Dovers Patent Universal Sowing or Drill Machine fixed to a Kentish turn rest Plough.

Fig. 1. Mathematical Rule, for ascertaining on demonstrative principles, the only correct distance for drilling. By the Rev.d James Cooke.

Fig. 2. Mathematical Definition by the Rev.d J. Cooke, proveing the erroneous method, recommended by Mr. Winter of drilling at the distance of 7 Inches only.

Milne del.

Published as the Act directs by C. Cooke, No. 17, Paternoster Row, April 3d. 1789.

Agricultural Correſpondents, who ſpend a conſiderable ſhare of their time and attention to improvements in cultivating the ſoil, are fond of Drilling upon what they call a ſtale furrow, i. e. when land has been expoſed to the influences of the atmoſphere for ſome time after it is ploughed previous to the time of ſeedneſs.

"As far as my obſervations and experience have extended, no one need fear drilling a piece of land, though it ſhould not be ſo clean from weeds as might be wiſhed, provided the ſoil is powerful and productive, and reduced to a proper tilth for the reception of the ſeed, it will be in vain, during the growth of that crop, to retrieve the loſs, which will uniformly attend ſo groſs a neglect.

"However doubtful it might be a few years back, whether the Syſtem of Drilling would ever become general, there is now every reaſon to believe, that it will, in a few years more, become the prevailing ſyſtem with all the active, the induſtrious, and enlightened cultivators of this iſland. Indeed it is already become the favourite ſyſtem with multitudes, upon ſo extenſive a ſcale, that individuals, who, through an improper uſe of the ſyſtem, have not had equal ſucceſs, begin to find themſelves hardly at liberty to condemn it, as that would ſubject them to the reproach of their more ſucceſsful friends and neighbours; but ſeem rather diſpoſed to adopt their ways and methods; by this means many converts are daily made; and as one ſingle convert will make many more, there is every reaſon to believe, that the Syſtem will ſoon become general: and, whenever that period arrives, I can, with the greateſt propriety, and without fear of running into error, pronounce the product of grain in this kingdom to be vaſtly ſuperior to what it is at the preſent time."

IMPLEMENTS USED IN HUSBANDRY.

The references to the plan of the Rev. James Cooke's highly improved and ſimplified patent Drill Machine, with Horſe-hoes annexed; and comprized in one and the ſame inſtrument. *Plate* I. *fig.* 1.

A A. Shafts of the machine, applied to the axis of the wheels BB, ſo that a horſe may go on the land or in the furrow.

C C. Coulter beam, with mortices in it, at different diſtances.

D D. Handles of the machine, applied to the coulter beam at CC, by means of ſcrew bolts and nuts; alſo to the axis of the wheels, by hooks and eyes, or ſtaples.

E E. Upper ſeed-box, in partitions.

F F. Lower ſeed-box, in partitions.

G, G. Slides, between the upper and lower ſeed-boxes, to prevent the grain or ſeed from deſcending too faſt into the lower boxes; by elevating or depreſſing of which, the quantity of grain or ſeed diſtributed in the drills may be varied at pleaſure.

H H. Cylinder, with cups or ladles, by which the grain or ſeed is taken up from the lower ſeed-box and dropped into the funnels I, I, I, I, and directed thereby into inciſions made in the land by the coulters K, K.

I. A chain and hook, applied to the coulter beam and axis of the wheels, to prevent the coulter going too deep in the land, and to prevent the coulter beam dropping ſo low as to unſhip the upper funnels in croſſing deep furrows or gutters.

M. A pin of iron, projecting from the coulter beam, which being lifted on to the hook L at the end of the land, will bear the coulter out of the ground, while the machine is turning round, without any labour of the man, who attends the machine, in ſupporting the ſame.

N. A cog wheel upon the nave of the wheel B.

O. A cog wheel upon the gudgeon or axis of the cylinder H, which is turned by the wheel N.

P. Lever and ſtring, paſſing over a pully to the axis of the cylinder H; by moving the lever P to a notch in the ſtaple Q, the wheel O will be lifted out of generation with the wheel N, by which means the diſtribution of the grain or ſeed may be ſtopped at pleaſure, particularly at the head land, while the machine is turning round.

R. An iron bar with holes in it, applied to the croſs bar of the ſhafts by a ſtaple, and to the front edge of the ſeed-box. By means of this box, the ſeed-box may be elevated or depreſſed, ſo as to keep the top of the ſame horizontally level, whether going up or down ſteep hills.

S, S. Staples in the ends of the ſeed-box, for the reception of two ſlides of wood, with canvas applied to the ſame, alſo to a ſmall ſtaple in the end of the coulter beam, to prevent the wind from interrupting the grain or ſeed in its deſcent from the cups or ladles to the funnels or conductors I, I.

T, T. Hooks in the handles of the machine, to which weights may be applied to force the coulters, if neceſſary, into the ground.

Fig. 2, repreſents the ſhafts, the axis and wheels, the coulter beam, with handles applied to the ſame, as in *fig.* 1; and the ſaid Drill Machine is converted into a Horſe-hoe, only by taking away the ſeed-box E E, the cylinder H H, the funnels I, I, I, I, and the coulters K, K, as in *fig.* 1, and introducing the Hoes A, A, A, A, A, A, in the places of the coulters.

B. A guide projecting from the hoe beam, which the perſon who conducts the inſtrument muſt keep directly over one of the rows of corn, when hoeing drills at nine inches apart, and over the middle of one of the ſpaces between the drills when hoeing the ſame at twelve inches apart. And ſo long as he does this, it will be impoſſible to injure the crop, by cutting up any of the rows of corn. He will, with the greateſt facility, keep the guide B directly over one of the rows of corn, or over the middle of one of the ſpaces between the rows of corn, by means of the hoe beam with ſix hoes fixed in it, readily moving to the right or left upon the principles of the pentagraph, ſo as to counteract the irregularity of the horſes draught, notwithſtanding he ſhould deviate from the direction in which he ought to go two feet or more.

As Mr. Cooke, the publiſher of this Work, has received two Letters reſpecting the Drill Machine we have juſt deſcribed, we think this the moſt proper place to introduce them.

Atherston upon Stour, near Stratford on Avon, Warwickshire, 25 Oct. 1788.

"SIR,

"Finding you are favoured by the Rev. Mr. Cooke with the particulars of his newly improved Drill Machine, I ſend you the following, and which you have the liberty to publiſh in your Encyclopædia, as I am always happy to ſerve the man to whoſe inventions I am ſo much indebted.

"For three years laſt paſt, I have uſed the Rev. Mr. Cooke's old Drill Machine with extraordinary ſucceſs, particular accounts of which you will find in the fifth and ſixth volumes of the Tranſactions of the Society of Arts, Manufactures, and Commerce of London. The crops of this year are not yet threſhed; but I have reaſon to believe they will not fall ſhort of the produce of the two preceding years, conſidering the dryneſs of the ſeaſon. Some time ſince, I was informed that Mr. Cooke had made a great improvement in his Drill Machine, particularly by annexing to the ſame a method of horſe-hoeing. This newly improved Drill with horſe-hoes I procured a few days ſince, and have already uſed it upon 60 acres of land, in drilling wheat; and, as far as I am able to judge, it will turn out a real improvement. In juſtice to the inventor, I have only to obſerve, that Mr. Cooke has exhibited a wonderful diſplay of mechanical knowledge, not only by ſimplifying, but by adding to the ſame, a method of horſe-hoeing without any additional apparatus, and has thereby rendered to this country an everlaſting ſervice.

"I am, Sir,
your moſt humble ſervant,
JOHN BOOTE."

To Mr. C. Cooke,
Pater-noſter Row,
London.

Clapham Park, Surry, 29 Oct. 1788.

"SIR,

"As I perceive you treat largely on Agriculture, in the Dictionary of Arts and Sciences you are publiſhing, and being always happy in doing juſtice to merit, I chearfully avail myſelf of an opportunity to inform you, that I have ſucceſsfully uſed the Rev. Mr. Cooke's Drill Machine for two years paſt; I mean his firſt, for which he obtained his patent about four years ago, and has, I believe, ſold ſeveral hundreds of them; and which appeared to me ſo well adapted to the work for which it was intended, that I really had no idea there was a poſſibility of rendering it more uſeful and perfect.

"But juſtice to Mr. Cooke calls upon me to ſay, that I have this ſeaſon drilled ſeveral fields of wheat with his new improved Drill, for which I underſtand a new patent is granted, and find it manifeſtly improved in every reſpect; all its parts being under the eye of the ploughman, and their deſign and uſe evident to every huſbandman; and, by making a ſet of horſe-hoes part part of the whole, it is now become the moſt perfect inſtrument ever yet offered to the public; and to thoſe who know the ſuperiority of the drill huſbandry over the broad-caſt. As from experience I know the great advantages which attend the Drill Syſtem; from the ſame convincing evidence I find the Rev. Mr. Cooke's Drill Machine equally ſuperior to every other which I have ſeen or tried; and I aſſure you, I take every opportunity of informing myſelf as well by obſervation as experiment.

"I write in haſte, and have only time to add, that in the European Magazine for September laſt, page 214, you will find a letter I wrote to the Editor on that ſubject.

"I am, Sir,
your moſt humble ſervant,
CHRIS. BALDWIN."

Mr. Cooke,
Paternoſter-Row,
London.

On inſpecting the Tranſactions of the Society of Arts, referred to by Mr. Boote, we find a gold medal was, laſt year, adjudged to him by that Society, as being the cultivator who had brought the Drill Syſtem to the greateſt perfection, he having drilled near *five hundred acres* of grain in one year, and with amazing ſucceſs. And as the Rev. Mr. Cooke's Drill effected this, it ſurely will be uſeleſs for us to ſay more on the ſubject.

AGRICULTURE.

MATHEMATICAL RULE FOR ASCERTAINING THE MOST APPROVED DISTANCES FOR DRILLING.

REFERENCES to Plate I. *fig.* 3 and 4.

AAA. Seminal roots or fibres.

BBB. Secondary or coronal roots.

CCC. Roots or fibres occaſioned by earthing up the ſoil by the hoes to the firſt joints of the ſtems above the ſurface of the land, which otherwiſe would not have exiſted.

DEF and GHI. Two triangles, with their oppoſite angles E and H, comprizing an angle of 45 degrees each.

Single Hand-hoe. — Plate I. *Fig.* 5.

A. The hoe plate.

B. Wings or mould plates, by which the ſoil is earthed up to the rows of corn.

C. The handle, which is elevated or depreſſed by an iron wedge, being applied to the upper or under ſide of the ſaid handle.

Double Hand-hoe. — Plate I. *Fig.* 6.

AA. The hoe plates.

BB. Wings or mould plates, for earthing up the ſoil to the rows of corn.

C. The handle.

DD. Two iron rails joined together at the locket of the handle at E.

We next lay before our readers two other Patent Drill Machines, of which the reſpective authors give very flattering accounts, but as we have no teſtimonials of the performance of either of them, our readers muſt be content with what the Patentees are pleaſed to ſay in commendation of their own works.

THE DESCRIPTION AND USE OF MR. WINTER's NEW INVENTED PATENT DRILL MACHINE.

THIS Machine (ſays Mr. W.) is univerſally acknowledged to be ſuperior to any hitherto invented; it is ſo ſtrong that nothing but the greateſt violence can injure it; and is conſtructed on ſuch plain mathematical principles, as to be worked by any perſon of the loweſt capacity. It depoſits grain, pulſe, turnip, carrot, or any other ſeed, with the greateſt accuracy, at any required depth in the earth, from the ſurface to ſix inches, at any required diſtance from 6, 7, 8, 9, to 40 inches between the rows, and may be inſtantaneouſly regulated ſo as to increaſe or decreaſe the quantity ſown, which is immediately covered. One man, a boy, and two horſes, can Drill ten acres of light, and eight acres of ſtiff land in one day; and from one buſhel of ſeed wheat, and one buſhel and a half of barley, will produce a crop of from 6 to 20 buſhels per acre, according to the richneſs of the ſoil, more than when ſowed by the common mode of huſbandry.

The Machine may be ſeen at the Exchange, or at Mr. HANCOCK's, wheelwright, Old-market, Briſtol. Orders to be directed to Mr. G. WINTER, Briſtol. Price ſixteen guineas.

REFERENCE to Plate I. *Fig.* 7.

Repreſents a front view of the Machine when at work, with ſix coulters faſtened on, depoſiting grain at the depth of two inches, in drills at ſeven inches diſtance.

A. The fore flap turned up, and the back board taken off, for the purpoſe only of repreſenting the inſide work, which, when Drilling in the field, is all incloſed: it then appears as a box between two wheels, and all the inſide work is perfectly ſecured from the effects of the moſt tempeſtuous weather.

B. The frame.

C. Iron plates, in which the gudgeons of the fore wheels are placed, and may be removed to any required depth.

D, D. The two hind wheels with ſpikes, which are for the purpoſe of preventing the wheels from ſliding over rough ground or clods, and by the ſpikes penetrating into the earth, the wheels are forced round, by which the grain is delivered; for when the wheels ſtop, or ſlide, no grain is diſcharged.

E, E. Iron rings faſtened to the fore-ſtandards, to which the chains are fixed, for drawing the Machine.

F. Coulter-bars with grooves, through which the coulters are placed at any required diſtance, from 6, 7, 8, 9, 10, to 36 inches or more.

1, 2, 3, 4. Six coulters numbered between the bolt-holes, with figures for ſetting the coulters, ſo as to depoſit the grain at any required depth; for inſtance, when the bolts are placed over N°. 2, the grain is depoſited at two inches deep; when over N°. 3, at three inches deep; and ſo on.

G. Six cylinders, which occaſionally ſlide off and on the axis, ſo that the whole, or any number of them, may be fixed at any required diſtance.

H. Boxes which contain the ſeed.

I. Conductors, into which the ſeed is delivered out of the cylinders, and conveyed into the grooves, in the back part of the coulters.

K. The axis, which paſſes through the cylinders and large wheels.

PATENT UNIVERSAL SOWING MACHINE,

BY MR. JOHN HORNE, DOVER.

" THIS Machine, whether made to be worked by hand, drawn by a horſe, or fixed to a plough, and uſed with it, is extremely ſimple in the conſtruction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any ſkill in working. It will ſow wheat, barley, oats, rye, clover, cole-ſeed, hemp, flax, canary, rape, turnip, beſides a great variety of other kinds of grain and ſeeds broad-caſt, with an accuracy hitherto unknown. It is equally uſeful in the New Huſbandry, particularly when fixed to a plough; it will then drill a more extenſive variety of grain, pulſe, and ſeed, (through every gradation, with regard to quantity) and deliver each kind with greater regularity than any Drill-Plough whatever. When uſed in this manner, it will likewiſe be found of the utmoſt ſervice to farmers who are partial to the old huſbandry, as, among many other very valuable and peculiar properties, it will not only ſow in the broad-caſt way with a moſt ſingular exactneſs, but ſave the expence of a ſeedſman; the ſeed being ſown (either over or under furrow at pleaſure) and the land ploughed at the ſame operation.

" Perhaps a fair and deciſive experiment for aſcertaining the ſuperior advantage of broad-caſting or drilling any particular crop, was never before ſo practicable; as the ſeed may now be put in with the utmoſt degree of regularity, in both methods of culture, by the ſame Machine; conſequently, the ſeed will be ſown in both caſes with equal accuracy, without which it is impoſſible to make a juſt deciſion.

The excellence of this Machine conſiſts in ſpreading any given quantity of ſeed over any given number of acres, with a mathematical exactneſs, which cannot be done by hand; by which a great ſaving may be made in ſeeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in ſowing turnip ſeed with any degree of exactneſs, both from the minuteneſs of the ſeed, and the ſmallneſs of the quantity required to be ſown on an acre. Here the Machine has a manifeſt advantage, as it may be ſet to ſow the leaſt quantity ever required on an acre; and with an accuracy the beſt ſeedſman never can attain to.

It will alſo ſow clover, cole, flax, and every other kind of ſmall ſeed, with the utmoſt degree of regularity.

It will likewiſe broad-caſt beans, peaſe, and tares, or drill them with the greateſt exactneſs, particularly when conſtructed to be uſed with a Plough.

Another advantage attending the uſe of this Machine is, that the wind can have no effect on the falling of the ſeed.

REFERENCES TO PLATE I.

FIGURE 8.

The Machine fixed to a Kentiſh turn-reſt Plough.

B. The apron, upon which the ſeed falls and rebounds upon the land, in broadcaſting.

C. Lid to cover the hopper.

D. Wheel at the heel of the plough.

E. Strap.

FF. Hooke, upon which the apron turns by a pivot on each ſide.

G. Stay, to keep the Machine ſteady.

H. Lever, to prevent it from ſowing.

FIGURE 9.

The Machine conſtructed to be drawn by a Horſe.

AAAA. The hoppers.

BB. The diagonal ſupporters.

CCCC. The upper ſpouts.

D. The apron or ſhelf upon which the ſeed falls from the upper ſpouts.

E. The lever, which carries back the bar, and prevents the Machine from ſowing.

FF. Staples upon the handles, through which the reins paſs, for the man who conducts the Machine to direct the horſe by.

I. Screw, to fix the Machine occaſionally.

N. B. The knobs (by turning which each particular ſpout may be taken from off the bar, and thereby prevented from ſeeding) are over each upper ſpout, but (to prevent confuſion) are not lettered in the plate.

FIGURE 10.

Is the ſame Machine with that in *fig.* 8. The dotted lines expreſſing the ſituation of the long ſpout, when the apron is removed, and the Machine adapted for Drilling.

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New Invented Implements, used in Husbandry.

See System of Agriculture.

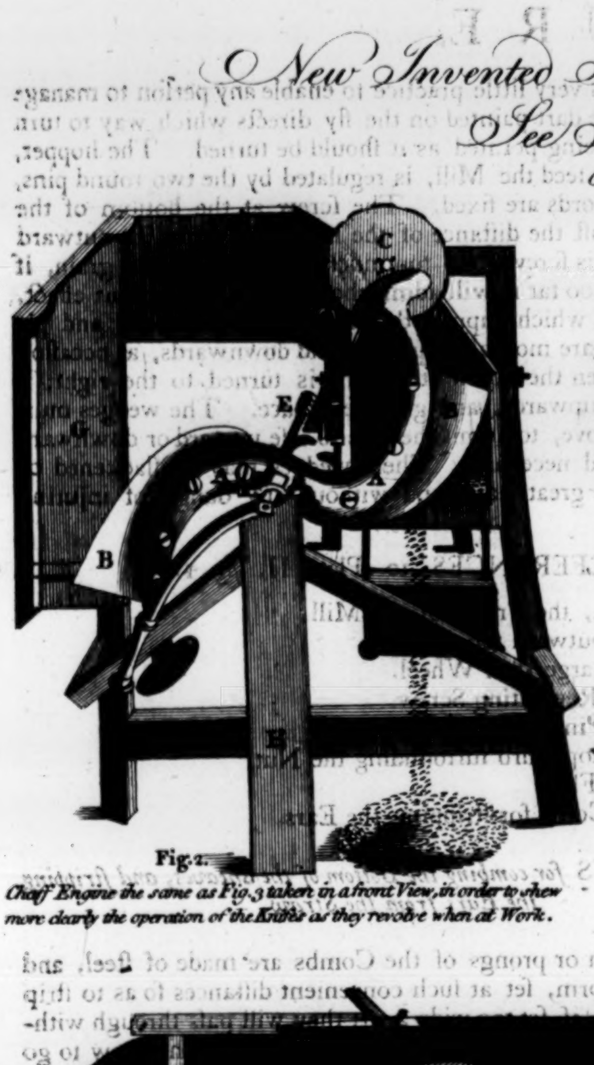


Fig. 2.

Chaff Engine the same as Fig. 3 taken in a front View, in order to shew more clearly the operation of the Knives as they revolve when at Work.

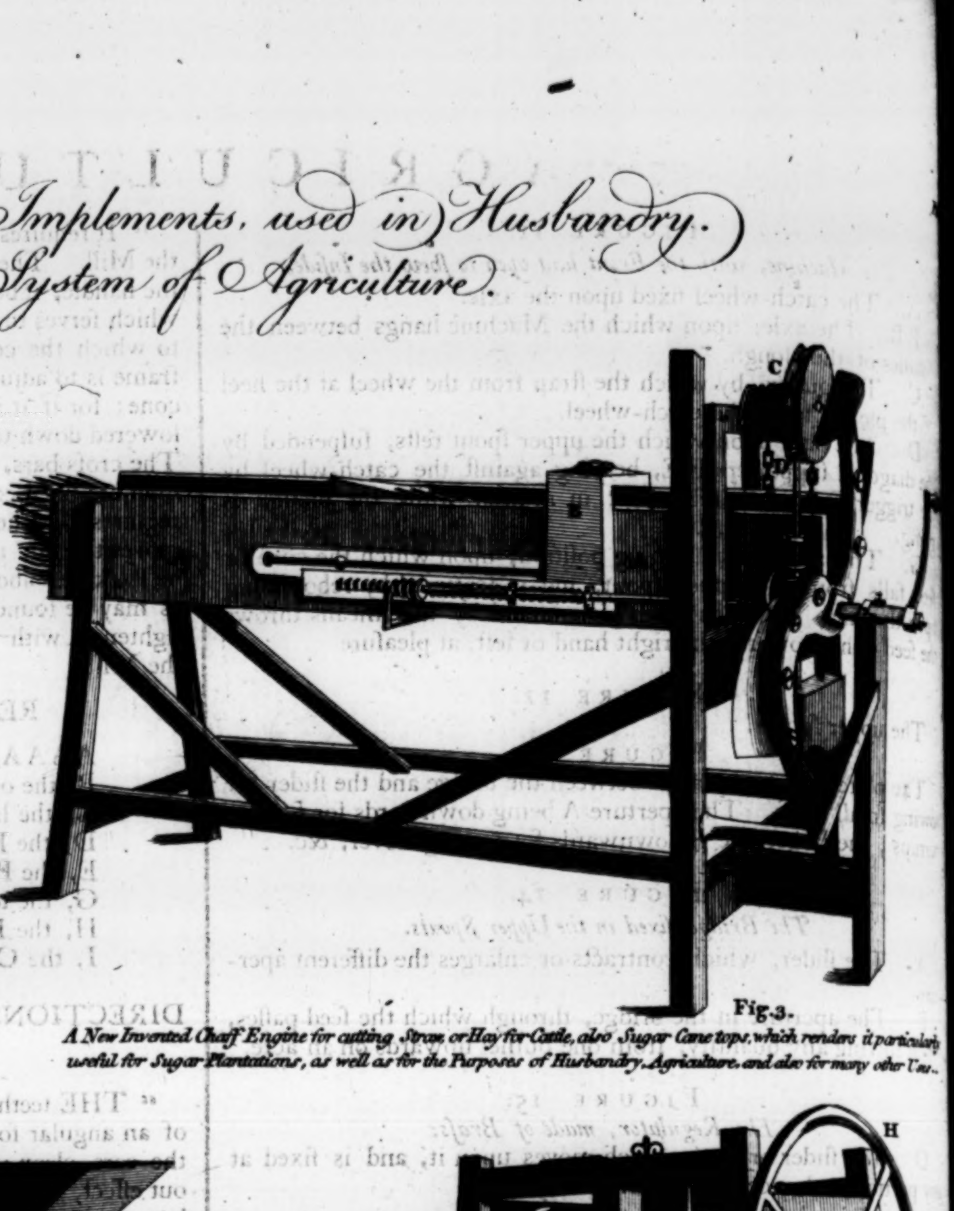


Fig. 3.

A New Invented Chaff Engine for cutting Straw or Hay for Cattle, also Sugar Cane tops, which renders it particula useful for Sugar Plantations, as well as for the Purposes of Husbandry, Agriculture, and also for many other Us

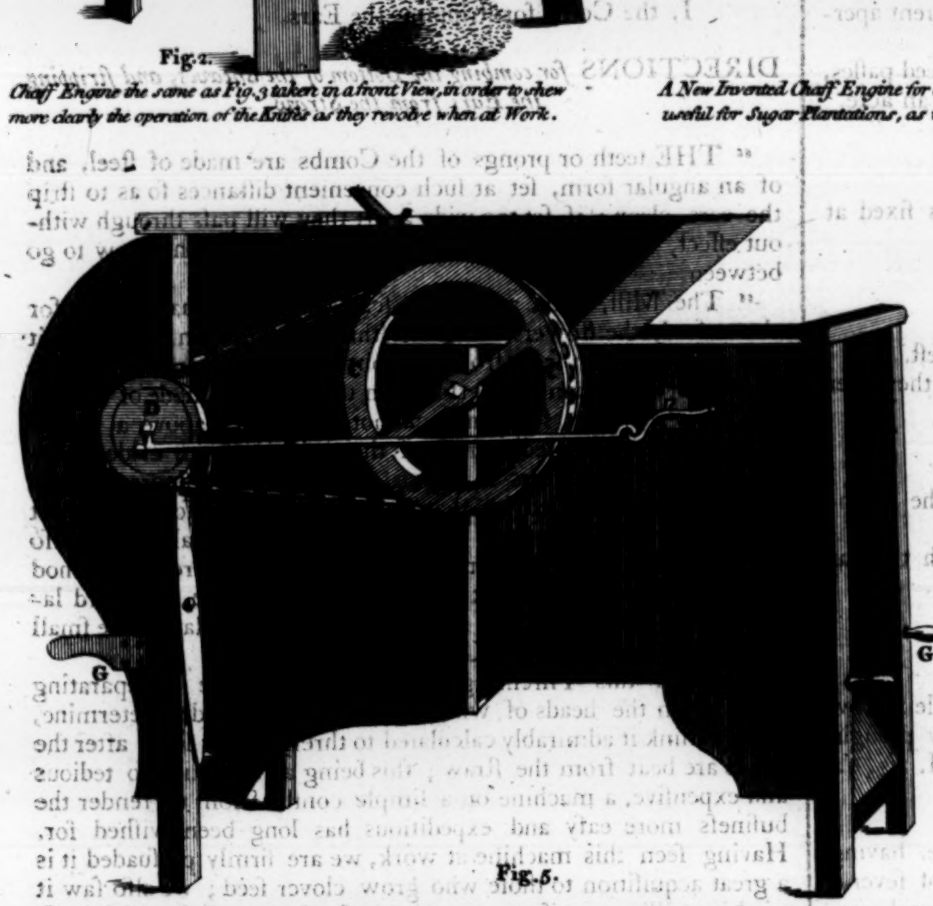


Fig. 5.

Winlaw's new Improved Winnowing Machine, which seperates the Chaff from the Grain, riddles & Screens at one operation: it is equally useful for all kinds of Seed large or small Whatever.

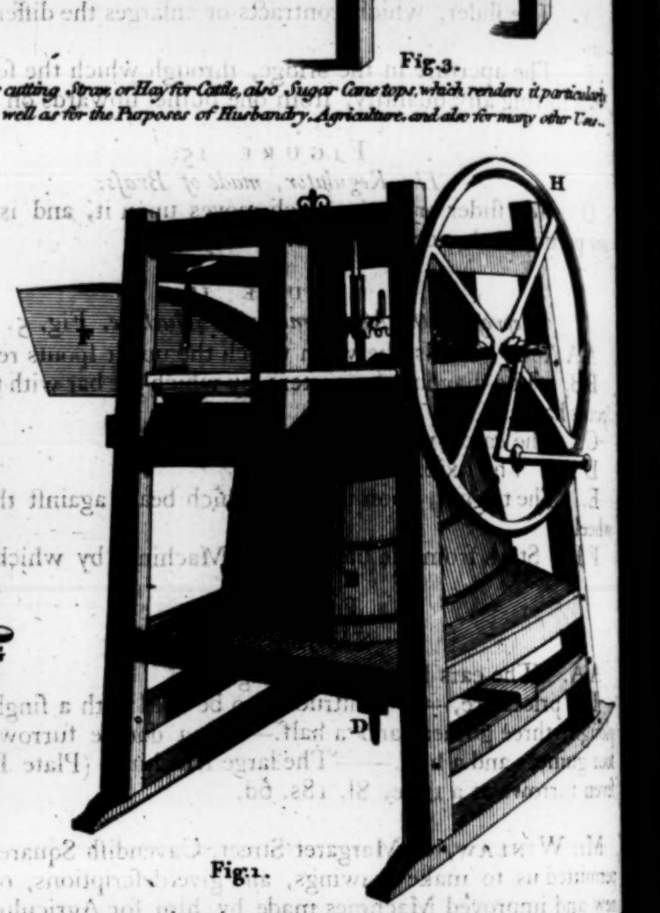


Fig. 1.

Winlaw's New Patent Threshing Mill, for the seperating Grain, from the Ea also Clover & other Seeds from the Husks, instead of the laborious methods in

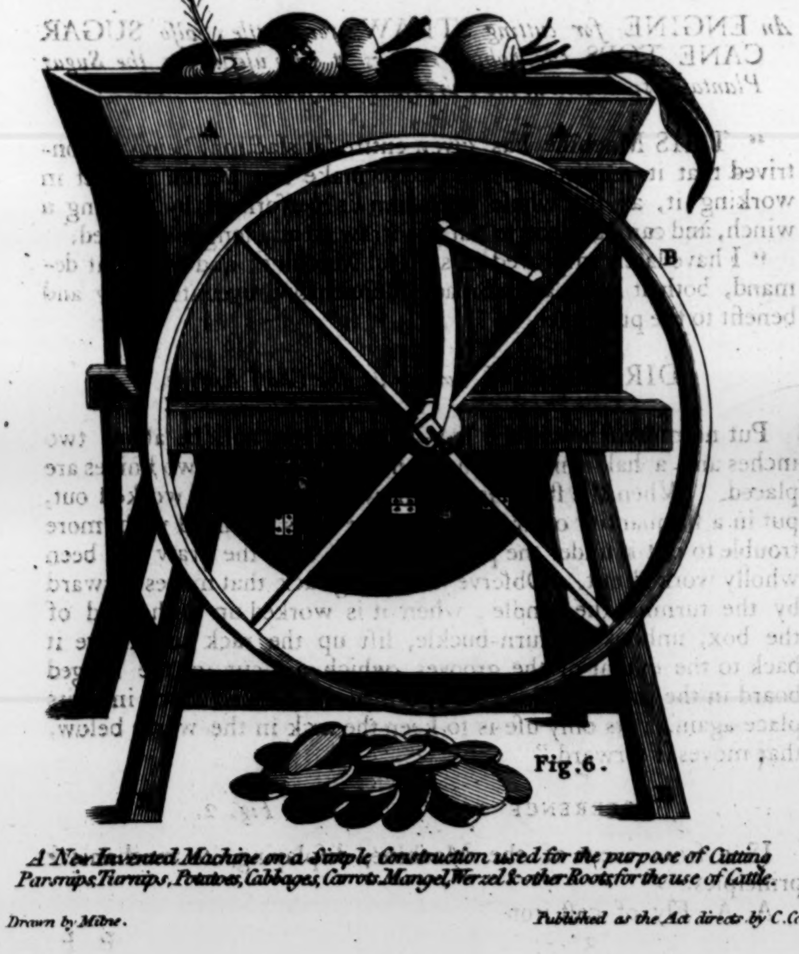


Fig. 6.

A New Invented Machine on a Simple Construction used for the purpose of Cutting Parsnips, Turnips, Potatoes, Cabbages, Carrots Mangel Werzel & other Roots for the use of Cattle.

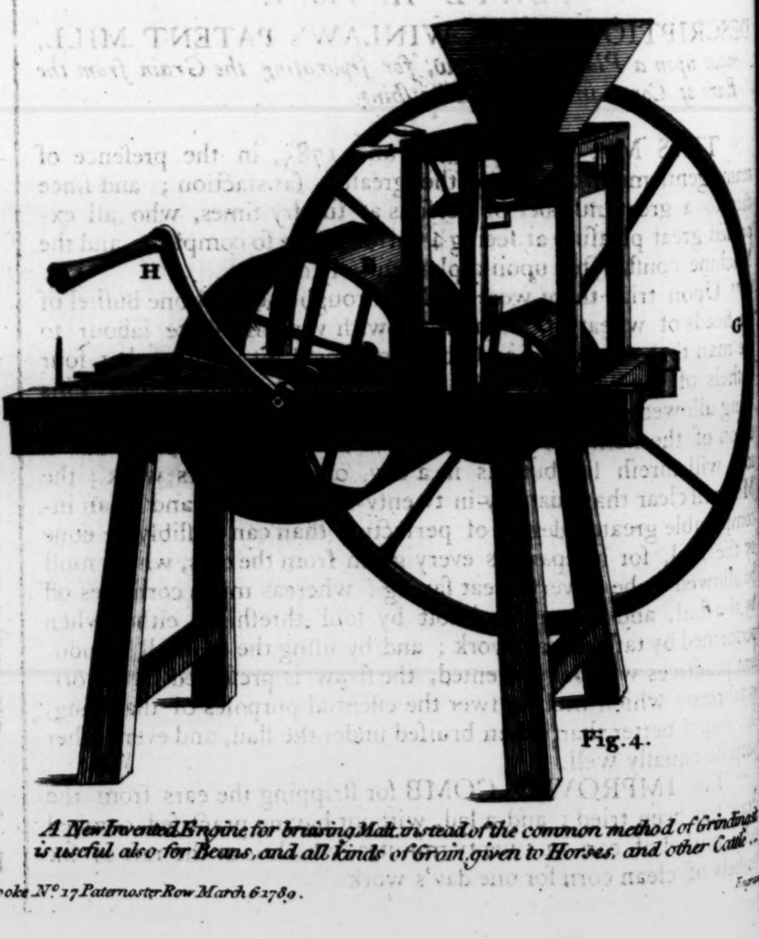


Fig. 4.

A New Invented Engine for bruising Malt, instead of the common method of Grinding is useful also for Beans, and all kinds of Grain given to Horses, and other Cattle.

Drawn by Milne.

Published as the Act directs by C. Cooke No 17 Paternoster Row March 6 1789.

Figure 11.

The Machine, with the Front laid open to ſhew the Inſide.

A. The catch-wheel fixed upon the axle.

B B. The axle, upon which the Machine hangs between the andles of the plough.

C. The pulley, by which the ſtrap from the wheel at the heel f the plough turns the catch-wheel.

D. The bar, upon which the upper ſpout reſts, ſuſpended by he diagonal ſupporters E E, bearing againſt the catch-wheel by he trigger F, and thereby kept in motion while the plough is oing.

G. The apron in a ſloping poſition, upon which the corn or eed falls from the upper ſpout, and is ſcattered by rebounding pon the land. It turns upon pivots, and by this means throws he ſeed either towards the right hand or left, at pleaſure

Figure 12.

The upper ſpouts.

Figure 13.

The plate which is placed between the bridge and the ſlider for owing ſmall ſeeds. The aperture A being downwards for ſowing urnips; the larger one B downwards for ſowing clover, &c.

Figure 14.

The Bridge fixed in the Upper Spouts.

A. The ſlider, which contracts or enlarges the different aper-ures.

B. The aperture in the bridge, through which the ſeed paſſes, hen ſowing any quantity, from one buſhel upwards on an acre.

Figure 15.

The Regulator, made of Braſs.

D. The ſlider or horſe which moves upon it, and is fixed at ny particular degree by a ſcrew in its ſide.

Figure 16.

Repreſents the Movement in the Machine, Fig. 5.

A A A A. Cleets, between which the upper ſpouts reſt.

B B. The diagonal ſupporters, by which the bar with the upper pouts hang.

C. The catch-wheel.

D D. The axle.

E. The trigger, upon the bar, which bears againſt the catch-heel.

F F. Stays from the back of the Machine, by which the bar

Figure 17.

The long Spout.

A A. The ears by which it hangs.

The prices are,—If conſtructed to be uſed with a ſingle furrow lough, three guineas and a half.—To a double furrow plough, our guineas and a half.——The large Machine, (Plate I. *fig.* 9.) even furrows at a time, 8l. 18s. 6d.

Mr. Winlaw, of Margaret Street, Cavendiſh Square, having ermitted us to make drawings, and give deſcriptions, of ſeveral ew and improved Machines made by him for Agricultural pur-oſes, we preſent them to the public.

PLATE II. Fig. 1.

ESCRIPTION OF W. WINLAW's PATENT MILL, *made upon a Plan entirely new, for ſeparating the Grain from the Ears of Corn, in Place of Threſhing.*

"THIS Mill was tried in June, 1785, in the preſence of any gentlemen, and gave the greateſt ſatisfaction; and ſince hen to a great number of perſons at ſundry times, who all ex-reſſed great pleaſure at ſeeing a performance ſo compleat, and the achine conſtructed upon a plan entirely new.

"Upon trial there were paſſed through the Mill one buſhel of e heads of wheat in one minute, with very moderate labour to e man that turned it; and, by experiment, it is found that four uſhels of the ears will yield one buſhel of clean grain. This eing allowed, the difference will clearly appear betwixt the expe-ition of the Mill and the labour of a Threſher; allowing that a an will threſh ſix buſhels in a day, of eight hours work; the ill will clear that quantity in twenty-four minutes, and to an in-omparable greater degree of perfection than can poſſibly be done y the flail, for it ſeparates every grain from the ears, which muſt e allowed to be a very great ſaving; whereas much corn flies off y the flail, and a great deal loſt by foul threſhing, either when erformed by taſk or day-work; and by uſing the Mill all fraudu-ent practices will be prevented, the ſtraw is preſerved in its ori-inal reed, which muſt anſwer the eſſential purpoſes of thatching, c. much better than when bruiſed under the flail, and every other urpoſe equally well.

"The IMPROVED COMB for ſtripping the ears from the raw has been tried; and a lad, without having practiſed, combed ut a buſhel of ears in twenty minutes, which is at the rate of ſix uſhels of clean corn for one day's work.

"It requires very little practice to enable any perſon to manage the Mill. The dart painted on the fly directs which way to turn the handle, it being pointed as it ſhould be turned. The hopper, which ſerves to feed the Mill, is regulated by the two round pins, to which the cords are fixed. The ſcrew at the bottom of the frame is to adjuſt the diſtance of the inner nut from the outward cone; for if it is ſcrewed up too much it will bruiſe the grain, if lowered down too far it will admit the ears to paſs without effect. The croſs bars, which ſupport the axis on which the fly and pinion are fixed, are moveable upwards and downwards, as occaſion requires. When the ſcrew at bottom is turned to the right, it moves the nut upwards, and gives leſs ſpace. The wedges muſt be ſlackened above, to admit the axle to riſe upward or downward as may be found neceſſary. Theſe wedges may be ſlackened or tightened with great eaſe, and without any danger of injuring the Mill.

REFERENCES to Plate II. *fig.* 1.

A A A A, the Frame of the Mill.
B, the outward Cone.
C, the large Iron Wheel.
D, the Regulating Screw.
E, the Pinion.
G, the top Curb ſurrounding the Nut.
H, the Fly.
I, the Comb for ſtripping the Ears.

DIRECTIONS *for combing the Bottom of the Sheaves, and ſtripping the Ears from the Straw.*

"THE teeth or prongs of the Combs are made of ſteel, and of an angular form, ſet at ſuch convenient diſtances ſo as to ſtrip the ears clean; if ſet too wide apart they will paſs through without effect, and if too near together will not admit the ſtraw to go between.

"The Mill, upon a ſmaller ſcale, anſwers equally well for clover ſeed, the flowers being firſt threſhed off from the ſtems, it will clear as much ſeed from the outward integument or huſk in three hours as a man can perform, in the common mode of threſhing, in one week; for a man cannot clean much above a buſhel in that time. The tedioufneſs of the operation is an evident reaſon why the ſeed bears ſo high a price; the barn floors are likewiſe quickly deſtroyed by that tedious forcible performance. It alſo anſwers for flax ſeed, canary, or any other ſmall ſeeds; alſo for ſeparating the huſks from rice, which, by the preſent method in practice, is performed at a great expence of time and hard labour. The ſame methods may be obſerved in regulating the ſmall one for clover ſeed, as the Corn Mill."

How far this Threſhing Mill may be capable of ſeparating grain from the heads of wheat we will not pretend to determine, but we think it admirably calculated to threſh clover ſeed, after the heads are beat from the ſtraw; this being an operation ſo tedious and expenſive, a machine on a ſimple conſtruction to render the buſineſs more eaſy and expeditious has long been wiſhed for. Having ſeen this machine at work, we are firmly perſuaded it is a great acquiſition to thoſe who grow clover ſeed; we alſo ſaw it tried in milling, or ſeparating the huſks from trefoil, which it effected both complete and expeditious.

An ENGINE *for cutting* STRAW *for Cattle; alſo* SUGAR CANE TOPS, *&c. which renders it very uſeful for the Sugar Plantations, as well as the Purpoſes of Huſbandry.*

"THIS Machine has given entire ſatisfaction, being ſo contrived that it requires no practice to make any perſon perfect in working it, as the whole operation is performed by turning a winch, and can be made to cut the ſtraw to any length required.

"I have lately improved this uſeful Machine, and the great demand, both at home and abroad, ſufficiently proves its utility and benefit to the purchaſer."

DIRECTIONS *how to uſe the Chaff Engine.*

Put no more ſtraw in the box at once than will be about two inches and a half thick at the front end, where the two knives are placed. When the ſtraw is within two feet of being worked out, put in a fit quantity of freſh ſtraw, for it is attended with more trouble to put it under the preſſing board, after the ſtraw has been wholly worked out. Obſerve the ſliding rack that moves forward by the turning the handle; when it is worked up to the end of the box, unhook the turn-buckle, lift up the rack and move it back to the extent of the grooves, which are cut in the hinged board in the inſide of the box, and turn the hooked catch into its place again. Its only uſe is to keep the rack in the worm below, that moves it forward."

Reference to Plate II. *Fig.* 2.

IS a front view of the Machine, diſplaying its mechanical principles.

A, A. Fly of caſt iron.

B. B. Knives annexed to the fly with ſcrews.
C. Pulley wheel to which an iron weight is ſuſpended by a chain.
D. Iron weight which compreſſes the ſtraw at the inſtant it is cut by the knife.
E. Screw or worm which brings forward the ſtraw, this in the Machine is in a right line with the ſpindle of the windlas, but is here elevated to diſplay its action.
F. Handle or windlas by which the fly is turned, and the operation performed.
G. Guard to prevent accidents as the fly revolves.
H. Frame to ſupport the whole.

Plate II. *Fig.* 3. Is a profile view of the ſame.

A. Box, or Hopper, containing the ſliding rack which holds the ſtraw.
B. Sliding rack.
C. Pulley wheel.
D. Chain going round the wheel and faſtened to the weight.
E. A ſhort projecting iron, which being touched by another, as the fly and knives reſolve, raiſes the weight and gives permiſſion to the ſtraw to be brought forward.

As the cutting chaff for cattle is a circumſtance of the moſt material conſequence, and the common method being very laborious, we think this invention will greatly facilitate the operation; and that a ſtrong boy may, with eaſe, do as much work with this Machine as two men can in the common method.

BRUISING ENGINE FOR MALT, *inſtead of the common Method of Grinding, likewiſe for Beans and other Grain for Horſes and other Cattle.*

" As Horſes ſwallow great part of the corn given them, whole or without chewing, and which often paſſes through them in the ſame ſtate; this being the caſe, they cannot receive any nouriſhment from the grains that are unbroke; but when bruiſed in this Machine, it eaſes maſtication, and every grain is prepared for nutrition, conſequently a much leſs quantity will be found ſufficient for cattle.

" This Machine is equally uſeful for bruiſing Malt. By repeated experiments it has been found, that Malt bruiſed is more advantageous than the common method of grinding and flouring, by which a great part is waſted. It is a great deal more expeditious than the common method, and is by no means liable to be out of repair."

DIRECTIONS *how to uſe the above Engine.*

" To bruiſe oats, ſcrew the large roller cloſe up to the ſmall one, and do not feed too faſt from the ſhoe, which you regulate by the pins which have ſtrings fixed to them. When you bruiſe Beans, unſcrew the two regulating ſcrews a little, and put the fly in motion with your hand, on account that the rollers are then a little ſpace apart, and will not turn each other before the Beans come between them. Feed ſlow and regular at firſt, until you have a little practice, oil the pivets frequently, or the iron will cut the coupling braſſes, and damage the mill."

Of the ſuperiority of Bruiſing Malt in preference to grinding it, we can from experience give ample teſtimony, when two ſmooth ſurfaces are oppoſed to each other at a diſtance which can be regulated at pleaſure; neither grain nor any other ſubſtance of a like nature, can paſs between them without being flattened or bruiſed. This being the principle on which the bruiſing mill acts the mealy ſubſtance, which is the eſſential part of Malt, is entirely removed from the ſkin or huſk which contains it, and all the virtues of the Malt are with eaſe extracted by the water, in a manner ſuperior to Malt which is cut to pieces by grinding. We attentively examined this machine, and Mr. WINLAW, at our requeſt, procured a buſhel of malt, purpoſely to exhibit the perfections of his machine; and we were witneſs that two men, with eaſe, bruiſed a buſhel of malt in one minute, and believe there was not a ſingle grain eſcaped whole.

REFERENCES to the Bruiſing Mill, Plate II. *fig.* 4.

AAAA. The frame.
B. The large cylinder.
C. The ſmall ditto.
D. The hopper.
E. The ſhoe.
F. The frame that ſupports the hopper.
G. The fly wheel.
H. The windlas.

MACHINE FOR DRESSING CORN, RAPE-SEED, FLAX-SEED, MUSTARD-SEED, &c.

" THIS Machine winnows, riddles, and ſcreens, all at one operation, and will finiſh after the threſher, between twenty and thirty buſhels in one hour; and will dreſs in the granary ten quarters in the hour.

" The three principal performances of this Machine are,
I. That it dreſſes better than any other method.
II. With leſs waſte; and
III. More expeditiouſly than any other method yet found out; and has been proved by a great many gentlemen, corn-merchants and farmers.

" It gives corn an additional brightneſs, by paſſing through wire riddles and ſcreens, both fixed and moving; and the benefit in a granary is, that it cleans the corn from duſt, which breeds weevils; and blows them out if any be in. The above Machine will dreſs malt better than any other method yet found out, and much quicker."

In uſing this Winnowing Machine three perſons are neceſſary; one to ſupply the hopper, another to turn the handle which gives motion to the Machine, and a third to remove the grain from the bottom of the ſcreen.

In Yorkſhire, and other parts of the north, theſe implements are generally uſed, and with the greateſt ſucceſs; and as the conſtruction is ſimple, and the performance expeditious, we think the invention of great utility. Thoſe made by Mr. WINLAW are on a better principle than any other we have ſeen, and make no doubt they are much improved by his ingenuity.

REFERENCE to the Winnowing Machine, Plate II. *Fig.* 5.

A. Body of the Machine in which are the fan, riddle, and ſcreen.
B. Hopper, where the Machine is ſupplied.
C. Wheel which gives motion to the work, the windlas being on the oppoſite ſide on the ſame ſpindle.
D. Pulley-wheel that moves the fan, ſcreen, and riddle.
E. Crank-rod faſtened to the riddle and ſcreen, and gives them motion.
F. Chain going round each wheel in a groove.
G. Four ſhort handles to convey it from place to place by two men.
H. Feet or ſupporters.
I. Fan made of wood which blows chaff from the corn.
K. Riddle which ſtops ſtraw, the heads of corn, and other matters.
L. Cloſe ſcreen, by which the corn is perfectly cleaned.

A MACHINE *on a ſimple Conſtruction to cut* TURNIPS, POTATOES, CARROTS, *or* CABBAGE, *before they are given to Cattle.*

THIS Machine will cut into pieces of any ſize, according to the pleaſure of the perſon who uſes it, as many roots and other ſuch kind of ſubſtances in one minute, by the turning of a wheel, as by the common method would employ a perſon one hour. It is perfectly ſimple in its operation and make, and compoſed of very few movements, of courſe not liable to be out of repair.

REFERENCE to the Turnip-Cutter, Plate II. *Fig.* 6.

A. Hopper, into which the roots or cabbages are put.
B. Fly-wheel, which by a windlas gives motion to the Machine.
C. Handle or windlas.
D. Lower part of the wheel, which is armed with four knives ſet narrow or wide by means of ſcrews.
E. Frame.
F. Cutting-wheel exhibited independent of the Machine, and which contains the knives mentioned as above.

REMARK.

AS we, for reaſons before given, now conclude this part of our SYSTEM OF AGRICULTURE, gratitude obliges us to return our ſincere thanks to thoſe whoſe kindneſs we have experienced; our endeavours have been to render ſervice to the art; if we have ſucceeded in any reſpect, the thoughts of having added, in the ſmalleſt degree, to ſo important a ſubject, is a ſufficient reward.

Variety of other detached matters relating to Agriculture, will be regularly claſſed under the article HUSBANDRY, and Plates given of every implement, new or old, which we conceive uſeful.

If the AUTHOR of this Syſtem has beſtowed cenſure on any gentleman undeſervedly, he will readily acknowledge his faults, and as he conceives anonymous attacks on real characters illiberal, Mr. COOKE, the publiſher, has liberty to give his addreſs.

AGRIFOLIUM, in botany, the Holy tree.

AGRIMONIA, Agrimony: a genus of the digynia order, belonging to the dodecandria claſs of plants; and in the natural method ranking under the 35th order, Senticoſæ. For its characters, ſee Syſtem of Botany. Of this genus there are five ſpecies enumerated by botanical writers; but none of them have any remarkable properties except the two following:

1. The eupatoria, or common agrimony, grows naturally in ſeveral parts of Britain by the ſides of hedges and of woods. It is eat by ſheep and goats, but refuſed by horſes and ſwine.

2. The odorata, or ſweet-ſcented agrimony. This grows near four feet high; the leaves have more pinnæ than the former; the ſerratures of the leaves are alſo ſharper, and, when handled, they emit an agreeable odour.

Both theſe ſpecies may be propagated either by ſeed, or by parting the roots in autumn when the leaves begin to decay. The ſeeds ought alſo to be ſown in this ſeaſon; for if kept out of the ground till ſpring, they ſeldom come up that year. Agrimony is a hardy perennial plant, and will thrive in almoſt any ſoil or ſituation; but the plants ſhould not be placed nearer one another than two feet, that the roots may have room to ſpread.

AGRIOCARDAMUM, ſynonimous with cardamine.

AGRIOCASTANUM, ſignifying the earth nut, commonly called the pig nut.

AGRIOCINARA, in botany, ſignifies a ſpecies of the wild articnoak.

AGRIOCOCCIMELA, or Prunus Sylvestris, the plum trees.

AGRIOMELA, ſignifies the crab-apple, or crab-tree.

AGRIOMELANZANION, amongſt the ancient botaniſts, implied a kind of eſculent night ſhade, or ſolanum.

AGRIONA, in Grecian antiquity, feſtivals annually celebrated, by the Bœotians, in honour of Bacchus. At theſe feſtivals the women pretended to ſearch after Bacchus as a fugitive; and, after ſome time, gave over their inquiry, ſaying, that he was fled to the Muſes, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to thoſe who fed on wild beaſts. The word is Greek compounded of *αγριος*, "wild," "ſavage," and *Φαγω*, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, ſaid to have fed altogether on lions and panthers. Pliny and Solinus ſpeak of Agriophagi in Ethiopia, and Ptolemy of others in India on this ſide the Ganges.

AGRIORIGANUM, in botany, ſignifies wild marjoram.

AGRIOSELINUM, in botany, ſignifies wild parſley.

AGRIPPA, in midwifery, a term applied to children, brought forth with their feet foremoſt.

AGRIPPINIANS, in church hiſtory, the followers of Agrippinus biſhop of Carthage, in the third century, who firſt introduced and defended the practice of re-baptization.

AGRIUM, in the materia medica of the ancients, ſignified the impurer ſort of natrum.

AGROM, a diſeaſe frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in ſeveral places, being extremely rough withal, and ſometimes covered with white ſpots. The Indians are very fearful of this diſeaſe, which they attribute to extreme heat of the ſtomach. Their remedy is to drink ſome chalybeate liquor, or the juice of mint.

AGROSTEMA, Wild Lychnis, or Campion: a genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, Caryophyllei. For the characters, ſee Syſtem of Botany.

The moſt remarkable are, 1. The githago, hairy wild lychnis, or common campion, which grows naturally in corn fields in moſt parts of Britain. The flowers appear in June, are generally purple, ſometimes white, and by cultivation yellow.

2. The coronaria, or ſingle-roſe campion. Of this ſpecies there are four varieties; one with deep red, another with fleſh-coloured, a third with white, flowers; and a ſort with double flowers, which has turned moſt of the others out of the gardens.

3. The flos jovis, or umbelliferous mountain-campion, grows naturally upon the Helvetian mountains. It is a low plant with wooly leaves: the flower-ſtem riſes near a foot high; the flowers grow in umbels on the top of the ſtalk, and are of a bright red colour. They appear in July, and the ſeeds ripen in September.

The firſt and third ſpecies are annual plants, ſo muſt be propagated by ſeeds. The ſecond ſpecies is perennial, but only thoſe varieties which have ſingle flowers produce any ſeeds; the double kind, therefore, as it produces no ſeeds, muſt be propagated by parting the roots in autumn, after the flowers are paſt. This plant is eat by horſes, goats, and ſheep.

AGROSTIS, Bent-grass, in botany: a genus of the triandria order, belonging to the digynia claſs of plants; and, in the natural method, ranking under the 4th order, Gramina. For its characters, ſee Syſtem of Botany. There are 15 ſpecies; eight of them natives of Britain.

AGROSTOGRAPHIA, in phyſiology, ſignifies the hiſtory or deſcription of graſſes.

AGROUND, the ſituation of a ſhip whoſe bottom, or any part of it, hangs or reſts upon the ground, ſo as to render her immoveable, till a greater quantity of water floats her off, or till ſhe is drawn out into the ſtream by the application of mechanical powers.

AGRYPNIA, among phyſicians, implies an inaptitude to ſleep; a troubleſome ſymptom of feveriſh and other diſorders.

Agrypnia, in the Greek church, implies the vigil of any of the greater feſtivals.

AGUAGUIN, in Botany, a ſhrub in much eſteem among the Africans, as balſamic and vulnerary. See Philoſophical Tranſactions, No. 232.

AGUAPECACA, in ornithology, a Brazilian bird of the moor-hen kind.

AGUARA-QUIYA, in botany, a Brazilian plant, ſomewhat ſimilar to the common nightſhade.

AGUARA-PONDA, in botany, the plant called the Viola Spicata Braziliana.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feveriſh paroxyſm, are denominated tertian, quartian and quotidian.

Ague-Cake, the popular name for a hard tumour on the left ſide of the belly, ſaid to be the effect of intermitting fevers.

Ague-Tree, a name given by ſome to the ſaſſafras, on account of its febrifuge qualities.

AGUILLANEUF, or Augillaneuf, a form of rejoicing uſed among the antient Franks on the firſt day of the year. The word is compounded of the French *A* "to," *gui*, "miſleto," and *l'an neuf*, "the new year." Its origin is traced from a druid ceremony: the prieſts uſed to go early in December, which with them was reputed a ſacred month, to gather miſleto from the oak in great ſolemnity. The prophets marched in the front, ſinging hymns in honour of their deities; after them came an herald with a caduceus in his hand; theſe were followed by three druids abreaſt, bearing the things neceſſary for ſacrifice; laſt of all came the chief, or arch-druid, accompanied with the train of people. The chief druid climbing the oak, cut off the miſleto with a golden ſickle, and the other druids received it in a white cloth: on the firſt day of the year it was diſtributed among the people, after having bleſſed and conſecrated it by crying, *A gui l'an neuf*, to proclaim the new year. This cry is ſtill continued in Picardy, with the addition of *Plantez, Plantez*, to wiſh a plentiful year. In Burgundy, and ſome other parts, the children uſe the ſame word to beg a new-year's gift. Of later times the name *Aguillaneuf* was alſo given to a ſort of begging, practiſed in ſome dioceſes, for church tapers, on new-year's day, by a troop of young people of both ſexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occaſioned the ſynods to ſuppreſs it.

AGUILLES, cotton cloth made at the Turkiſh factory at Aleppo.

AGUL, in botany, a ſmall prickly ſhrub, whoſe leaves are longiſh, and reſemble thoſe of the knot-graſs. It abounds with flowers of a reddiſh colour, which are ſucceeded by red huſks. This plant grows in Arabia, Perſia and Meſopotamia.

AGURAH, in Jewiſh antiquity, the name of a ſilver coin to the value of a twentieth part of an antient ſilver ſhekel.

AGUSADURA, in ancient cuſtoms, a fee due from vaſſals to their lord for ſharpening their ploughing tackle. Anciently the tenants in ſome manors were not allowed to have their rural implements ſharpened by any but whom the lord appointed; for which an acknowledgment was to be paid, called *Aguſadura*, in ſome places *Aguſage*; which ſome take to be the ſame with what was otherwiſe called *Reillage*, from the ancient French *reille*, a ploughſhare.

AGUTI, in zoology, the name of an American animal of the rat ſpecie, much reſembling what is called in England the Guinea-pig. It has the characters of the rat, with the voice and hair of a hog. It is a very voracious animal, devouring its food with extreme eagerneſs, and uſing its fore feet in the manner of the ſquirrel. It runs very ſwiftly, and is amazing expert at digging, ſo that it ſoon buries itſelf in the earth. When provoked, it raiſes all the hair of its back upright, and ſtrikes the earth with its hinder feet.

AGUTIGUEPA obi Brasiliensibus, in medicine, the name given by many authors to the arrow-root, or ſagittaria-alexipharmica of the Weſt Indies.

AGYEI, in antiquity, a kind of obeliſks ſacred to Apollo, erected in the veſtibules of houſes, by way of ſecurity.

AGYNIANI, in church hiſtory, a ſect who condemned all uſe of fleſh, and marriage, as not inſtituted by God, but introduced at the inſtigation of the devil. The word is compounded of the privative *α*, and *γυνη*, *woman*. They are ſometimes alſo called *Agynnenſes*, and *Agynii*; and are ſaid to have appeared about the year 694. It is no wonder they were of no long continuance. Their tenets coincide in a great meaſure with thoſe of the Abelians, Gnoſtics, Cerdonians, and other preachers of chaſtity and abſtinence.

AGYRTÆ, in antiquity, a kind of ſtrolling impoſtors running about the country, to pick up money by telling fortunes at rich men[illegible] doors, pretending to cure diſeaſes by charms, ſacrifices, and other religious myſteries; alſo to expiate the crimes of their deceaſed anceſtors, by virtue of certain odours and fumigations; to torment their enemies, by the uſe of magical verſes and the like. The word is Greek Αγυρται, formed of the verb *αγυρω, I congregate*; alluding to the practice of quacks, who gather a crowd about them.

Agyrtæ, among the Greeks, ſignify the ſame with *Æruſcatores* among the Latins, and differs not much from Gypſies among us.

AHALOTH, in the materia medica, a Hebrew name given to the lignum aloes, or aloes wood.

AHANIGER, in ichthyology, a name given by Albertus, and by others called the acus vulgaris, or garfiſh.

AHÆTULA, the trivial name of a ſpecies of the coluber.

A-HEAD, a ſea-term, ſignifying further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to aſtern, which expreſſes the ſituation of an object behind the ſhip.

AHICCYATLI, in zoology, the Indian name of a ſerpent reſembling the rattle-ſnake, only it wants the rattles. It is as fatal in the effect of its poiſon as any known ſpecies of ſerpent.

AHMELLA, in botany, a ſpecies of bidens or water hemp agrimony.

AHOUAI, in botany, a ſynonime, and alſo the trivial name of a ſpecies of Cerbera.

A-HULL, in the ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AIAIA, in ornithology, a ſpecies of the ſpoon-bill in Brazil, South America.

AJAX, in antiquity, a furious kind of dance, in uſe among the Grecians; intended to repreſent the madneſs of that hero after his defeat by Ulyſſes, to whom the Greeks had given the preference in his conteſt for Achilles's arms. Lucian, in his treatiſe on Dancing, ſpeaks of dancing the Ajax. There was alſo an annual feaſt called Ajantia, Αιαντεια, conſecrated to that prince, and obſerved with great ſolemnity in the iſland of Salamis, as well as in Attica; where, in memory of the valour of Ajax, a bier was expoſed, ſet out with a compleat ſet of armour.

AICUROUS, a ſpecies of parrot.

AID, in a general ſenſe, denotes any kind of aſſiſtance given by one perſon to another.

Aid, in law, denotes a petition made in court to call in help from another perſon who has intereſt in land, or any other thing conteſted.

Aid-de-camp, in military affairs, an officer employed to receive and carry the orders of a general.

Aid, Auxilium, in antient cuſtoms, a ſubſidy paid by vaſſals to their lords on certain occaſions. Such were the aid of relief, paid upon the death of the lord meſne to his heir; the *aid cheval*, or capital aid, due to the chief lord on ſeveral occaſions, as, to make his eldeſt ſon a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French cuſtoms, certain duties paid on all goods exported or imported into that kingdom.

Court of aids, in France, a ſovereign court eſtabliſhed in ſeveral cities, which has cognizance of all cauſes relating to the taxes, gabelles, and aids, impoſed on ſeveral ſorts of commodities, eſpecially wine.

Aids, in the manege, are the ſame with what ſome writers call *cheriſhings*, and uſed to avoid the neceſſity of corrections. The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIEREBA, in ichthyology, a ſpecies of the paſtinacha marina kind of fiſh.

AIGEIROS, ſignifies the black poplar.

AIGHENDALE, the name of a liquid meaſure uſed in Lancaſhire, containing ſeven quarts.

AIGITHALUS, αιγιθαλος, in ornithology, the little hedge bird, called the tom-tit-mouſe.

AIGRETTA, in ornithology, a name given to a ſpecies of the heron.

AIGUISCE, in heraldry, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles. It differs from the croſs fitchee, inaſmuch as the latter tapers by degrees to a point, and the former only at the ends.

AILE, in law, a writ which lies where a perſon's grandfather, or great-grandfather, being ſeiſed of lands, &c. in fee-ſimple, the day that he died, and a ſtranger abates and enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AILERONS, in natural hiſtory, the fleſhy part of the wings of flies.

AILES vitrees, in natural hiſtory, a French term uſed to expreſs the wings of a ſeries of inſects between the fly and butterfly kind.

AIPIMIXIRA, in ichthyology, the name of an American fiſh, called the pudiano. It is a ſmall fiſh about the ſize of a perch, with a purple back, and yellow ſides and belly.

AIR, in natural philoſophy, a thin, fluid, elaſtic, tranſparent, ponderous, compreſſible, and dilatable body, ſurrounding the terraqueous globe to a conſiderable height.

Air, in medicine, &c. makes one of the ſix non-naturals. From obſervations on bleeding in rheumatiſms, and after taking cold, it is evident, the air can enter with all its qualities, and vitiate the whole texture of the blood, and other juices. From the palſies, vertigoes, and other nervous affections cauſed by damps, mines, &c. it is evident, that air thus qualified can relax and obſtruct the whole nervous ſyſtem. And from the cholics, fluxes, coughs, and conſumptions produced by damp, moiſt, and nitrous air, it is evident it can corrupt and ſpoil the noble organs, &c.

Circulation of Air *in Rooms.* To render the circulation of air ſenſible, let the air of a room be heated by a ſtrong fire, whilſt the air of a contiguous room is cold; then let the door between theſe two rooms be opened, in which caſe the hot air of one room being lighter, will paſs through the upper part of the opening of the door into the cold room; and, on the contrary, the cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; whilſt in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the ſame reaſon, that when the fire is lighted in the chimney, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall openings, if the doors and windows are ſhut; for the air over the fire being heated, becomes lighter, and aſcends into the chimney, conſequently other colder air muſt ſupply its place, which forces its way through all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome for reſpiration, and the fire would be ſoon extinguiſhed, beſides other inconveniences. Hence it appears, that thoſe perſons miſtake who expect to keep the air of a room ſweet and wholeſome, eſpecially for convaleſcents, by accurately ſtopping all the ſmalleſt openings that admit freſh air. When the current of air that enters into a room is on ſome ſide of it where it falls immediately upon the perſons who ſit in the room, then it may be offenſive, eſpecially to delicate conſtitutions. In that caſe, ſuch opening ſhould be cloſed: but at the ſame time another opening ſhould be made for admitting freſh air, in another more convenient part; for a circulation of air, eſpecially in rooms where a fire is kept, is not only ſalutary and uſeful, but abſolutely neceſſary.

In an ingenious publication, intitled, *A Practical Treatiſe on Chimnies*, there are the following remarks relating to the propereſt method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent-hole near the top of the room, in order to expel the heated and contaminated air, "this," ſays he, "might be done by means of a ſmall tube opening into the room, either in or near the ceiling; which might either be carried to the top of the building, or be made to communicate with the external air by a ſmall perſpiration through the wall at the roof of the room; by means either of which, a proper circulation would be eſtabliſhed, and the foul air be carried off.

"For the fire would no ſooner have warmed any particles of air within the room, than theſe would be greatly expanded, and riſe immediately upwards, ſo as to fill the higher parts of the room with rarefied air? and as other particles would be ſucceſſively heated and rarefied in their turn, by their expanſive force they would preſs upon the ſides of the apartment in every place, ſo as to force the lighteſt particles through the opening left for that purpoſe in the top of the room; by which means the fouleſt air would be gradually drawn off, without deſcending again into the lower regions, to the annoyance of the company."

But in order to admit freſh air into the room, "Let," ſays he, "another opening be made in the ceiling of the room, having a communication with a ſmall pipe that ſhould lead from thence either to the outſide of the wall, or to any other part of the building that might be judged more convenient, where it ſhould be bent, and conducted downwards, till it reached the ground; where it ſhould be left open, to communicate with the external air. In this ſituation the cool external air would be forced in at the lower opening of the tube, and made to aſcend into the apartment in proportion to the quantity that eſcaped towards the higher regions by means of the ventilator. And as that weighty air would no ſooner enter the room, than it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its deſcent, become, in ſome meaſure, warmed by that means, and equally diſperſed through the room, ſo as ſlowly and imperceptibly to reach the candles and the company in the room, and ſupply them with a ſufficient quantity of freſh and wholeſome air, without the inconveniences to which the company are ſubjected by the uſual way of admitting freſh air. For if it enters near the floor of the apartment, it is hurried along in a rapid undivided ſtream towards the fire-place, and ſtriking upon the legs and inferior parts of the body, affects them with a ſtrong ſenſation of cold. To overcome the effects of this, large fires muſt be kept, by which other parts of the body are warmed to an extraordinary degree, which is productive of moſt of thoſe diſorders that are pernicious to the young, and often prove fatal to the old, during the winter ſeaſon, in theſe cold regions.

"Thus might our apartments be kept conſtantly, moderately, and equally warm, at a moderate expence, without endangering our health on the one hand, by a reſpired confined, ſtagnant, and putrid air, or, on the other hand, by ſubjecting ourſelves to ſuch danger of catching colds, conſumptions, and rheumatic complaints, by being expoſed to ſuch exceedingly unequal degrees of heat and cold, as are unavoidable where our apartments are ſo open as to admit a ready paſſage to the external air during the winter ſeaſon.

"The reader will eaſily perceive, that all that has been here ſaid has a reference only to thoſe apartments in cold climates, and rigorous weather, where fire to warm them becomes neceſſary. In warmer regions, or during the ſummer ſeaſon, there can be no objection to the wheel-ventilator in the window. It is a ſimple contrivance, and a ſafe and effectual means of preſerving the air in our apartments ſweet and wholeſome at that ſeaſon."

It is a vulgar error among many people, to believe that fire purifies the contaminated air, by deſtroying the noxious particles mixed with it; and for this reaſon they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for reſpiration. Indeed, a fire kept in a room or apartment where the air is tainted, as is the caſe with hoſpitals, goals, and the like, does certainly purify the apartment, and the practice is very uſeful; but this effect is only becauſe the fire promotes the circulation of the air, and dries the dampneſs of rooms, furniture, &c. ſo that it is not the infected air that is purified, but is new, freſh, and wholeſome air, that by the action of the fire has taken the place of the infected air; which infected air, being rarified by the heat, has been expelled from the apartment. Fire and combuſtion in general is ſo far from purifying contaminated air, that it actually contaminates a prodigious quantity of it in a ſhort time; ſo that not only a common fire, but even a lighted candle, when kept in a well-cloſed room, wherein the external air has not a free acceſs, inſtead of purifying, renders the air of that room noxious.

Air-Gun, a pneumatic machine for exploding bullets, &c. with great violence. See Syſtem of Pneumatics.

Air-Jacket, a ſort of jacket made of leather, in which are ſeveral bags, or bladders, compoſed of the ſame materials, communicating with each other. Theſe are filled with air through a leather tube, having a braſs ſtop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket muſt be wet, before the air be blown into the bags, as otherwiſe it will immediately eſcape through the pores of the leather. By the help of theſe bladders which are placed near the breaſt, the perſon is ſupported in the water, without making the efforts uſed in ſwimming.

Air-Pipes, an invention for drawing foul air out of ſhips, or any other cloſe places, by means of fire. Theſe pipes were firſt found out by one Mr. Sutton, a brewer in London; and from him have got the name of Sutton's Air-pipes. The principle on which their operation depends is known to every body, being indeed no other than that air is neceſſary for the ſupport of fire; and, if it has not acceſs from the places moſt adjacent, will not fail to come from thoſe that are more remote. Thus, in a common furnace, the air enters through the aſh-hole; but if this is cloſed up, and a hole made in the ſide of the furnace, the air will ruſh in with great violence through that hole. If a tube of any length whatever is inſerted in this hole, the air will ruſh through the tube into the fire, and of conſequence there will be a continued circulation of air in that place where the extremity of the tube is laid. Mr. Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this. "As, in every ſhip of any bulk, there is always provided a copper or boiling-place proportionable to the ſize of the veſſel; it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling-places for the neceſſary uſes of the ſhip.

"It is well known, that, under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fires and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire-place upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip.

"It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the draught of air through the forementioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out.

"But if, after ſhutting up the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear, the ſaid fire muſt again be raiſed and burn as before, there being a like draught of air through the ſame as there was before the ſtopping up of the firſt holes; this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place.

"It is therefore propoſed, that, in order to clear the holds of ſhips of the bad air therein contained, the two holes abovementioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron-doors; and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air then contained; and conſequently, that air, ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold; whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration.

"And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively either with the [illegible] or lower decks; it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."

This account is ſo plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned through thoſe places where it otherwiſe be moſt apt to ſtagnate and putrefy. Several other contrivances have been uſed for the ſame purpoſe; and Doctor Hales's ventilators, by ſome unaccountable prejudice, have been reckoned ſuperior in efficacy and even ſimplicity to Mr. Sutton's machine, which at its firſt invention met with great oppoſition, and even when introduced by Dr. Mead, who uſed all his intereſt for that purpoſe, was ſhamefully neglected.

A machine capable of anſwering the ſame purpoſe was invented by M. Deſaguliers, which he called the *ſhip's lungs*. It conſiſted of a cylindrical box ſet up on its edge, and fixed to a wooden pedeſtal. From the upper edge of the box iſſued a ſquare trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into twelve parts, by means of partitions placed like the radii of a circle. Theſe partitions did not extend quite to the centre, but left an open ſpace of about eighteen inches diameter in the middle; towards the circumference, they extended as far as poſſible without interfering with the caſe, ſo that the wheel might always be allowed to turn freely. Things being thus circumſtanced, it is plain, that if the wheel was turned towards that ſide of the box on which the trunk was, every diviſion would puſh the air before it, and drive it out through the trunk, at the ſame time that freſh air would come in through the open ſpace at the centre, to ſupply that which was thrown out through the trunk. By turning the wheel ſwiftly, a ſtrong blaſt of air would be continually forced out through the ſquare trunk, on the ſame principles on which a common fanner winnows corn. If the wheel is turned the oppoſite way, a draught of air may be produced from the trunk to the centre. If this machine then is placed in a room where a circulation of air is wanted, and the trunk made to paſs through one of the walls; by turning the wheel ſwiftly round, the air will be forced with great velocity out of that room, at the ſame time that freſh air will enter through any chinks by which it can have acceſs to ſupply that which has been forced out.

It is evident, that the circulation which is promoted by this machine, is entirely of the ſame kind with that produced by Mr. Sutton's; the turning of the wheel in M. Deſagulier's machine being equivalent to the rarefaction of the air by fire in Mr. Sutton's; but that the latter is vaſtly ſuperior, as acting of itſelf, and without intermiſſion, requires no arguments to prove. Mr. Sutton's machine has yet another conveniency, of which no other contrivance for the ſame purpoſe can boaſt; namely, that it not only draws out putrid air, but deſtroys it by cauſing it to paſs through fire; and experience has abundantly ſhewn, that though putrid air is thrown into a great quantity of freſh air, it is ſo far from loſing its pernicious properties, that it often produces noxious diſeaſes. We do not ſay, indeed, that putrid air becomes ſalutary by this means; but it is undoubtedly rendered leſs noxious than before; though whether it is equally innocent with the ſmoke of a fire fed in the common way, we cannot pretend to determine.

Beſides this machine by M. Deſaguliers, the ventilators of Dr. Hales, already mentioned, and thoſe called *wind-ſails*, are likewiſe uſed for the ſame purpoſe; the former of which is an improvement of the Heſſian bellows: the other is a contrivance for throwing freſh air into thoſe places where putrid air is apt to lodge; but this has the laſt-mentioned inconvenience in a much greater degree than any of the others, as the blaſt of freſh air throws out that which was rendered putrid by ſtagnation, in ſuch a manner as to contaminate all around it.

Air-Trunk, is alſo a contrivance by Doctor Hales to prevent the ſtagnation of putrid effluvia in jails, and other places where a great number of people are crowded together in a ſmall ſpace. It conſiſts only of a long ſquare trunk open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reaſon is, that the putrid effluvia which do ſo much miſchief when collected, being much lighter than the pure atmoſphere, ariſe to the top of the room; and, if they there find a vent, will continually go out through it. Theſe effluvia ariſe in very conſiderable quantities, being calculated by the late Dr. Keil at no leſs than 39 ounces from one man in twenty-four hours.

Theſe trunks were firſt made trial of by Mr Yeoman, over the Houſe of Commons, where they were [illegible] inches wide within; and over the Court of King's Bench, in Weſtminſter-Hall, where they were ſix inches wide. They are ſometimes made wider, and ſometimes narrower: but the wider they are, the longer they ought to be, more effectually to promote the aſcent of the vapour. The reaſon why vapours of this kind aſcend [illegible] ſwiftly through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to their different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing on the upper end of the trunk, and that which preſſes on the lower end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter. One pan of a ſingle pair of ſcales, which was two inches in diameter, being held within one of of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than twelve grains were requiſite to reſtore the equilibrium; which clearly ſhews, that theſe trunks muſt be of real and very great efficacy.

Air-Pump, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. See Syſtem of Pneumatics.

Air-Shafts, among miners, denote holes or ſhafts let down from the open air to meet the adits and furniſh freſh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air-ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard of their vaſt depths, hardneſs of the rock, drawing of the water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray deſcribes a method, uſed in the coal-mines at Liege, of working mines without air-ſhafts.

When the miners at Mendip have ſunk a groove, they will not be at the charge of an Air-ſhaft till they come at ore; and for the ſupply of air have boxes of elm exactly cloſed, of about ſix inches in the clear, by which they carry it down about twenty fathoms. They cut a trench at a little diſtance from the top of the groove, covering it with turf and rods diſpoſed to receive the pipe, which they contrive to come in ſideways to their groove, four feet from the top; which carries down the air to a great depth. When they come at ore, and need an air-ſhaft, they ſink it four or five fathoms diſtant, according to the convenience of the breadth, and of the ſame faſhion with the groove, to draw as well ore as air.

Air-Threads, in natural hiſtory, a name given the long filaments, ſo frequently ſeen in autumn, floating about in the air.

Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field-ſpider; which, having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air: on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height.

Air-Vessels, are ſpiral ducts in the leaves, &c. of plants, ſuppoſed to be analogous to the lungs of animals, in ſupplying the different parts of a plant with air.

Air, in mythology, was adored by the Heathens under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſphere, and the latter the inferior and groſſer part. The augurs alſo drew preſages from the clouds, thunder, lightning, &c.

Air, in painting, &c. denotes the manner and very life of action; or it is that which expreſſes the diſpoſition of the agent. It is ſometimes alſo uſed in a ſynonymous ſenſe with geſture or attitude.

Air, in muſic, is taken in different ſenſes. It is ſometimes contraſted with harmony; and, in this ſenſe, it is ſynonymous with melody in general. Its proper meaning is, a tune, which is ſet to words, or to ſhort pieces of poetry that are called *ſongs*.

In operas, we give the name of *air* to ſuch pieces of muſic as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an *air*, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the ſubject admits of harmony, and is ſet in parts, the *air* is, according to their number, denominated a *duet*, a *trio*, a *quartetto*, &c. We need not follow Rouſſeau, and the other philologiſts, in their endeavours to inveſtigate the etymon of the word *air*. Its derivation, though found and aſcertained, would contribute little to illuſtrate its meaning in that remote ſenſe, to which, through a long continuance of time, and the various viciſſitudes of language, it has now paſſed.

In modern muſic, there are ſeveral different kinds of *airs*, each of which agrees to a certain kind of dancing, and from theſe dances the airs themſelves take their ſpecific names.

The *airs* of our operas are, if we may be permitted the expreſſion, the canvaſs, or ſubſtratum, upon which are painted all the pictures of imitative muſic; melody is the deſign, and harmony the colouring; every pictureſque object ſelected from the moſt beautiful parts of nature, every reflected ſentiment of the human heart, are the models which the artiſt imitates; whatever gains attention, whatever intereſts the ſoul, whatever charms the ear, or cauſes emotion in the heart, theſe are the objects of his imitation. An air which delights the ear, and diſcovers the learning of the compoſer; an air invented by genius, and compoſed with taſte; is the nobleſt effort of muſic: it is this which explores the compaſs, and diſplays the delicacy, of a beautiful voice; it is in this where the charms of a well-conducted ſymphony ſhine; it is by this, that the paſſions, excited and inflamed by nice gradations, reach and agitate the ſoul through the avenues of external ſenſe. After hearing a beautiful *air*, the mind is acquieſcent and ſerene: the ear is ſatisfied, not diſguſted: it remains impreſſed on the fancy, it becomes a part of our eſſence, we carry it with us, we are able to repeat it at pleaſure: without the ability acquired by habit to breathe a ſingle note of it, we execute it in our imagination in the ſame manner as we heard it upon the theatre: one ſees the ſcene, the actor, the theatre; one hears the accompaniments and the applauſes. The real enthuſiaſt in muſic never forgets the beautiful airs which he has heard; when he chooſes, he cauſes the opera to re-commence.

The words to which *airs* are adapted, are not always rehearſed in regular ſucceſſion, nor ſpoken in the ſame manner with thoſe of the recitative; and though, for ordinary, they are very ſhort, yet they are interrupted, repeated, tranſpoſed, at the pleaſure of the artiſt. They do not conſtitute a narrative, which once told is over; they either delineate a picture, which it is neceſſary to contemplate in different points of view; or inſpire a ſentiment in which the heart acquieſces with pleaſure, and from which it is neither able or willing to be diſengaged; and the different phraſes of the *air* are nothing elſe but different manners of beholding the ſame image. This is the reaſon why the ſubject of an *air* ſhould be one. It is by theſe repetitions properly placed, it is by theſe redoubled efforts, that an impreſſion, which at firſt was not able to move you, at length ſhakes your ſoul, agitates you, tranſports you out of yourſelf: and it is likewiſe upon the ſame principle, that the runnings, as they are called, or thoſe long, mazy, and inarticulated inflections of the voice, which, in pathetic *airs*, frequently ſeem, though they are not always ſo, improperly placed; whilſt the heart is affected with a ſentiment exquiſitely moving, it often expreſſes its emotions by inarticulate ſounds, more ſtrongly and ſenſibly than it could do by words themſelves.

The form of *airs* is of two kinds. The ſmall airs are often compoſed of two ſtrains, which ought each of them to be ſung twice; but the important airs in operas are frequently in the form of rondeaus.

AIRA, in botany, a genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, gramina. For the characters ſee Syſtem of Botany. There is no pericarpium; including corolla grows to the ſeed: the ſeed is egg-ſhaped and covered. There are fourteen ſpecies of the aira, nine of which are natives of Britain. The Engliſh name is Hair-graſs.

AIRING, a term peculiarly uſed for the exerciſing horſes in the open air. It purifies the blood; purges the body from groſs humours; and, as the jockies expreſs it, teaches the horſe how to make his wind rake equally, and keep time with the other motions of his body. It alſo ſharpens the ſtomach, and keeps the creatures hungry; which is a thing of great conſequence, as hunters and racers are very apt to have their ſtomachs fall off, either from want of exerciſe, or from the too violent exerciſe which they are often expoſed to. If the horſe be over fat, it is beſt to air him before ſun-riſe and after ſun-ſetting; and in general, it is allowed by all, that nothing is more beneficial to thoſe creatures than early and late airings. Some of our modern managers, however, diſpute this: they ſay, that the cold of theſe times is too great for the creature; and that if, in particular, he is ſubject to catarrhs, rheums, or the like complaints, the dews and cold fogs, in theſe early and late airings, will be apt to o increaſe all thoſe diſorders. Nature, we ſee, alſo points out he ſun-beams as of great uſe to theſe animals; thoſe which re kept hardy and lie out all night, always running to thoſe laces where the ſunſhine comes, as ſoon as it appears in a norning. This ſhould ſeem to recommend thoſe airings that re to be made before ſun-ſet, and a little time after ſun-riſe. As to the caution, ſo earneſtly inculcated by Markham, of uſing heſe early and late airings for fat horſes, it is found unneceſſary y many: for they ſay, that the ſame effect may be produced by irings at warmer times, provided only that they are made onger; and that, in general, it is from long airings we are to xpect to bring a horſe to a perfect wind and ſound courage.

AIRS, in the manege, are the artificial motions of taught orſes; as the demivolt, curvet, capriole, &c.

AIRY, or Aery, among ſportſmen, a term expreſſing the eſt of a hawk or eagle.

Airy Triplicity, among aſtrologers, denotes the three igns, gemini, libra, and aquarius.

AJUBATIPITA Braſilienſum, in botany, a name given o a ſhrub that bears a black fruit like an almond, which yields a reat deal of oil.

AJUGA, Bugle, a genus of the gymnoſpermia order, beonging to the didynamia claſs of plants; and in the natural nethod ranking under the 42d order, *Aſperifoliæ*. For the chaacters, ſee Syſtem of Botany. The ſpecies enumerated by innæus are, 1. The orientalis, with inverted flowers, which is native of the eaſt. 2. The genevenſis, a native of Swiſſerland. . The pyramidalis, or mountain-bugle, a native of Sweden, ermany, Swiſſerland, and the hilly parts of Europe, and is net with in woods and moiſt places in many parts of Britain. he roots are aſtringent, and ſtrike a black colour with vitriol f iron.

The firſt ſpecies is propagated by ſowing the ſeeds ſoon after hey are ripe, in a pot filled with loamy earth, and placed in a hady ſituation till autumn; when it muſt be removed under a rame, and protected from the froſts. In the ſpring, after the lants are come up, let them be tranſlated each into a ſeparate ot, and in ſummer placed under a ſhady ſituation. The other orts are eaſily propagated by their ſide-ſhoots, and ſucceed beſt n a moiſt ſhady ſituation.

AJURU Catinga, in ornithology, a ſpecies of parrot found n Brazil, South America.

Ajuru Curau, in ornithology, another ſort of Brazilian arrot of various colours.

Ajuru Para, in ornithology, a ſpecies of the ſmall Braſiian parrot.

AIUS Locutius, the name of a deity to whom the Romans rected an altar. The words are Latin, and ſignify "a ſpeaking oice." The following accident gave occaſion to the Romans recting an altar to the Aius Locutius. One M. Seditius, a lebeian, acquainted the tribunes, that, in walking the ſtreets y night, he had heard a voice over the temple of Veſta, giving he Romans notice that the Gauls were coming againſt them. This intimation was however neglected; but after the truth was onfirmed by the event, Camillus acknowledged this voice to e a new deity, and erected an altar to it under the name of the ius Locutius.

AJUTAGE, or Adjutage, a kind of tube fitted to the nouth of the veſſel through which the water of a fountain is to e played. To the different form and ſtructure of ajutages, is wing the great variety of fountains.

AIZOON, in botany, called by Mr. Miller *ſempervive*; hough the name Aizoon has been by ſome writers applied to the ouſe-leek, and alſo to the aloes: it is a genus of the pentaynia order, belonging to the icoſandria claſs of plants; and in he natural method ranking under the 13th order, Succulentæ. innæus mentions three ſpecies; the canarienſe, hiſpanicum, nd paniculatum. The firſt is a native of the Canary iſlands, he ſecond of Spain, and the third of the Cape of Good Hope. hey may all be raiſed in this country on hot-beds.

AKOND, an officer of juſtice in Perſia, who takes cogniance of the cauſes of orphans and widows; of contracts, and ther civil concerns. He is the head of the ſchool of law, and ives lectures to all the ſubaltern officers; he has his deputies in ll the courts of the kingdom, who, with the ſecond *ſadra*, nake all contracts.

AL, an Arabic particle prefixed to words, and ſignifying much e ſame with the Engliſh particle *the*: thus they ſay, alkermes, lkoran, &c. i. e. the kermes, the koran, &c.

Al, or Ald, a Saxon term frequently prefixed to the names f places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a Latin term properly ſignifying a wing; from a reemblance to which ſeveral other things are called by the ſame ame: Thus,

Ala, is a term uſed by botaniſts for the hollow of a ſtalk, which ther the leaf, or the pedicle of the leaf, makes with it; or it that hollow turning, or ſinus, placed between the ſtalk or ranch of a plant and the leaf, whence a new offſpring uſually ues. Sometimes it is uſed for thoſe parts of leaves, otherwiſe lled *lobes*, or *wings*.

ALÆ (the plural number) is uſed to ſignify thoſe petals or leaves of papilionaceous flowers, placed between thoſe others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Inſtances of flowers of this ſtructure are ſeen in thoſe of peaſe and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the ſide ones the alæ.

Alæ is alſo uſed for thoſe extremely ſlender and membranaceous expanſions running along the ſtems of ſome plants, which are therefore called *alated ſtalks*.

Alæ, in anatomy, a term applied to the lobes of the liver, the cartilages of the noſtril, &c.

Alæ, in the Roman art of war, were the two wings or extreme parts of the army drawn up in order of battle.

ALABARCHA, in antiquity, a kind of magiſtrate among the Jews of Alexandria, whom the emperors allowed them to elect, for the ſuperintendency of their policy, and to decide differences and diſputes which aroſe among them.

ALABARDA, the name of a ſpear, anciently uſed by the Helvetians and Germans.

ALABASTER, in natural hiſtory, a ſpecies of that genus of ſtones whoſe baſe is calcareous earth. It differs from marble in being combined, not with the aërial, but with vitriolic acid; therefore, when mixed with any acid, no efferveſcence appears. It is ſoluble in about 500 times its weight of water at the temperature of 60. It is fuſible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture granular, with ſhining particles. In compoſition, and conſequently in its chemical properties, it does not differ from gypſum, ſelenite, and plaſter of Paris.

There are three ſpecies of alabaſter. 1. The ſnow-white ſhining alabaſter, or lygdinum of the ancients, is found in Taurus, in pieces large enough to make diſhes, or the like. It cuts very freely, and is capable of a fine poliſh. 2. The yellowiſh alabaſter, or phengites of Pliny, is found in Greece; and is of a ſoft looſe open texture, pretty heavy, and nearly of the colour of honey. This ſpecies has likewiſe been found in Germany, France, and in Derbyſhire in England. 3. Variegated, yellow, and reddiſh alabaſter. This ſpecies is the common alabaſter of the ancients, and is ſo ſoft that it may be cut with a knife: it is remarkably bright, and almoſt tranſparent; admits of a fine poliſh, and conſiſts of large angular ſparry concretions. It is not proof againſt water; it ferments violently with aqua-fortis, and burns to a pale yellow. The colour of this ſpecies is a clear pale yellow reſembling amber, and variegated with undulated veins; ſome of which are pale red, others whitiſh, and others of a pale brown. It was formerly brought from Egypt, but is now to be met with in ſeveral parts of England. The alabaſters are frequently uſed by ſtatuaries for ſmall ſtatues, vaſes, and columns. After being calcined and mixed with water, they may be caſt in any mould like plaſter of Paris.

Alabaster, in antiquity, a term uſed for a vaſe wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter-ſtone, which Pliny and other ancients repreſent as peculiarly proper for this purpoſe.

Alabaster is alſo ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABASTRITÆ Alabastrites, in natural hiſtory, a ſpecies of alabaſter.

ALABASTRUM Dendroide, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to free-thinkers among us.

ALAMANNICUM, in antiquity, a tribute impoſed by the Roman emperor Alexius Angelus.

ALAMODALITY, in a general ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

Alamodality *of Writing*, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times, in order to render them more acceptable to the readers.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode. The phraſe has been adopted not only into ſeveral of the living languages, as the Engliſh and High Dutch, but ſome have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas*.

Alamode, in commerce, a thin gloſſy black ſilk, chiefly uſed for womens hoods and mens mourning ſcarfs.

ALANA-Gibea, a name given to the yellowiſh white tripoli.

ALANA-Terra, ſignifies a drying aſtringent, uſed in diſtillation, commonly known by the name of Engliſh oker.

ALANFUTA, ſignifies in the Perſian art of phyſic, to bleed between the chin and the under lip, to cure a foul breath.

ALANORARIUS, in antiquity, implies a ſportſman, or keeper of game dogs.

ALAPOULI, in phyſioligy, implies a ſpecies of the Eaſt Indian medicinal tree called bilimbi.

ALAQUECA, an Indian medicinal ſtone, ſaid to be good againſt hemorrhages, when applied internally.

ALARAF, in the Mahometan theology, the partition wall that ſeparates heaven from hell. The word is plural, and properly written *al araf*; in the ſingular it is written *al arf*. It is derived from the Arabic verb *arafa*, to diſtinguiſh. Al araf gives the denomination to the ſeventh chapter of the alcoran, wherein is made mention of this wall. Mahomet ſeems to have copied his Al araf, either from the great gulph of ſeparation mentioned in the New Teſtament, or from the Jewiſh writers, who alſo ſpeak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the perſons who are to be found on Al araf. Some take it for a ſort of limbus for the patriarchs, prophets, &c. others place here ſuch whoſe good and evil works ſo exactly balance each other, that they deſerve neither reward or puniſhment. Others imagine this intermediate ſpace to be poſſeſſed by thoſe who, going to war without their parents leave, and ſuffering martyrdom there, are excluded paradiſe for their diſobedience, yet eſcape hell becauſe they are martyrs.

ALARBES, a name given to thoſe Arabians who live in tents, and diſtinguiſh themſelves by their dreſs from the others who live in towns.

ALARES, in Roman antiquity, an epithet given to the cavalry, on account of their being placed in the two wings of the army.

ALARIS VENA, the innermoſt of the three veins in the bend of the arm.

ALARM, in the military art, denotes either the apprehenſion of being ſuddenly attacked; or the notice thereof, ſignified by firing a cannon, firelock, or the like. Falſe alarms are frequently made uſe of, to harraſs the enemy, by keeping them conſtantly under arms. Sometimes alſo this method is taken to try the vigilance of the picket-guard, and what might be expected from them in caſe of real danger.

ALARM-BELL, that rung upon any ſudden emergency, as a fire, mutiny, or the like.

ALARM-POST, or ALARM-PLACE, the ground for drawing up each regiment in caſe of an alarm. This is otherwiſe called *the rendezvous*.

ALARM, in fencing, is the ſame with what is otherwiſe called an appeal, or challenge.

ALASCANI, in church hiſtory, a ſect of Antilutherans, whoſe diſtinguiſhing tenet, beſides their denying baptiſm, is ſaid to have been this, that the words, *This is my body*, in the inſtitution of the euchariſt, are not to be underſtood of the bread, but of the whole action, or celebration of the ſupper. They are ſaid to have taken the name from one Joannes a Laſco, a Poliſh baron, ſuperintendant of the church of that country, in England.

ALASTROB, in alchymy, denotes lead.

ALATERNOIDES, in botany, ſignifies the caſſire.

ALATERNUS, in botany, the trivial name of a ſpecies of the ramanus.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of paſſeres; there are 28 ſpecies of the alauda, of which the arvenſis, or common ſky-lark, is the moſt remarkable. This and the wood-lark are the only birds that ſing as they fly; this raiſing its note as it ſoars, and lowering it till it quite dies away as it deſcends. It will often ſoar to ſuch a height, that we are charmed with the muſic when we loſe ſight of the ſongſter; it alſo begins its ſong before the earlieſt dawn. Milton, in his Allegro, moſt beautifully expreſſes theſe circumſtances; and biſhop Newton obſerves, that the beautiful ſcene that Milton exhibits of rural cheerfulneſs, at the ſame time gives us a fine picture of the regularity of his life, and the innocency of his own mind: thus he deſcribes himſelf as in a ſituation

> To hear the lark begin his flight,
> And ſinging ſtartle the dull night,
> From his watch-tow'r in the ſkies,
> Till the dappled dawn doth riſe.

It continues its harmony ſeveral months, beginning early in the ſpring, on pairing. In the winter they aſſemble in vaſt flocks, grow very fat, and are taken in great numbers for our tables. They build their neſts on the ground, beneath ſome clod, forming it of hay, dry fibres, &c. and lay four or five eggs. The place theſe birds are taken in the greateſt quantities, is the neighbourhood of Dunſtable: the ſeaſon begins about the 14th of September, and ends the 25th of February; and during that ſpace, innumerable quantities are caught, which ſupply the markets of the metropolis.

ALAY, ſignifying in the Turkiſh language "The Triumph," a ceremony which accompanies the aſſembling together the forces of that vaſt empire upon the breaking out of a war. It conſiſts of the moſt inſipid buffoonery, and is attended with acts of the moſt ſhocking barbarity. That which took place upon occaſion of the late war between the Porte and Ruſſia is deſcribed by Baron Tott, in his Memoirs, as follows:

"It conſiſts in a kind of maſquerade, in which each trade ſucceſſively preſents to the ſpectators the mechanical exerciſe of its reſpective art. The labourer draws his plough, the weaver handles his ſhuttle, the joiner his plane; and theſe different characters, ſeated in cars richly ornamented, commence the proceſſion, and precede the ſtandard of Mahomet, when it is brought out of the ſeraglio to be carried to the army, in order to inſure victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or The Standard of the Prophet, is ſo revered among them, that, notwithſtanding its reputation has been ſo often tarniſhed, it ſtill retains their implicit confidence, and is the ſacred ſignal unto which they rally. Every thing proclaims its ſanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Muſſelmen alone are permitted to look upon it. If touched by other hands, it would be defiled; if ſeen by other eyes, profaned. In ſhort, it is encompaſſed by the moſt barbarous fanaticiſm.

"A long peace had unfortunately cauſed the ridiculouſneſs, and eſpecially the danger, of this ceremony to be forgotten. The Chriſtians imprudently crowded to ſee it; and the Turks, who, by the ſituation of their houſes, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his preſence the holy ſtandard of the prophet; and let every Muſſulman who perceives an unbeliever, make it known under pain of reprobation.'

"From that moment no aſylum was to be found; even thoſe became informers, who, by letting out their houſes, had rendered themſelves accomplices in the crime. A religious fury ſeized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meretorious. No regard was paid to ſex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, periſhed in the moſt deplorable manner. Nothing was reſpected by theſe monſters; and under ſuch auſpices the Turks commenced the war."

ALB, or ALBE, in the Romiſh church, a veſtment of white linen hanging down to the feet, and anſwering to the ſurplice of the Engliſh clergy. In the ancient church, it was uſual, with thoſe newly baptized, to wear an Alb, or white veſtment; and hence the Sunday after Eaſter was called *dominica in albis*, on account of the Albs worn by thoſe baptized on Eaſter-day.

ALB is alſo a name of a Turkiſh coin, otherwiſe called *aſper*.

ALBADARA, ſignifies, in Arabic, the ſeſamoide bone of the firſt joint of the great toe, which is about the ſize of a ſmall pea; and is of the like uſe to that joint as the patella is to the knee.

ALBA FIRMA, or ALBUM, in our old cuſtoms, denoted rent paid in ſilver, and not in corn, which was called *black-mail*.

ALBA TERRA, one of the numerous names for the philoſopher's ſtone.

ALBAHURIM, *figura ſexdecim laterum*, a figure of great importance according to aſtrological phyſicians, who built their prognoſtics on it.

ALBANENSES, in church-hiſtory, the ſame with Albigenſes, according to ſome; according to others, different. Thoſe, however, who are for diſtinguiſhing them, attribute the ſame opinions to both; only making the Albanenſes to have been prior in reſpect of time, as having been found towards the cloſe of the eighth century; whereas the Albigenſes appeared not till the twelfth.

ALBANI, in Roman antiquity, a college of the *ſalii*, or prieſts of Mars; ſo called from mount Albanus, the place of their reſidence.

ALBANUM, in chemiſtry, implies ſalt of urine.

ALBARA, in medicine, ſignifies a malignant itch, originating from various cauſes.

ALBARAZIN, or ABAZARIN, a kind of Spaniſh wool.

ALBARDEOLA, in ornithology, a name given to the bird called the ſpoonbill.

ALBARII, in antiquity, properly denoted thoſe who gave the whitening to earthen veſſels, &c. In which ſenſe they ſtood contradiſtinguiſhed from *dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incruſtation or covering of the roofs of houſes with white plaſter, made of mere lime. This is otherwiſe called *opus album*. It differs from *tectorium*, which is a common name given to all roofing or cieling, including even that formed of lime and ſand, or lime and marble; whereas *albarium* was reſtrained to that made of lime alone.

ALBATI EQUI, an appellation given to ſuch horſes, in the games of the ancient circus, as wore white furniture.

ALBATROSS, in ornithology, the name of a large ſea-bird common about the Cape of Good Hope. It is a thieviſh animal, and principally feeds on the prey which another ſea-bird, called the *booby*, provides for itſelf.

ALBE, a ſmall piece of money, current in Germany, worth only a French ſol and ſeven deniers.

ALBELEN, in ichthyology, a fiſh of the truttaceous kind, of a fine ſilver colour.

ALBELLUS, a ſpecies of the anſeres, belonging to the genus of Mergus.

ALBEOLA, a ſpecies of anas.

ALBERNUO, a kind of camblet, brought from the Levant by the way of Marſeilles.

ALBERTISTS, a ſect of ſcholaſtics, ſo named from their leader Albertus Magnus.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the adminiſtration of Albertus archduke of Auſtria.

ALBESIA, in antiquity, a kind of ſhield, otherwiſe called *decumana*.

ALBICILLA, in phyſiology, implies a ſpecies of the eagle kind.

ALBIGENSES, in church hiſtory, a ſect or party of reformers, about Toulouſe and the Albigeois in Languedoc, who ſprung up in the twelfth century, and diſtinguiſhed themſelves by their oppoſition to the diſcipline and ceremonies of the Romiſh church.

This ſect had their name, it is ſuppoſed, either by reaſon there were great numbers of them in the dioceſe of Albi, or becauſe they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenſes* were alſo called *Albiani*, *Albigeſei*, *Albii*, and *Albanenſes*, though ſome diſtinguiſh theſe laſt from them. Other names given to them are, *Henricians*, *Abelardiſts*, *Bulgarians*, &c. ſome on account of the qualities they aſſumed; others on that of the country from whence it is pretended they were derived; and others on account of perſons of note who adopted their cauſe, as Peter de Brius, Arnold de Breſſe, Abelard, Henry, &c. Berengarius, if not Wickliff himſelf, is by ſome ranked in the number. The *Albigenſes* are frequently confounded with the *Waldenſes*; from whom, however, they differ in many reſpects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers hereſies, particularly Manicheiſm, from which the *Waldenſes* are exempt. But ſeveral proteſtant writers have vindicated them from that imputation. Dr. Allix ſhows, that a great number of *Manichees* did ſpread over the weſtern countries from Bulgaria; and ſettled in Italy, Languedoc, and other places, where there were alſo *Albigenſes*; by which means, being both under the imputation of *hereſy*, they came, either by ignorance or malice, to be confounded, and called by the ſame common name, though in reality entirely different.

ALBIGENSES is alſo a name ſometimes given to the followers of Peter Vaud, or Waldo; and hence ſynonymous with what we more properly call *Waldenſes*, or Poor Men of Lyons. In this ſenſe the word is applied by Camerarius, Thuanus, and ſeveral other writers.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium*. They make a different profeſſion from the *dealbatores* or *whiteners*.

ALBINOS, the name by which the Portugueſe call the white Moors, who are looked upon by the negroes as monſters. They at a diſtance might be taken for Europeans; but, when you come near them, their white colour appears like that of perſons affected with a leproſy.

In Sauſſure's *Voyages dans les Alpes*, is the following account of two boys, at Chamouni, who have been called *Albinos*. "The elder, who was at the end of the year 1785 about twenty, or one-and-twenty years of age, had a dull look, with lips ſomewhat thick, but nothing elſe in his features to diſtinguiſh him from other people. The other, who is two years younger, is rather a more agreeable figure: he is gay and ſprightly, and ſeems not to want wit. But their eyes are not blue; the iris is of a very diſtinct roſe-colour; the pupil too, when viewed in the light, ſeems decidedly red; which ſeems to demonſtrate, that the interior membranes are deprived of the uvea, and of that black mucous matter that ſhould line them. Their hair, their eye-brows, and eye-laſhes, the down upon their ſkin, were all, in their infancy, of the moſt perfect milk-white colour, and very fine; but their hair is now of a reddiſh caſt, and has grown pretty ſtrong. Their ſight too is ſomewhat ſtrengthened; though they exaggerate to ſtrangers their averſion for the light, and half-ſhut the eye-lids, to give themſelves a more extraordinary appearance. But thoſe who, like me, have ſeen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can atteſt that then they were not very much offended with the light of day. At that time, they were ſo little deſirous of exciting the curioſity of ſtrangers, that they hid themſelves to avoid ſuch; and it was neceſſary to do a ſort of violence to them before they could be prevailed on to allow themſelves to be inſpected. It is alſo well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like the other children at the ſame age; and that one of their uncles maintained them out of charity, at a time of life when others were capable of gaining a ſubſiſtence by their labour.

"I am therefore of opinion, that we may conſider theſe two lads as true albinos: for if they have not the thick lips and flat noſes of the white negroes, it is becauſe they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair; it even diminiſhes the ſtrength, but does not alter the conformation of the features. Beſides, there are certainly in this malady various degrees: ſome may have leſs ſtrength, and be leſs able to endure the light: but theſe circumſtances in thoſe of Chamouni are marked with characters ſufficiently ſtrong to intitle them to the unhappy advantage of being claſſed with that variety of the human ſpecies denominated albinos.

"When nature preſents the ſame appearance often, and with circumſtances varied, we may at laſt diſcover ſome general law, or ſome relation which that appearance has with known cauſes: but when a fact is ſo ſingular and ſo rare, as that of thoſe albinos, it gives but little ſcope to conjectures; and it is very difficult to verify thoſe by which we attempt to explain it.

"I at firſt imagined that this diſeaſe might be referred to a particular ſort of organic debility; that a relaxation of the lymphatic veſſels within the eye might ſuffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina, which might occaſion the redneſs of the iris and of the pupil. The ſame debility ſeemed alſo to account for the intolerance of the light, and for the whiteneſs of the hair.

"But a learned phyſiologiſt, M. Blumenbach, profeſſor in the univerſity at Gottingen, who has made many profound obſervations on the organs of ſight, and has conſidered with great attention the albinos of Chamouni, attributes their infirmity to a different cauſe.

"The ſtudy of comparative anatomy has furniſhed him with frequent opportunities of obſerving this phenomenon; he has found it in brutes, in white dogs, and in owls; he ſays, it is generally to be ſeen in the warm-blooded animals; but that he has never met with it in thoſe with cold blood.

"From his obſervations, he is of opinion, that the redneſs of the iris, and of the other internal parts of the eye, as well as the extreme ſenſibility that accompanies this redneſs, is owing to the total privation of that brown or blackiſh mucus, that, about the fifth week after conception, covers all the interior parts of the eye in its ſound ſtate. He obſerves, that Simon Pontius, in his treatiſe *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were leſs abundantly provided with this black mucus, and were therefore more ſenſible to the action of light. This ſenſibility of blue eyes agrees very well, ſays M. Blumenbach, with northern people, during their long twilight; while, on the contrary, the deep black in the eyes of negroes enables them to ſupport the ſplendor of the ſun's beam in the torrid zone.

"As to the connection between this red colour of the eyes and the whiteneſs of the ſkin and hair, the ſame learned phyſiologiſt ſays, that it is owing to a ſimilarity of ſtructure, *conſenſus ex ſimilitudine fabricæ*. He aſſerts, that this black mucus formed only in the delicate cellular ſubſtance, which has numerous blood-veſſels contiguous to it, but contains no fat; like the inſide of the eye, the ſkin of negroes, the ſpotted palate of ſeveral domeſtic animals, &c. And, laſtly, he ſays, that the colour of the hair generally correſponds with that of the iris. *Gazette litt. de Gotingue*, Oct. 1784.

"At the very time that M. Blumenbach was reading this memoir to the Royal Society of Gottingen, M. Buzzi, ſurgeon to the hoſpital at Milan, an eleve of the celebrated anatomiſt *Moſcati*, publiſhed in the *Opuſcoli Scelti de Milan*, 1784, t. vii. p. 11. a very intereſting memoir, in which demonſtrates by diſſection what Blumenbach had only ſuppoſed.

"A peaſant of about 30 years of age died at the hoſpital of Milan of a pulmonary diſorder. His body, being expoſed to view, was exceedingly remarkable by the uncommon whiteneſs of the ſkin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long deſired an opportunity of diſſecting ſuch a ſubject, immediately ſeized upon this. He found the iris of the eyes perfectly white, and the pupil of a roſe-colour. The eyes were diſſected with the greateſt poſſible care, and were found entirely deſtitute of that black membrane which anatomiſts call the *uvea*; it was not to be ſeen either behind the iris, or under the retina: within the eye there was only found the choroid coat extremely thin and tinged, of a pale red colour, by veſſels filled with diſcoloured blood. What was more extraordinary, the ſkin, when detached from different parts of the body, ſeemed alſo entirely diveſted of the *rete mucoſum*: maceration did not diſcover the leaſt veſtige of this, not even in the wrinkles of the abdomen, where it is moſt abundant and moſt viſible.

"M. Buzzi likewiſe accounts for the whiteneſs of the ſkin and of the hair, from the abſence of the *rete mucoſum*, which, according to him, gives the colour to the cuticle, and to the hairs that are ſcattered over it. Among other proofs of this opinion, he alleges a well known fact, that if the ſkin of the blackeſt horſe be accidentally deſtroyed in any part of the body, the hairs that afterwards grow on that part are always white, becauſe the *rete mucoſum* which tinges thoſe hairs is never regenerated with the ſkin.

"The proximate cauſe of the whiteneſs of albinos, and the colour of their eyes, ſeems therefore pretty evidently to depend on the abſence of the *rete mucoſum:* But what is the remote cauſe?

"In the firſt place, it ſeems probable that men affected with this infirmity form no diſtinct ſpecies, for they are produced from parents that have dark ſkins and black eyes. What is then that deſtroys the *rete mucoſum* in ſuch perſons? M. Buzzi relates a ſingular fact, which ſeems to throw ſome light on this ſubject.

"A woman of Milan, named Calcagni, had ſeven ſons. The two eldeſt had brown hair and black eyes; the three next had white ſkins, white hair, and red eyes: the two laſt reſembled the two eldeſt. It was ſaid that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which ſhe took in great quantities: but that when ſhe was with child of the other four children, ſhe had no ſuch deſire. It is not however aſcertained, that this preternatural appetite was not itſelf the effect of a certain heat, or internal diſeaſe, which deſtroyed the *rete mucoſum* in the children before they were born.

"The albinos of Chamouni are alſo the offſpring of parents with dark ſkins and black eyes. They have three ſiſters by the ſame father and mother, who are alſo brunettes. One of them that I ſaw had the eyes of a dark brown, and the hair almoſt black. They are ſaid, however, to be all afflicted with a weakneſs of ſight. When the lads are married, it will be curious to obſerve how the eyes of their children will be formed. The experiment would be particularly deciſive if they were married to women like themſelves. But this faulty conformation ſeems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one deſcribed by Mauperitus, the one by Helvetius, and almoſt all the inſtances of theſe ſingular productions, have been of our ſex. It is known, however, that there are races of men and women affected with this diſeaſe, and that theſe races perpetuate themſelves, in Guinea, in Java, at Panama, &c.

"Upon the whole, this degeneration does not ſeem to be owing to the air of the mountains; for though I have traverſed the greateſt part of the Alps, and the other mountains of Europe, theſe are the only individuals of the kind ever I met with."

ALBION, the ancient name of Britain.

ALBIREO, in aſtronomy, a ſtar of the third or fourth magnitude, in the conſtellation Cygnus.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, in the Mahometan theology, the beaſt on which the pretended prophet is ſaid to have rode in his extraordinary aërial journies. It is repreſented as of an intermediate ſhape and ſize, between an aſs and a mule; and many fabulous accounts are given of it by the Arabian commentators.

ALBORO, in ichthyology, a name by which the erythrinus, a ſmall red fiſh, caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBUCA, Baſtard star-of-Bethlehem: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ.* For its characters, ſee Syſtem of Botany. Of this genus Linnæus reckons only two ſpecies. The major, or ſtar-flower, with ſpear-ſhaped leaves, a native of Canada, and North America: and the minor, or African ſtar-flower, a native of the Cape of Good Hope.

The Canada albuca is hardy; ſo the roots may be planted about four inches deep in a border of light earth, where they will thrive and produce their flowers late in the ſummer: but as the ſeeds do not often ripen in Britain, and the bulbs put out few off-ſets, the plants are not common in this country. The African ſort generally flowers twice a-year; firſt in March or April, and again in July or Auguſt; and if its roots are kept in pots filled with light earth, ſheltered under a hot-bed frame, they will flower even in winter.

ALBUGINEA Tunica, in anatomy, the third or innermoſt coat or covering of the teſtes; it is likewiſe the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term ſometimes applied to the aqueous humour of the eye.

ALBUGO, or Leucoma, in medicine, a diſtemper occaſioned by a white opaque ſpot growing on the cornea of the eye, and obſtructing viſion.

ALBULA, in ichthyology, a ſpecies of the truttaceous kind of fiſhes having no teeth: there are various kinds under this denomination.

ALBUM, in antiquity, a kind of white table, or regiſter, wherein the names of certain magiſtrates, public tranſactions, &c. were entered. Of theſe there were various ſorts; as the *album decurionum, album ſenatorum, album judicum, album prætoris*, &c.

Album *Decurionum*, was the regiſter wherein the names of the *decuriones* were entered. This is otherwiſe called *matriculatio decurionum.*

Album *Senatorum*, the liſt of ſenators names, which was firſt introduced by Auguſtus, and renewed yearly.

Album *Judicum*, that wherein the names of the perſons of thoſe decuriæ who judged at certain times, were entered.

Album *Prætoris*, that wherein the *formulæ* of all actions, and the names of ſuch judges as the prætor had choſen to decide cauſes, were written.

The high-prieſt entered the chief tranſactions of each year into an *album*, or table, which was hung up in his houſe for the public uſe.

Album is alſo uſed, in later times, to denote a kind of table, or pocket-book, wherein the men of letters with whom a perſon has converſed, inſcribe their names with ſome ſentence or motto. The famous Algernon Sydney being in Denmark, was by the univerſity of Copenhagen preſented with their *album*, whereupon he wrote theſe words:

——— *Manus hæc inimica tyrannis*
Enſe petit placidam ſub libertate quietem.

Album *Græcum*, among phyſicians, the white dung of dogs, formerly preſcribed for inflammations of the throat, &c. but now juſtly deſpiſed.

ALBUMEN, the white of an egg. This, according to Boerhaave, makes an extraordinary menſtruum. Being boiled hard in the ſhell, and afterwards ſuſpended in the air by a thread, it reſolves and drops down into an inſipid, ſcentleſs liquor, which appears to be that anomalous unaccountable menſtruum ſo much uſed by Paracelſus; and will, though it contains nothing ſharp, oleaginous, or ſaponaceous, make a thorough ſolution of myrrh; which is more than either water, oil, ſpirits, or even fire itſelf, can effect.

A little putrid white of egg taken into the ſtomach, occaſions a nauſea, horror, fainting, vomiting, diarrhœa, and gripes; it inflames the bile, excites heat, thirſt, fever; and diſſolves the humours like the plague. On the contrary, the white of freſh-laid eggs, if taken while warm from the hen, is extremely nouriſhing to the infirm: it may be taken in luke-warm milk; but if any other heat is applied to it, the nutritious quality will be deſtroyed. The freſh white of egg prevents burns from riſing in bliſters, if it is uſed immediately after the accident: it mitigates inflammations of the eyes, and preſerves the face from ſun-burning. In pharmacy, it is uſed as a medium to render balſams and turpentines, &c. miſcible with aqueous fluids; but as it diſagrees with many ſtomachs when thus taken, a mucilage of gum arabic may ſupply its place, it being as good a medium in ſimilar circumſtances, and not apt to offend the tendereſt ſtomach. White of eggs are alſo uſeful for clarifying liquors; to which purpoſe, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the groſs parts of the liquor along with them.

ALBURN, the Engliſh name of a compound colour, being a mixture of white and red, or reddiſh brown.

ALBURNUM, the ſoft white ſubſtance which in trees is found between the liber or inner bark and the wood, and in progreſs of time acquiring ſolidity, becomes itſelf the wood. From its colour and comparative ſoftneſs, it has been ſtyled by ſome writers the fat of trees, *adeps arborum.*

The alburnum is found in largeſt quantities in trees that are vigorous; though in ſuch as languiſh, or are ſickly, there is a great number of beds. In an oak ſix inches in diameter, this ſubſtance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but theſe proportions vary according to the health and conſtitution of the trees. The alburnum is frequently gnawed in pieces by inſects, which lodge in the ſubſtance, and are nouriſhed from it.

ALBURNUS, in ichthyology, a ſpecies of the cyprinus of Linnæus.

ALBUS Piscis, in ichthyology, a white fiſh, commonly called the jentling.

ALCA, or Auk, in ornithology, a genus of the order of anſeres. The beak of this genus is without teeth, ſhort, convex, compreſſed, and frequently furrowed tranſverſely; the inferior mandible is gibbous near the baſe; the feet have generally three toes. The ſpecies of the Alca are 12; of which the moſt remarkable are,

The impennis, northern penguin, or great auk, with a compreſſed bill furrowed on each ſide, and an oval ſpot on each ſide of the eyes. According to Mr. Martin, this bird breeds on the iſle of St. Kilda; appearing there the beginning of May, and retiring the middle of June. It lays one egg, which is ſix inches long, of a white colour; ſome are irregularly marked with purpliſh lines croſſing each other, others blotched with black, and ferruginous about the thicker end: if the egg is taken away, it will not lay another that ſeaſon.

ALCAICS, in ancient poetry, a denomination given to ſeveral kinds of verſe, from Alcæs, their inventor.

The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a long ſyllable; a dactyle; another dactyle: ſuch as the following verſe of Horace,

Omneſs | *eo* | *dem cogimur,* | *omnium*
Verſe | *tur ur* | *nâ* | *ſerins* | *ocyus* |
Sors exitura.

The ſecond kind conſiſts of two dactyles and two trochees: as,

Exili | *um impoſi* | *tura* | *cymbæ.*

Beſides theſe two, which are called *dactylic Alcaïcs*, there is another ſtyled ſimply *Alcaïc*; conſiſting of an epitrite; a choriambus; another choriambus; and a bacchius: the following is of this ſpecies,

Cur timet fla | *vum Tiberim tan* | *gere, cur* | *olivum?*

Alcaic *Ode*, a kind of manly ode compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always Alcaïcs of the firſt kind; the third verſe is a diameter hypercatalecti, or conſiſting of four feet and a long ſyllable; and the fourth verſe in an Alcaïc of the ſecond kind. The following ſtrophe is of this ſpecies, which Horace calls *minaces Alcæi camenæ.*

Non poſſidentem multa vocaveris
Recte beatum: rectius occupat
Nomen beati, qui deorum
Muneribus ſapienter uti, &c.

ALCAID, Alcayde, or Alcalde, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate or officer of juſtice, anſwering nearly to the French provoſt and the Britiſh juſtice of peace. The alcaid among the Moors is veſted with ſupreme juriſdiction, both in civil and criminal caſes.

ALCALA ed Guadeira, a ſmall town of Spain, in Andaluſia, upon the river Guadeira. Here are abundance of ſprings, from whence they convey water to Seville by an aqueduct.

ALCALY, ſynonymous with Alcali, or Alkali.

ALCANNA, in commerce, a powder prepared from the leaves of the Egyptian privet, in which the people of Cairo drive a conſiderable trade. It is much uſed by the Turkiſh women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when ſteeped with common water, and a red one when infuſed in vinegar. There is alſo an oil extracted from the berries of alcanna, and uſed in medicine as a calmer.

Knights of ALCANTARA, a military order of Spain. They make a very conſiderable figure in the hiſtory of the expeditions againſt the Moors. The knights of Alcantara make the ſame vows as thoſe of Calatrava, and are only diſtinguiſhed from them by this, that the croſs fleur de lys, which they bear over a large white cloak, is of a green colour. They poſſeſs 37 commanderies. By the terms of the ſurrender of Alcantara to this order, it was ſtipulated, that there ſhould be a confraternity between the two orders, with the ſame practices and obſervances in both; and that the order of Alcantara ſhould be ſubject to be viſited by the grand maſter of Calatrava. But the former ſoon releaſed themſelves from this engagement, on pretence that their grand maſter had not been called to the election of that of Calatrava, as had been likewiſe ſtipulated in the articles. After the expulſion of the Moors, and the taking of Granada, the ſovereignty of the order of Alcantara and that of Calatrava was ſettled in the crown of Caſtile by Ferdinand and Iſabella. In 1540, the knights of Alcantara ſued for leave to marry, which was granted them.

ALCAVALA, in the Spaniſh finances, was at firſt a tax of ten per cent. afterwards of fourteen per cent. and is at preſent of only ſix per cent. upon the ſale of every ſort of property, whether moveable or immoveable; and it is repeated every time the property is ſold. The levying of this tax requires a multitude of revenue officers ſufficient to guard the tranſportation of goods, not only from one province to another, but from one ſhop to another. It ſubjects not only the dealers in ſome ſorts of goods, but thoſe in all ſorts, every farmer, every manufacturer, every merchant and ſhopkeeper, to the continual viſits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is eſtabliſhed, nothing can be produced for diſtant ſale. The produce of every part of the country muſt be proportioned to the conſumption of the neighbourhood. It is to the alcavala, accordingly, that Uſtaritz imputes the ruin of the manufactures of Spain. He might have imputed to it likewiſe the declenſion of agriculture, it being impoſed not only upon manufactures, but upon the rude produce of the land.

ALCE, Alces, or Elk, in zoology, the trivial name of a ſpecies of the cervus, belonging to the order of mammalia pecora.

ALCEA, the Holly-hock: a genus of the polyandria order, belonging to the monodelphia claſs of plants; and in the natural method ranking under the 37th order, Columniferæ. For its characters, ſee Syſtem of Botany. The *ſeeds* are ſolitary, reniform, and depreſſed.

Linnæus mentions two diſtinct ſpecies of this genus, viz. the *roſea* and *ficifolia.*

ALCEDO, or Kingsfisher, in ornithology, a genus of the order of picæ. The alcedo has a long, ſtrait, thick, triangular bill; with a fleſhy, plain, ſhort, flat tongue.

Of this genus there are a great many ſpecies, with one or other of which almoſt every part of the world is furniſhed. Moſt of them frequent rivers, and live on fiſh, the ſingularity of catching which is admirable: ſometimes they hover over the water, where a ſhoal of ſmall fiſhes is ſeen playing near the ſurface; at other times they wait with attention, on ſome low branch hanging over the water, for the approach of a ſingle one who is ſo unlucky as to ſwim that way; in either caſe dropping like a ſtone, or rather darting with rapidity on his prey; when, ſeizing it croſſways in his bill, it retires to a reſting place to feaſt on it; which it does piecemeal, bones and all, without reſerve, afterwards bringing up the indigeſtible parts in pellets, like birds of prey. The wings of moſt of this genus are very ſhort; yet the birds fly rapidly, and with great ſtrength. It may be remarked, that throughout this genus, blue, in different ſhades, is the moſt predominant colour. The ſpecies found in the South Sea Iſlands are held in a kind of ſuperſtitious veneration by the natives of the places they ſeverally inhabit, perhaps on account of their being frequently ſeen flying about the morals or burial-places. That which inhabits Otaheite, where it is called *Eroro*, is accounted particularly ſacred, and not allowed to be taken or killed. The moſt diſtinguiſhed among the various ſpecies of this bird are the following:

1. The iſpida, or common kingsfiſher, is not much larger than a ſwallow; its ſhape is clumſy; the bill diſproportionably long; it is two inches from the baſe to the tip; the upper chap black, and the lower yellow. But the colours of this bird atone for its inelegant form: the crown of the head and the coverts of the wings are of a deep blackiſh green, ſpoted with bright azure: the back and tail are of the moſt reſplendent azure; the whole under-ſide of the body is orange-coloured; a broad mark of the ſame paſſes from the bill beyond the eyes; beyond that is a large white ſpot: the tail is ſhort, and conſiſts of twelve feathers of a rich deep blue; the feet are of a reddiſh yellow, and the three joints of the outmoſt toe adhere to the middle toe, while the inner toe adheres only by one.

This ſpecies is the αλκυωναφωνος, or mute halcyon of Ariſtotle, which he deſcribes with more preciſion than is uſual with that great philoſopher. He relates, that it reſembled thoſe concretions that are formed by the ſea-water; that it reſembled the long-necked gourd; that it was hollow within; that the entrance was very narrow, ſo that, ſhould it overſet, the water could not enter; that it reſiſted any violence from iron, but could be broke with a blow from the hand; and that it was compoſed of the bones of the Βελονη, or ſea-needle. The neſt had medical virtues aſcribed to it; and from the bird was called *Halcyoneum*. In a fabulous age, every odd ſubſtance that was flung aſhore received that name; a ſpecies of tubular coral, a ſponge, a zoophite, and a miſcellaneous concrete, having by the ancients been dignified with that title from their imaginary origin. Yet much of this ſeems to be founded on truth. The form of the neſt is juſtly deſcribed; and the materials which Ariſtotle ſays it was compoſed of, are not entirely of his own invention. Whoever has ſeen the neſt of the kingsfiſher, will obſerve it ſtrewed with the bones and ſcales of fiſh; the fragments of the food of the owner and its young.

Ariſtotle and Pliny tell us, that this bird was moſt common in the ſeas of Sicily; that it ſat only a few days, and thoſe in the depth of winter; and during that period the mariner might ſail in full ſecurity; for which reaſon they were ſtyled *Halcyon days.*

In after-times, theſe words expreſſed any ſeaſon of proſperity: theſe were the *Halcyon days* of the poets; the brief tranquillity, the *ſeptem placidi dies*, of human life.

This bird is found not only in Britain, but throughout Europe, Aſia, and Africa.

2. The rudis, or Egyptian kingsfiſher, as deſcribed by Haſſelquiſt, is the ſize of the Royſton crow.

3. Le taparara of Buffon is about the ſize of a ſtarling.

4. The torquata, or cinereous kingsfiſher, is about the ſize of a magpie.

The jacamars are much allied to this genus, and have been ranked under it by Linnæus: their toes are, however, differently placed; their food alſo is different, being inſects alone, and not fiſh; and their haunts are different, being moiſt woods, and not ſhores or the banks of rivers.

5. The galbula, or green jamacar, is about the ſize of a lark. The bill is black, of a ſquare form, a little incurvated and ſharp at the point: the plumage in general, in the upper part of the body, is of a moſt brilliant green, gloſſed with copper and gold in different lights: the belly, throat, and vent, are rufous: the tail is compoſed of ten feathers, and ſhaped like a wedge: the legs are of a greeniſh yellow, very ſhort and weak; the claws are black. This ſpecies is found both in Guiana and Braſil, in the moiſt woods, which it prefers to the more dry ſpots, for the ſake of inſects, on which it feeds.

6. The paradiſea, or paradiſe jacamar, is of the ſame ſize with the former, and has a ſimilar bill: the throat, fore part of the neck, and under wing coverts, are white: the reſt of the plumage is of a deep dull green, in ſome lights appearing almoſt black, in others with a ſlight gloſs of violet and copper bronze; the tail is compoſed of twelve feathers of unequal

lengths: the two middle ones longeſt: the legs are black: the toes are placed two before and two behind, and pretty much united. It inhabits Surinam; and like the others, it feeds on inſects; and ſometimes, contrary to them, frequents open places. It flies farther at a time and perches on the tops of trees; it is frequently found with a companion, not being quite ſo ſolitary a bird as the other. It alſo differs in the note, having a kind of ſoft whiſtle often repeated, but not heard a great way off.

ALCHATA, in ornithology, implies a ſpecies of the tetrao.

ALCHEMILLA, or **Ladies-mantle**, a genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 35th order *Senticoſæ*. For its characters, ſee Syſtem of **Botany**. Of this genus there are three ſpecies.

1. The vulgaris, or common ladies-mantle, with leaves plaited like a fan, and yellowiſh-green bloſſoms. It grows naturally in paſture-lands in this as well as in moſt other countries in Europe. The leaves diſcover to the taſte a moderate aſtringency; and were formerly much eſteemed in ſome female weakneſſes, and in fluxes of the belly. 2. The alpina, or cinque-foil ladies-mantle, with finger-ſhaped ſawed leaves, and greeniſh bloſſoms. It is a native of the mountainous parts of Europe. 3. The minor, or at leaſt ladies-mantle, with five ſmooth leaves growing at a joint and cut into many ſegments. It grows naturally in Sweden, Lapland, and other cold countries.

Theſe plants have perennial roots, and annual ſtalks. They are eaſily propagated by parting of their roots, or ſowing their ſeeds in autumn.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, or **Alchymy**, which the ancients called Halchymia, denotes the moſt ſecret parts of chemiſtry. It may be divided into three parts, namely, 1. the making of gold; 2. the diſcovery of an univerſal medicine, or panacea; and, 3. the diſcovery of an univerſal diſſolvent, or alkaheſt.

How far theſe may be accounted proper objects of ſtudy, the diſappointments, which all the practitioners in this art have met with, will readily certify. For after a ſucceſſion of labour and expence for many ages, and in different regions, not one of the pretenders to this art has been able to make gold, or to produce any one medicine, diſſolvent or ferment, capable of operating effectually on every body or ſubject. Yet we find the names of very learned men in the liſt of authors, who have eſpouſed the ſtudy of Alchemy; and ſome of them vain enough to imagine the poſſibility of diſcovering an univerſal menſtruum to which ſome have given the name of the Philoſopher's Stone, for performing the ſecret myſteries of this art: therefore this menſtruum is the greateſt object of the Alchemiſt, becauſe without it there can be no tranſmutation.

According to the received opinion of adepts in this pretended ſcience, nothing more is required than caſting a ſmall quantity of the menſtruum upon metals in infuſion, which will convert all the true mercurial part of metal into pure gold; there being no other requiſite for this wonder-working change, than to do that by art, which nature does in many years and ages; for as gold and lead do but little differ in weight, there cannot be much in lead beſides mercury and gold: conſequently, if any body could be found that would agitate all the parts of lead, ſo as to burn all that is not mercury therein, having alſo ſulphur to fix the mercury; the queſtion then is, Would not the maſs remaining be converted into pure gold?

Such is the foundation for the opinion of the Philoſopher's Stone, which the Alchemiſts contend to be a moſt fixed concentrated fire, which, as ſoon as it melts with any metal, does, by a magnetic virtue, immediately unite itſelf to the mercurial body of the metal, volatilizes and cleanſes off all that is impure therein, and leaves nothing but a maſs of pure gold.

Upon this principle many have ſet out to try their fortunes in the Alchemiſt's furnace. Some have attempted the tranſmutation of the moſt imperfect into perfect metals, both ſilver and gold, by ſeparation; others by maturation and real tranſmutation.

Thoſe who proceed by the method of ſeparation muſt ſuppoſe that all inferior metals contain a quantity of gold more or leſs. For unleſs it could be made appear that ſuch a ſeparation was ever diſcovered, and that the quantity of gold ſeparated from the baſer metals was ſufficient to defray the expence of the operation, neither of which can be affirmed, there can be little or no hopes of making gold by this method.

The proceſs by maturation is no leſs liable to exceptions. Nothing but mercury could be changed into gold by maturation, becauſe the principles of all other metals not being pure mercury, their abundant heterogeneous particles, and the ſmall quantity of imperfect ones which enter into their compoſition, cannot be ſeparated from it by a digeſtion.

Here Mr. Chambers interferes with a ſuppoſition, that could mercury be once purged of its impurities by maturation, it might eaſily be changed into gold, becauſe (ſays he) it would then be as heavy as gold. A very ſuperficial reaſon! for weight is not the eſſential quality conſtitutive of that perfect metal. It muſt be ductile and malleable; qualities which have never been diſcovered by the maturation of mercury. Beſides, there is another moſt eſſential quality: the mercury ſhould equal gold in its fixedneſs in the fire, reſulting from the homogenity and equality of its parts, which all have equal pores or interſtices through which the fiery corpuſcules find an eaſy paſſage; and therefore cannot haſten its fuſion with the ſame facility as that of leſs perfect metals, where, through the obliquity and unequal poſition of the pores, they meet with more reſiſtance.

The affair of Monſ. Langueille, an adapt in this art about the middle of the laſt century, will ſerve to illuſtrate and confirm this obſervation. This gentleman piqued himſelf very highly on having diſcovered the art of converting mercury into gold by maturation; but when his metal ſo prepared was put into the crucible, he was ſoon convinced of his error and preſumption: for its pores not being in the ſame poſition, nor at the ſame equal diſtances, his metal evaporated into ſmoak.

The Alchemiſts in general ſeem to have the practice of real tranſmutation moſt at heart; and they ſay this tranſmutation of metals is to be done by melting them in the fire, and by caſting a certain quantity of a powder, termed by them the *powder of projection*, into the matter fuſed, whoſe effects they aſſert will be the ſame as mentioned before reſpecting the Philoſopher's Stone; the practability of which operation has never been proved by any ſcientific profeſſor more fully than by the late Dr. Price, as the following extracts from the London Review for October 1782 evince.

" Account of ſome experiments on mercury, ſilver and gold,
" made at Guildford in May 1782, in the laboratory of
" James Price, M. D. F. R. S.

" We ſhall proceed to the experiments, ſeven in number, three of which were made in the preſence of many great and reſpectable perſons, to whom the author appeals for the truth of his accounts; and the reſult of all theſe experiments was, the partial tranſmutation of Mercury into Gold or Silver, and of Silver into Gold.

" The author informs us, that the perſons preſent at the firſt of theſe experiments were, the Rev. Mr. Anderſon, a clergyman reſiding near Guildford, well verſed in experimental philoſophy, and ſtudious of its chemical branches; Capt. Francis Groſe, a gentleman advantageouſly known in the chemical world by his reſearches and publications; Mr. Ruſſel, a magiſtrate of the place, and a perſon, from his technical employments, converſant with the appearance of the precious metals, well acquainted with the uſual operations on them, and with the methods employed by artiſts for aſcertaining their commercial value; and enſign D. Groſe. And theſe gentlemen ſeem, at the expreſs inſtance of the author, to have provided every inſtrument or ingredient employed in the proceſs, except the **powder itself**, which poſſeſſed ſuch wonderful properties.

" Half an ounce of mercury, the principal ingredient, was bought by Capt. Groſe at an apothecary's in the town, and placed in a crucible brought by Mr. Ruſſel, on a flux, the ingredients of which were either brought or examined by the company, and the very mortar in which they were pounded previouſly inſpected. Before the crucible was placed on the fire, half a grain of a deep red powder, furniſhed by the author, was weighed by Mr. Ruſſel, and added by Mr. Anderſon to the other ingredients.

" In about a quarter of an hour after the projection of this powder, and placing the crucible on the fire, it was obſerved, 'that though the crucible was now become red-hot, the mercury ſhewed no ſigns of evaporation, or even of boiling.' And the fire being raiſed to a ſtrong glowing red, or white-red heat, a clean iron rod was dipped into the matter, and the ſcoriæ which adhered to the point being knocked off when cold, were found to be replete with ſmall globules of whitiſh metal, which the author repreſented as 'an intermediate ſubſtance, between mercury and a more perfect metal.'

" A ſmall quantity of borax, brought by Mr. Ruſſel, was now injected into the crucible; and the matter kept in a ſtrong red-white heat about a quarter of an hour; when the crucible being cooled, and broke, a globule of yellow metal was found at the bottom; which, together with ſome ſmaller globules found in the ſcoriæ, weighed full ten grains. This metal was ſealed up in a phial; and the next morning, in the preſence of the ſame company, and Captain Auſten, the large globule was hydroſtatically examined, when its ſpecific gravity, compared with water, was eſtimated to be nearly in the ratio of 20 to 1. The globule, which weighed nine grains and a quarter, was then beat into a thin plate, and examined, in the manner of artiſts, by Mr. Ruſſel, who declared it to be as good gold as the grain gold of the refiners; and half the plate being ſent to Dr. Higgins, he was alſo of opinion that it was pure gold.

" The author mentions other chemical trials which were alſo made, and eſtabliſhed its pretence to the character of gold.

" In the ſecond and third experiments, a white powder is projected on mercury, which produces a white metal: the mercury lying quiet after the crucible had acquired a red heat in the former of theſe experiments; but in the latter, it accidentally began to boil; when on applying the white powder, the ebullition ceaſed, and did not return.

“ In the fourth and fifth of theſe experiments, ſilver appeared to be tranſmuted by the projection of a ſmall quantity of the red powder ; and to be found, on a regular aſſay, to contain pure gold, to the quantity of one-eighth of the joint weight.

“ In the ſixth experiment, made before Sir Philip Norton Clarke, the Rev. Mr. Anderſon, Captain Groſe, Dr. Spence, Enſign Groſe, and Mr. Hallamby, two ounces of quickſilver were rubbed with a drop or two of vitriolic æther, in a ſmall mortar of Wedgwood's ware ; and barely a grain of the white powder was put to it, and rubbed up with it for about three minutes. When the mercury was poured out of the mortar, it appeared to have acquired a degree of ſpiſſitude, and to be full of lumps ; on ſtraining it through a cloth, an amalgam of a pretty ſolid conſiſtence remained, from which the unmixed mercury was expelled by the flame of a lamp directed by a blow-pipe, as it laid on a piece of charcoal ; and the remainder was a bead of fine metal, which, on ſubſequent trials, appeared to be ſilver. The weight of this bead was eighteen grains, and as much more was ſeparated from the ſtrained mercury as made the whole twenty-nine grains of ſilver ; and the ſilver to the powder as 28 to 1.

“ On the 25th of May, Lords Onſlow, King and Palmerſton ; Sir Robert Barker ; Sir Philip N. Clarke, Bart. the Rev. O'Manning, B. Anderſon, G. Pollin, J. Robinſon, Clerks ; Dr. Spence, W. Mann Godſchall, Wm. Smith, Wm. Godſchall, jun. eſqrs. and Meſſrs. Gregory and Ruſſel, being preſent, the ſixth experiment was made with the uſual precautions and ſimilar ſucceſs, and ſilver obtained in a ſtill larger proportion. And the firſt experiment being alſo again tried, with the variation of placing the mercury in a depreſſion made in a flux of charcoal and borax, pure gold was obtained as before.

“ The author relates two other experiments, made before ſome of the ſame company, on a much larger ſcale ; in which his white powder produced fifty times its weight of ſilver, and his red powder ſixty times its weight in gold : and the produce of theſe experiments, as well as ſome of the former, the author informs us, have been preſented to his majeſty.

“ On reading this very extraordinary publication, it is difficult to avoid falling into thoſe doubts, which the author ſays have been illiberally entertained of the truth of the fact ; yet the evidence is unqueſtionable, and the precautions taken ſuch as ſeem to preclude every poſſibility of deceit. Could it be poſſibly ſuſpected of a gentleman whoſe ſituation in life can by no means render him deſirous of attaining fame by indirect means ? And, as the teſtimony of the fact muſt be admitted without controverſy, he very reaſonably aſks, By what arts of deceit can mercury be prevented from boiling in a red heat ? Or, when actually boiling and evaporating, can it be almoſt inſtantaneouſly fixed by the addition of a ſubſtance not above one 480th of its weight ?

“ On the whole, we might have flattered ourſelves, in the courſe of reading this publication, that many more experiments of the like kind would have been tried, and the facts have received the additional ſanction of ſome learned public ſociety, if we had not unfortunately peruſed the introduction previous to the work ; and, at the cloſe of it, found, to our great mortification, and to the diſappointment of the curious at large, the following paragraph :

“ The whole of the materials, producing the extraordinary change produced in the metal employed, was expended in performing the proceſſes ; nor can the author furniſh himſelf with a ſecond portion, but by a proceſs equally tedious and operoſe ; whoſe effects he has recently experienced to be injurious to his health, and of which he muſt therefore avoid the repetition.”

“ It appears thas Dr. Price, the author of this pamphlet, is a Fellow of the Royal Society, and a phyſician of eminence at Guildford in Surry.”

Theſe ſingular experiments, exhibited ſo repeatedly, and in the preſence of ſuch reſpectable characters, bore the appearance of plauſibility that the tranſmutation of metals was to be obtained. It had long before been tried by various ſcientific gentlemen without effect ; but from the reſult of the above experiments it appeared to be at length accompliſhed. It is no wonder that ſo very ſingular a diſcovery ſhould have engaged the attention of the public at large, but in particular that auguſt body the Royal Society, of which Dr. Price was a member. Theſe diſtinguiſhed amateurs of ſcientific knowledge, deſirous of being ſatiſfied of the truth of what had been aſſerted by ocular demonſtration, requeſted Dr. Price to repeat his experiments in the preſence of the general aſſembly that compoſe that body. This the doctor thought proper to decline ; the conſequence of which was that the Society, being determined to be ſatisfied, laid a peremptory injunction on him that he ſhould comply with their requeſt, on no leſs penalty, in caſe of refuſal, than that of being expelled. This mandate ſtruck the philoſopher to the quick ; his mind was agitated to a degree not to be diſpenſed with, and he ſunk beneath his burthen. Conſcious, no doubt, of the deception he had practiſed on ſo many reſpectable characters, and apprehenſive that a diſcovery would be made ſhould he attempt a repetition before ſo diſcernable a body of people ; at the ſame time reflecting on the irreparable odium that would infallibly fall on him in his expulſion from one of the moſt diſtinguiſhed ſocieties in the kingdom, he knew not what ſtep to take ; till at length, determined not to outlive his ſhame, he formed the dreadful reſolution of terminating his anxiety of mind by putting a period to his exiſtence.

Notwithſtanding the foregoing circumſtances, the Alchemiſts are ſo far from being diſcouraged, that they look for the ſeed of gold not only in baſe metals, but in plants, blood, hair, and even in the very excrements of divers animals with as little ſucceſs.

Thus the celebrated philoſopher the Hon. Mr. Boyle caught the credulous diſtemper ; for he very gravely aſſerts, that the chalk, or earth, which was left at the bottom of an alembic, after a quantity had been diſtilled and re-diſtilled two hundred times, might have been converted into gold.

This mighty change, no doubt, was to be effected in the uſual way by the help of the *powder of projection* ; but herein we are left to think for ourſelves, as the experimentaliſt makes no mention of the proceſs or performance of the operation. And, as was before obſerved, this miraculous powder never was defined, or pretended to be acquired, by any of the adepts in Alchemy ; nor did any of the Alchemiſts ever preſume to ſhew the manner by which the powder operates, except our unfortunate countryman already mentioned.

This art (although generally proſtituted and miſapplied) is not to be finally rejected, or held in contempt, for the reaſons which I ſhall now deduce, and which will corroborate the juſtice of theſe obſerves, notwithſtanding the many legal objections that may be contraſted, or oppoſed, to the whole of this ſyſtem.

1. The artiſt, in his aſſiduous and indefatigable labour to make gold, has frequently ſtumbled upon ſpecific remedies, or medicines, which cure effectually, and ſooner a chronic or ſome other dangerous malady, than a galenical or other preparation uſed by our anceſtors. A diſcovery well worth the moſt laborious and expenſive proceſs, and more to be prized than the acquiſition of a ſecret, which, could it be found, would only ſerve to gratify covetouſneſs, avarice and ambition, three of the worſt paſſions our nature is prone to indulge, inaſmuch as they attend us to the hour of death, though the moſt rare caſe of longevity ſhould be our portion.

But it does not appear that any of thoſe hits have the deſerved name of a panacea, or univerſal medicine, to cure all diſeaſes ; though this is ſo frequently boaſted of by quacks, and other impoſtors, in all countries.

2. The univerſal diſſolvent of Parcelſus and Van Helmont are arguments in favour of this ſyſtem. “ There is (ſay they) a cer-
“ tain fluid in nature capable of reducing all ſublunary bodies, as
“ well homogeneous as mixed into their firſt principle, or original
“ matter of which they are compoſed ; or into an uniform, equal,
“ and portable liquor that will unite with water and the juices of
“ our bodies, yet retain its ſeminal virtues, and if mixed with
“ itſelf again will thereby be converted into pure elementary
“ water.”

Van Helmont is poſitive that he was maſter of that noble menſtruum, and Mr. Boyle conceived ſuch an advantageous opinion of it on his report, that he preferred it to the Philoſopher's Stone. As he (Mr. Boyle) conceived there was not the abſurdity attendant on the notion of an univerſal ens that reſolved all bodies into their general ens ; by freeing them of the heterogeneous particles they were wrapped in ; and thereby reſtore them to their priſtine liberty of directing themſelves, as there is to believe that at the ſame inſtant they are thus freed they acquire another form without the allowance of the leaſt moment for a new direction.

3. No perſon can doubt but that all bodies proceed originally from a firſt matter, which was itſelf once in a fluid ſtate, whoſe particles, by the continual agitation and compreſſion of the atmoſphere, the diverſity of their figures, and the occult quality which directs them to their different poles, have been concatenated together for the formation of thoſe different bodies.

This menſtruum is called the Alkaheſt by the adepts in this ſcience ; the invention of which Van Helmont honours Paracelſus with, who has left the character of it. “ There is (ſays this
“ author) the liquor alkaheſt of great efficacy in preſerving the
“ liver, as alſo in curing hydropical and other diſeaſes ariſing from
“ diſorders of that part. If it has once conquered its like, it
“ becomes ſuperior to all hepatic medicines, and though the liver
“ itſelf were broken and diſſolved, this medicine could ſimply
“ ſupply its place.”

Yet neither Van Helmont, or Paracelſus, has done that juſtice to mankind as to tranſmit ſo valuable a medicine to poſterity, and perhaps the reaſon was, that they might have, in the courſe of their practice, great reaſon to doubt of that ſovereign power above aſcribed to it. Be that as it will, there is great reaſon to doubt of its ſingular efficacy, as ſtated by Van Helmont, agreeable to the maxim, “ he that proves too much is no evidence ;” ſo that to ſubſtitute the Alkaheſt in the place or ſtead of a broken or diſſolved liver, is as far an hyperbole in quackery, as to pretend to reſtore a dead man to life by it. However, I ſhall give this head its due trial, and inform the reader of the particulars.

From the known practice of Paracelſus, he gave names to his remedies by reverſing their real orthography ; hence this word Alkaheſt is formed of the words *alkali* and *eſt*, which is corruptly pronounced Alcal-eſt, or Alkaheſt; conſequently the ſecret medicine is no other than the Alkaline Salt of Tartar volatilized, as Glauber very accurately defines.

It is thus deſcribed by the elder Helmont: “It is the higheſt and moſt ſucceſsful among ſalts, which having obtained the ſupreme degree of ſimplicity, purity and ſubtilty, alone enjoys the faculty of remaining unchanged and unimpaired by the ſubject it works upon, and of diſſolving the moſt ſtubborn and untractable bodies, as ſtones, gems, glaſs, earth, ſulphur, metals, &c. into real ſalt equal in weight to the matter diſſolved; and this with as much eaſe as hot water diſſolves ſnow; and by being ſeveral times cohobated with Parcelſus's ſal circulatum, this ſalt loſes all its fixedneſs, and at length becomes an inſipid water, equal in quantity to the ſalt it was made from.”

Hence we may infer that Parcelſus and Van Helmont, whatever deficiences might be in their Alkaheſt, took water for the univerſal inſtrument of chemiſtry and philoſophy; and earth for the unchangeable baſis of all things; that fire was deſigned as their efficient cauſe; that ſeminal impreſſions were lodged in the mechaniſm of the earth; and that water by diſſolving and fermenting with the earth as it does by means of fire, brings every thing forth; from whence proceed, the Animal, Vegetable, and Mineral kingdoms of nature.

The properties of Alkaheſt are defined under the following operations, viz.

1. It converts the ſubject into a ſubſtance congenial to itſelf, namely, ſaline, ſulphurous and mercurial; then into ſalt alone, which becomes volatile, after which it is turned wholly into an inſipid water.

2. The ſeminal virtues of the bodies thus diſſolved are not deſtroyed. For gold acted upon by this operation is not debaſed into any other ſalt but the ſalt of gold; and in the ſame degree of compariſon are all other metals. Hence an actual and genuine *aurum potabile* might readily be made by the Alkaheſt converting the whole body of gold into ſalt, and making it ſoluble in water without depriving the metal of its ſeminal or radical virtues.

3. The bodies diſſolved by this Alkaheſt may be rendered volatile by a ſand heat: and if after volatizing the ſolvent it be diſtilled therefrom, the body is left pure inſipid water, equal in quantity to its original ſelf, but deprived of its ſeminal virtues.

4. It ſuffers no change or diminution by diſſolving the bodies it works upon, and conſequently ſuſtains no re-action from them, being the only immutable menſtruum in nature.

5. Neither is it capable of mixture; and therefore is free from fermentation and putrefaction, coming off as pure from the body it hath diſſolved as when firſt put thereon, without leaving the leaſt impurity behind.

Such are the properties aſcribed to the Alkaheſt, which is rather an imaginary than a real diſſolvent: a medicine highly deſirable, but no where to be found.

The curious reader who deſires further knowledge on this head is referred to the works of Heliodorus and Syneſius, publiſhed by Fabricius; Boerhaave's Works, tom. I. Alſo to Norton, Ripley, Pearce, Carpenter, Andrews, Chamock, Blomfield, Kelly, Robinſon, Elias, Aſhmole, and Dr. Dee's Works.

ALCHIMELECH, the Egyptian melliot.

ALCHIMELLA, ſynonymous with ALCHEMELLA.

ALCHITRAM, among the alchemiſts, denotes ſometimes the oil of Juniper, ſometimes liquid pitch and ſometimes arſenic, prepared for ablution.

The words, *Alchieram*, *Alchytram*, and *Alkytran*, are ſynonymous of this word.

ALCHOLLEA, a kind of potted fleſh meat, much uſed and admired by the Weſtern Moors; it is firſt pickled, then dried, afterwards boiled, and laſt of all minced and potted.

ALCIBIUM, or ALCIBIADUM, in botany, a word uſed by the ancients to imply a kind of echium, or viper's bugloſs.

ALCMANIAN, in ancient lyric poetry, a kind of verſe conſiſting of two dactyles and two trochees; as,

Virgini | bus pue | riſque | canto.

The word is formed from *Alcman*, the name of an ancient Greek poet, in great eſteem for his erotics or amorous compoſitions.

ALCOHOL, or ALKOOL, in chemiſtry, ſpirit of wine highly rectified. It is alſo uſed for any highly rectified ſpirit. Alcohol is extremely light and inflammable: it is a ſtrong antiſeptic, and therefore employed to preſerve animal ſubſtances.

ALCOHOL is alſo uſed for any fine impalpable powder.

ALCOHOLIZATION, the proceſs of rectifying any ſpirit. It is alſo uſed for pulverization.

ALCOLA is uſed by chemiſts to expreſs the tartar of urine.

ALCOLA is found in three forms, viz.

1. Reſolved, or reduced, into an impalpable ſubſtance.

2. Sandy, or voided, under the appearance of ſmall grains of whitiſh or reddiſh ſand.

3. Mucilaginous, or viſcous.

ALCOR, in aſtronomy, a ſmall ſtar adjoining to the large bright one in the middle of the tail of *urſa major*.

ALCORAN, or AL-KORAN, the ſcripture, or bible, of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly ſignifies, *the reading*: or rather, *that which ought to be read*. By this name the Mahometans denote not only the entire book or volumn of the Koran, but alſo any particular chapter or ſection of it; juſt as the Jews call either the whole ſcripture, or any part of it, by the name of *Karah*, or *Mikra*, words of the ſame origin and import.

Beſides this peculiar name, the Koran is alſo honoured with ſeveral appellations common to other books of ſcripture; as, *al Furkan*, from the verb *foraka*, to *divide* or *diſtinguiſh*; not, as the Mahometan doctors ſay, becauſe thoſe books are divided into chapters or ſections, or diſtinguiſh between good and evil; but in the ſame notion that the Jews uſe the word *Perek*, or *Pirka*, from the ſame root, to denote a ſection or portion of ſcripture. It is alſo called *al Moſhaf*, *the volume*, and *al Kitab*, *the book*, by way of eminence, which anſwers to the *Biblia* of the Greeks; and *al Dhikr*, *the admonition*, which name is alſo given to the Pentateuch and Goſpel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *ſowar*, in the ſingular *ſura*; a word rarely uſed on any other occaſion, and properly ſignifying a row, order, or a regular ſeries; as a courſe of bricks in building, or a rank of ſoldiers in an army; and is the ſame in uſe and import with the Sura, or Tora of the Jews, who alſo call the fifty-three ſections of the Pentateuch *Sedarim*, a word of the ſame ſignification.

Theſe chapters are not, in the manuſcript copies, diſtinguiſhed by their numerical order, but by particular titles, which are taken ſometimes from a particular matter treated of, or perſon mentioned therein; but uſually from the firſt word of note, exactly in the ſame manner as the Jews have named their Sedarim; though the word from which ſome chapters are denominated be very far diſtant, towards the middle, or, perhaps, the end of the chapter; which ſeems ridiculous. But the occaſion of this appears to have been, that the verſe or paſſage wherein ſuch word occurs, was, in point of time, revealed and committed to writing before the other verſes of the ſame chapter which precede it in order; and the title being given to the chapter before it was completed, or the paſſages reduced to their preſent order, the verſe from whence ſuch title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occaſioned by the difference of the copies, as it is pretended that ſome of the chapters were revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will obſerve, that ſeveral of the chapters are ſaid to have been revealed partly at Mecca and partly at Medina; and, as to others, it is yet a diſpute among the commentators to which of the two places they belong.

Every chapter is ſubdivided into ſmaller portions, of very unequal length alſo, which we cuſtomarily call *verſes*: but the Arabic word is *ayat*, the ſame with the Hebrew *ototh*, and ſignifies *ſigns* or *wonders*: ſuch as are the ſecrets of God, his attributes, works, judgements, and ordinances, delivered in thoſe verſes; many of which have their particular titles alſo, impoſed in the ſame manner as thoſe of the chapters.

Beſides theſe unequal diviſions of chapter and verſe, the Mahometans have alſo divided their Koran into ſixty equal portions, which they call *Ahzab*, in the ſingular *Hizb*, each ſubdivided into four equal parts; which is alſo an imitation of the Jews, who have an ancient diviſion of their Miſhna into ſixty portions called Maſſictoth. But the Koran is more uſually divided into thirty ſections only, named *Ajza*, from the ſingular *Joz*, each of twice the length of the former, and in the like manner ſubdivided into four parts. Theſe diviſions are for the uſe of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of theſe readers belonging to every chapel, and each reads his ſection every day; ſo that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following ſolemn form, by the Mahometans called the *Biſmallah*, in the name of the moſt merciful God; which form they conſtantly place at the beginning of all their books and writings in general, as a peculiar mark or diſtinguiſhing characteriſtic of their religion, it being counted a ſort of impiety to omit it. The Jews, for the ſame purpoſe, make uſe of the form, *In the name of the Lord, or, In the name of the great God*; and the Eaſtern Chriſtians that of, *In the name of the Father, and of the Son, and of the Holy Ghoſt*. But Mahomet probably took this form, as he did many other things, from the Perſian Magi, who uſed to begin their books in theſe words, *Benam Yezdan bakſhaiſhgher dadar*; that is, *In the name of the moſt merciful juſt God*.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, ſome with a ſingle one, others with more. Theſe letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal ſeveral profound myſteries; the certain underſtanding of which, the more intelligent confeſs, has not been communicated to any mortal, their prophet only excepted. Notwithſtanding which, ſome will take the liberty of gueſſing at their meaning by that ſpecies of Cabala called by the Jews Notarikon, and ſuppoſe the letters to ſtand for as many words, expreſſing the names and attributes of God, his works, ordinances, and decrees; and therefore theſe myſterious letters, as well as the verſes themſelves, ſeem in the Koran to be called ſigns. Others explain the intent of theſe letters from their nature or organ, or elſe from their value in numbers, according to another ſpecies of the Jewiſh Cabala, called Gematria; the uncertainty of which conjectures ſufficiently appears from their diſagreement.

The Koran is univerſally allowed to be written with the utmoſt elegance and purity of language, in the dialect of the tribe of Koreiſh, the moſt noble and polite of all the Arabians, but with ſome mixture, though very rarely, of other dialects. It is confeſſedly the ſtandard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itſelf, inimitable by any human pen; and therefore inſiſted on by the Mahometans as a permanent miracle, greater than that of raiſing the dead.

To this did Mahomet himſelf chiefly appeal for the confirmation of his miſſion, publicly challenging the moſt eloquent men in Arabia, which was at that time ſtocked with thouſands whoſe ſole ſtudy and ambition it was to excel in elegance of ſtyle and compoſition, to produce even a ſingle chapter that might be compared with it.

To the pomp and harmony of expreſſion ſome aſcribe all the force and effect of the Alcoran; which they conſider as a ſort of muſic, equally fitted with other ſpecies of that art to raviſh and amaze.

In this Mahomet ſucceeded ſo well, and ſo ſtrangely captivated the minds of his audience, that ſeveral of his opponents thought it the effect of witchcraft and enchantment, as he himſelf complains. Others have attributed the effect of the Alcoran to the frequent mention of rewards and puniſhments; heaven and hell occurring almoſt in every page.

The general deſign of the Koran, the impoſtor pretended was to unite the profeſſors of the three different religions, then followed in the populous country of Arabia, Pagans, Jews, and Chriſtians, in the knowledge and worſhip of one God, under the ſanction of certain laws, and the outward ſigns of ceremonies partly of ancient and partly of novel inſtitution, enforced by the conſideration of rewards and puniſhments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambaſſador of God, who, after the repeated admonitions, promiſes, and threats, of former ages, was at laſt to eſtabliſh and propagate God's religion on the earth, and to be acknowledged chief pontiff in ſpiritual matters, as well as ſupreme prince in temporal.

The great doctrine then of the Koran, is the unity of God; to reſtore which point Mahomet pretended was the chief end of his miſſion; it being laid down by him as a fundamental truth, that there never was, nor ever can be, more than one true orthodox religion. For though the particular laws or ceremonies are only temporary, and ſubject to alteration, according to the divine direction, yet the ſubſtance of it being eternal truth, is not liable to change, but continues immutably the ſame.

And he taught, that, whenever this religion became neglected, or corrupted in eſſentials, God had the goodneſs to re-inform and re-admoniſh mankind thereof, by ſeveral prophets, of whom Moſes and Jeſus were the moſt diſtinguiſhed, till the appearance of Mahomet, who is their ſeal, and no other to be expected after him.

The more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful puniſhments formerly inflicted by God on theſe who rejected and abuſed his meſſengers; ſeveral of which ſtories, or ſome circumſtances of them, are taken from the Old and New Teſtaments, but many more from the apocryphal books and traditions of the Jews and Chriſtians of thoſe ages, ſet up in the Koran as truths in oppoſition to the Scriptures, which the Jews and Chriſtians are charged with having altered: and indeed, few or none of the relations or circumſtances in the Koran were invented by Mahomet, as is generally ſuppoſed, it being eaſy to trace the greateſt part of them much higher.

The reſt of the Alcoran is taken up in preſcribing neceſſary laws and directions, frequent admonitions to moral and divine virtues, the worſhip reverence of the Supreme Being, and reſignation to his will. One of their moſt learned commentators diſtinguiſhes the contents of the Alcoran into allegorical and literal; under the former are comprehended all the obſcure, parabolical, and enigmatical paſſages, with ſuch as are repealed or abrogated; the latter, ſuch as are clear and in full force.

The moſt excellent moral in the whole Alcoran, interpreters ſay, is in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and diſpute not with the ignorant; or, as Mr. Sale renders it, uſe indulgence, command that which is juſt, and withdraw far from the ignorant. Mahomet, according to the authors of the Keſchaf, having begged of the angel Gabriel a more ample explication of this paſſage, received it in the following terms: "Seek him who turns thee out, give to him who takes from thee, pardon him who injures thee; for God will have you plant in your ſouls the roots of his chief perfections." It is eaſy to ſee that this commentary is copied from the Goſpel. In reality, the neceſſity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Chriſtians; among thoſe latter, that among the Heathens; and to be traced originally among the Jews.

It is the general and orthodox belief among the Mahometans, that the Koran is of Divine original; nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God: that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the preſerved table, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was, by the miniſtry of the angel Gabriel, ſent down to the loweſt heaven, in the month of Ramadan, on the night of power: from whence Gabriel revealed it to Mahomet by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of 23 years, as the exigency of affairs required; giving him, however, the conſolation to ſhow him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a year; but in the laſt year of his life he had the favour to ſee it twice. They ſay, that few chapters were delivered entire, the moſt part being revealed piecemeal, and written down from time to time by the prophet's amanuenſis in ſuch a part of ſuch and ſuch a chapter, till they were completed, according to the directions of the angel. The firſt parcel that was revealed is generally agreed to have been the firſt five verſes of the 96th chapter.

When Mahomet died, he left his revelations in diſorder, and not digeſted into the method, ſuch as it is, in which we now find them. This was the work of his ſucceſſor Abu Beer; who, conſidering that a great number of paſſages were committed to the memory of Mahomet's followers, many of whom were ſlain in their wars, ordered the whole to be collected, not only from the palm-leaves and ſkins on which they had been written, and which were kept between two boards or covers, but alſo from the mouths of ſuch as had gotten them by heart. This tranſcript, when completed, he committed to the cuſtody of Haſſa the daughter of Gmar, one of the prophet's widows.

In the 30th year of the Hegira, Othman being then caliph, and obſerving the great diſagreement in the copies of the Koran in the ſeveral provinces of the empire; thoſe of Irak, for example, following the reading of Abu Muſa al Aſhari, and the Syrians that of Macdad Ebn Eſwad; he, by the advice of the companions, ordered a great number of copies to be tranſcribed from that of Abu Beer, in Haſſa's care, under the inſpection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, wherever they diſagreed about any word, they ſhould write it in the dialect of the Koreiſh, in which it was at firſt delivered. Theſe copies, when made, were diſperſed in the ſeveral provinces of the empire, and the old ones burnt and ſuppreſſed.

The Alcoran is held in the higheſt eſteem and reverence among the Muſſulmen. They dare not ſo much as touch the Alcoran without being firſt waſhed, or legally purified; to prevent which, an inſcription is put on the cover or label, *Let none touch, but thoſe who are clean.*

Mahomet fabricated a ſyſtem of incoherence, a religion of depravity totally repugnant to the nature of that being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and ſenſual age.

Alçoran is alſo figuratively applied to certain other books full of impieties and impoſtures. In this ſenſe we meet with the Alcoran of the Cordeliers, which has made a great noiſe; wherein St. Francis is extravagantly magnified, and repreſented as more than mortal.

ALCORANISTS, among Mahometans, thoſe who adhere ſtrictly to the letter or text of the alcoran, from an opinion of its ultimate ſufficiency and perfection. ThePerſians are generally Alcoraniſts, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. beſides the Alcoran, admit as multitude of traditions.

ALCOVE, among builders, a receſs, or part of a chamber ſeparated by an eſtrade, or partition of columns, and other correſponding ornaments, in which is placed a bed of ſtate, and ſometimes ſeats to entertain company.

ALCYON, the trivial name of a ſpecies of alcedo.

ALCYONIUM, an obſolete name of a ſubmarine plant. It is alſo uſed for a kind of coral, or aſtroites, frequently found foſſile in England.

ALDABARAM, in anatomy, a name given to the ſeſamoide bones in the great toe.

ALDARU, in botany, ſignifies the Lentiſk tree of many authors.

ALDEBAC, in medicine, implies the ancient vegetable poiſon, which modern authors ſuppoſe to be the ſame as bird-lime.

ALDEBARAN, in aſtronomy, a ſtar of the firſt magnitude, called in Engliſh the bull's eye, as making the eye of the conſtellation Taurus. Its longitude is 6 deg. 32 min. 9 ſec. of Gemini, and its latitude 5 deg. 29 min. 40 ſec. ſouth.

ALDER Tree, in botany, ſynonymous with Betula.

ALDER-Berry-Bearing, is ranked in the Pentandria claſs, Monogynia; order and genus of Rhamnus; and conſiſts of two ſpecies; for its characters, ſee Syſtem of BOTANY.

ALDERAIMIN, in aſtronomy, is a ſtar of the third magnitude, on the right ſhoulder of the conſtellation Cepheus.

ALDERMAN, in the Britiſh policy, a magiſtrate ſubordinate to the lord mayor of a city or town-corporate. The number of theſe magiſtrates is not limited, but is more or leſs according to the magnitude of the place. In London they are 26; each having one of the wards of the city committed to his care. This office is for life; ſo that when one of them dies, or reſigns, a wardmote is called, who return two perſons, one of whom the lord-mayor and aldermen chooſe to ſupply the vacancy. All the aldermen are juſtices of the peace, by a charter of 15 Geo. II.

The aldermen of London, &c. are exempted from ſerving inferior offices; nor ſhall they be put upon aſſizes, or ſerve on juries, ſo long as they continue to be aldermen.

ALDERMAN, among our Saxon anceſtors, was a degree of nobility anſwering to our preſent earl or count.

ALDERMAN was alſo uſed, in the time of king Edgar, for a judge or juſtice. Thus we meet with the titles of *Aldermannus totius Angliæ, aldermannus regis, comitatus, civitatis, burgi, caſtelli, hundredi ſive wapentachii, et novemdecimorum.* According to Spelman, the *aldermannus titius Angliæ* ſeems to have been the ſame officer who was afterwards ſtyled *capitalis juſticiarius Angliæ*, or chief juſtice of England; the *aldermannus regis* ſeems to have been an occaſional magiſtrate, anſwering to our juſtice of aſſize; and the *aldermannus comitatus*, a magiſtrate who held a middle rank between what was afterwards called the *earl* and the *ſheriff*; he ſat at the trial of cauſes with the biſhop: the latter proceeding according to eccleſiaſtical law, and the former declaring and expounding the common law of the land.

ALDHAFERA, in the Arabian ſyſtem of aſtronomy, denotes a fixt ſtar of the third magnitude in the lion's mane.

ALDII, in antiquity, implied ſervants who attended their maſters in expeditions to the wars.

ALDROVANDIA, in botany, a genus of the pentandria order, belonging to the pentagynia claſs of plants; of which there is but one ſpecies. The calyx is divided into five parts; the petals are five; and the capſule has five valves, with ten ſeeds. It is a native of Italy and the Indies; and has no Engliſh name.

ALE, a fermented liquor obtained from an infuſion of malt, and differing from beer chiefly in having a leſs proportion of hops.

This liquor, the natural ſubſtitute of wine in ſuch countries as could not produce the grape, was originally made in Egypt, the firſt planted kingdom, on the diſperſion from the Eaſt, that was ſuppoſed unable to produce grapes. And, as the Noachian colonies pierced further into the weſt, they found, or thought they found, the ſame defect, and ſupplied it in the ſame manner.

Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all uſed an infuſion of barley for their ordinary liquor: and it was called by the various names of Cælia and Ceria in the firſt country, Cereviſia in the ſecond, and Curmi in the laſt; all literally importing only *the ſtrong water*. See Syſtem of BREWING.

"All the ſeveral nations (ſays Pliny) who inhabit the weſt of Europe, have a liquor with which they intoxicate themſelves, made of corn and water. The manner of making this liquor is ſomewhat different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are every where the ſame. The people of Spain, in particular, brew this liquor ſo well, that it will keep good a long time. So exquiſite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itſelf intoxicate."

The method in which the ancient Britons, and other Celtic nations, made their ale, is thus deſcribed by Iſidorus and Oroſius. "The grain is ſteeped in water and made to germinate, by which its ſpirits are excited and ſet at liberty; it is then dried and grinded; after which it is infuſed in a certain quantity of water; which being fermented, becomes a pleaſant, warming, ſtrengthening, and intoxicating liquor." This ale was moſt commonly made of barley; but ſometimes of wheat, oats, and millet.

Anciently the Welch and Scots had alſo two kinds of ale, called *common ale* and *ſpiced ale*; and their value was thus aſcertained by law:

"If a farmer hath no mead, he ſhall pay two caſks of ſpiced ale, or four caſks of common ale, for one caſk of mead." By this law, a caſk of ſpiced ale, nine palms in height, and 18 palms in diameter, was valued at a ſum of money equal in efficacy to ſeven pounds ten ſhillings of our preſent money; and a caſk of common ale, of the ſame dimenſions, at a ſum equal to three pounds fifteen ſhillings.

This is a ſufficient proof, that even common ale, in this period, was an article of luxury among the Welch, which could only be obtained by the great and opulent.

Wine ſeems to have been quite unknown, even to the kings of Wales in this period; as it is not ſo much as once mentioned in their laws; though Giraldus Cambrenſis, who flouriſhed about a century after the conqueſt, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their anceſtors the ancient Germans. Before their converſion to Chriſtianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which thoſe heroes enjoyed who were admitted into the hall of Odin.

There are various ſorts of ale known in Britain, particularly pale and brown: the former is brewed from malt ſlightly dried; and is eſteemed more viſcid than the latter, which is made from malt more highly dried or roaſted.

Pale ale brewed with hard waters, as thoſe of ſprings and wells, is judged the moſt wholeſome, in regard the mineral particles tend to prevent the coheſions of thoſe drawn from the grain, and enable them to paſs the proper ſecretions the better; ſofter waters, as thoſe of rivers, and rain, ſeem better ſuited to draw out the ſubſtance of high-dried malts, which retain many igneous particles beſt abſorbed in a ſmooth vehicle.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick bean, &c.

Ale is generally held to be more diuretic than beer, in regard it is ſmoother, more ſoftening, and relaxing; ſo that where urine is to be promoted by facilitating the peſſage, ale is moſt likely to effect it.

Ale is flatulent; and hence ſometimes produces colics; and the cholera morbus: it is aceſcent; but it does not produce calcareous diſeaſes, as has been aſſerted.

If malt liquor, of any degree of ſtrength, is become flat and tartiſh, as it is uſed, it ſhould be drawn out of the caſk into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor: thus a new ferment will be raiſed, a ſprightly taſte will be reſtored to the liquor, and its acidity will be deſtroyed. Tart liquors of this kind are apt to produce a dyſury, ſtrangury, or a gonorrhœa; in which caſes, a ſmall quantity of brandy may be taken.

The duties on ale and beer make a principal branch of the revenue in Britain. They were firſt impoſed by the 12th of Car. II. and have been continued by ſeveral ſubſequent acts of parliament to firſt Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for ſale ſhall pay 8s. for every barrel of either, above 6s. a barrel; and for every barrel of 6s. or under, the ſum of 1s. 4d.

Medicated ALES, thoſe wherein medicinal herbs have been infuſed, or added during the fermentation.

Gill ALE is that in which the dried leaves of gill or ground-ivy have been infuſed. It is eſteemed abſterſive and vulnerary, and conſequently good in diſorders of the breaſt and obſtructions of the viſcera.

ALE-*Conner*, an officer in London, who inſpects the meaſures uſed in public houſes. There are four ale-conners, who are all choſen in the common-council of the city.

ALE-*Houſes* muſt be licenſed by juſtices of the peace, who take recognizances of the perſons licenſed, and of their ſureties, viz. 10l. each, that they will not ſuffer unlawful gaming, or other diſorderly practices in their houſes. Every perſon, excepting thoſe who ſell ale in fairs, neglecting to procure a licence, is liable to a penalty of 40s. for the firſt offence, 4l. for the ſecond, and 6l. for the third, with all coſts. The licence is granted on the firſt of September, or within twenty days after, at a general meeting of the juſtices for the diviſion to which he belongs, upon his producing a certificate to his character, unleſs, by living in a city or town-corporate, this laſt circumſtance is diſpenſed with, and continues in force for one year only. Ale-houſe keepers, ſelling ale in ſhort meaſure, are liable to a penalty not exceeding 40s. and not leſs than 10s. and likewiſe to a fine of 10s. for permitting tipling, &c.

By 29th Geo. II. c. 12. perſons keeping ale houſes in Scotland ſhall be licenſed as in England, and the juſtices there ſhall meet annually to licenſe ale-houſes; on each of which licenſes a fee of 1s. is payable to the clerk of the peace. Magiſtrates of royal boroughs ſhall meet yearly for the like purpoſe; but where there ſhall not be a ſufficient number of magiſtrates to act in any royal borough, juſtices may grant licenſes, to be in force for one year only.

Perſons in Scotland convicted of keeping unlicenſed ale-houſes ſhall forfeit for the firſt offence 5s. for the ſecond 10s. for the third 20s. and to be diſqualified; and for every ſubſequent offence 40s. to be levied by diſtreſs and ſale, one moiety to the informer, the other to the poor of the pariſh. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but perſons aggrieved may appeal to the quarter ſeſſions.

Licenſes for houſes on the military roads in Scotland ſhall be iſſued on payment of 1s. only to the clerk of the peace: making out licenſes before the ſame be ſtamped, is a penalty of 10l. and making them contrary to the intention of this act, 5l. and the ſame ſhall be vacated, unleſs the duty and fine be paid, and the receipt produced, and licence ſtamped.

ALE-*Silver*, a tax paid annually to the lord-mayor of London, by all who ſell ale within the city.

ALEA, in Roman antiquity, ſignifies generally all manner of games of chance; but, in a more reſtricted ſenſe, implies particular game played with dice and tables, not unlike our backgammon.

ALEATORIUM, in Roman antiquity, denoted the place where the game of Alea was played.

ALEC, in ichthyology, the name of a fiſh of the ſparus kind.

ALECOST, ſynonymous with Tanzy.

ALECTO, in mythology, one of the furies, daughter of Acheron and Night, or, as ſome ſay of Pluto and Proſerpine.

ALECTORIA, in natural hiſtory, a ſtone ſaid to be formed in the gall-bladders of old cocks, to which the ancients aſcribed many fabulous virtues. This is otherwiſe called *Alectorius Lapis*, ſometimes *Alectorolithos*, in Engliſh the *cock-ſtone*. The more modern naturaliſts hold the *alectorius lapis* to be originally ſwallowed down, not generated in, the ſtomach or gizzard of cocks and capons. It is known that many of the fowl-kind make a practice of ſwallowing pebbles, as it is ſuppoſed to be of ſervice in the buſineſs of trituration and digeſtion.

ALECTOROMANTIA, in antiquity, a ſpecies of divination performed by means of a cock. This is otherwiſe called *Alectryomancy*; of which there appear to have been different ſpecies. But that moſt ſpoken of by authors was in the following manner: a circle being deſcribed on the ground, and divided into twenty-four equal portions, in each of theſe ſpaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned looſe in the circle, particular notice was taken of the grains picked up by the cock, becauſe the letters under them, being formed into a word, made the anſwer deſired. It was thus, according to Zonoras, that Libanus and Jamblicus ſought who ſhould ſucceed the emperor Valens; and the cock eating the grains anſwering to the ſpaces ΘΕΟΔ, ſeveral whoſe names began with thoſe letters, as Theodotus, Theodiſtes, Theodulus, &c. were put to death; which did not hinder, but promote, Theodoſius to the ſucceſſion. But the ſtory, however current, is but ill ſupported: it has been called in queſtion by ſome, and refuted by others, from the ſilence of Marcellinus, Socrates, and other hiſtorians of that time.

A-LEE, in the ſea-language, a term only uſed when the wind, croſſing or flanking the line of a ſhip's courſe, preſſes upon the maſts and ſails ſo as to make her incline to one ſide, which is called the lee-ſide: hence, when the helm is moved over to this ſide, it is ſaid to be *a-lee*, or *hard-a-lee*.

ALEGER, a name given to an inferior ſort of vinegar made from malt liquor inſtead of wine.

ALEMBDAR, or ALEMDAR, an officer in the court of the Grand Signior, who bears the green ſtandard of Mahomet, when the ſultan appears in public on any ſolemn occaſion.

ALEHOOF, in botany, a name given to ground ivy.

ALEIPHA, in the materia medica, implies a general name for fatted bodies both in the animal and vegetable kingdoms of nature. But, in a more reſtricted ſenſe, ſignifies all ointments that are uſed to rub the human body with, in order to relieve the patient by abſorption through the pores of the ſkin. The word is purely Greek, from *αλειφε, I anoint*.

ALEMBIC, or LEMBEC, a chemical veſſel, uſually made of glaſs or copper, formerly uſed for diſtillation. The bottom part, which contained the ſubject for diſtillation, is called, from its ſhape, the *cucurbit*; the upper part, which receives and condenſes the ſteam, is called the head, the beak of which is fitted into the neck of a receiver. Retorts, and the common worm-ſtill, are now more generally employed in diſtillation.

ALEMBROTH, in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alkaheſt, in diſſolving bodies, opening the pores of moſt or all known ſubſtances, and thence, as well as by deſtroying ſulphurs, promoting the ſeparation of metals from their ores. It is alſo uſed for a compound of corroſive mercury and ſal ammoniac.

ALERON, in ancient medicine, ſignified the oil of ſweet almonds.

ALEORE, from *αλεωρη*, in the materia medica of the ancients, implied the intermiſſion of eaſe, from the raging pains of any acute or violent diſtemper.

ALERION, in heraldry, a ſynonomy of Allerion.

ALES, in a general ſenſe, ſignifies a name given to a compound ſalt. But in a particular application it implies contracted, when uſed by the faculty as an adjective.

ALETON, from *αληω, to grind*, implies meal produced from any ſort of corn ground in a mill.

ALETIDES, in mythology, denoted the ſacrifices offered by the Athenians to Icarius and Erigone. The former was ſlain by the ſhepherds of Attica, who imagined they were poiſoned by drinking ſome wine he had given them. The latter, on finding her father was dead, flew herſelf to accompany him in elyſium. The Delphian oracle inſtituted this worſhip to appeaſe the ghoſts of the unfortunate father and daughter.

ALETRIS, in botany, a genus of the monogynia order belonging to hexandria claſs of plants, and in the natural method ranking under the 10th order Coronariæ. For the character, ſee Syſtem of BOTANY.

Of this genus there are five ſpecies, all of which are exotics that cannot live in this country.

The Aletris is generally defined as the Baſtard Aloe.

ALEUCOMANCY, is formed of the Greek words, *αλευρον, meal*, and *μαντεια, divination*, which is the ſame with what was otherwiſe called *alphitomantia* and *crithomanthia*, and means an ancient kind of divination performed by means of meal or flour.

ALEXANDRIAN, in a general ſenſe, was applied to thoſe who taught ſchool in Alexandria: or at leaſt were profeſſors of the ſciences: hence Clemens, Apion, Oaſis, and Aroſtarchus, as well as the celebrated Philoſephus, Amonius, Plotinus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus, are called Alexandrians.

ALEXANDRIAN is more particularly underſtood of a college of prieſts, conſecrated to the ſervice of Alexander Severus after his deification. Lampridius relates, that, notwithſtanding Severus was killed by Maximin, the ſenate proſecuted his apotheoſis; and, for regularity of worſhip, founded an order of prieſts, or *ſodales*, under the denomination of *Alexandrini*.

ALEXANDRIAN MANUSCRIPT, a famous copy of the Scriptures, conſiſting of four volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtament, with the Apocrypha, and ſome ſmaller pieces, but not quite complete.

This manuſcript is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to king Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written.

In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice.

But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate biblical writers agreed about its age.

Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not written till near the end of the fifth century, or ſomewhat later.

ALEXANDRIAN, or ALEXANDRINE, in poetry, a kind of verſe conſiſting of twelve, or of twelve and thirteen ſyllables alternately; ſo called from a poem on the life of Alexander, called the Alexandriad, written in this kind of verſe by ſome French poet. Alexandrines are peculiar to modern poetry, and ſeem well adapted to epic poems. They are uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXICACUS, ſomething that preſerves the body from harm or miſchief. The word ſignifies the ſame as *alexiterial*.

ALEXICACUS, in mythology, was an attribute of Neptune, whom the tunny-fiſhers uſed to invoke under this appellation, that their nets might be preſerved from the ſword-fiſh, which uſed to tear them; and that he might prevent the aſſiſtance which it was pretended the dolphins uſed to give the tunnies on this occaſion.

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined, that the animal ſpirits, in acute diſtempers, were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

ALEXITERIAL, among phyſicians, a term of much the ſame import with *alexipharmic*; though ſometimes uſed in a ſynonymous ſence with amulet.

ALFANDICA, the name of the cuſtom-houſe at Liſbon.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion; in oppoſition to the Morabites, who anſwer to monks among Chriſtians.

ALFDOUCH, a name given by the Moors to a ſort of vermicelli, which they make of flour and water, and are very fond of in their entertainments.

ALFECCA, in aſtronomy, a name given to the ſtar, called Lucida Coronæ, or Alſeta.

ALFEET, in antiquity, denoted a caldron full of boiling water, wherein an accuſed perſon, by way of trial or purgation, plunged his arm up to the elbow.

ALGA, in botany, ſignifies the trivial name of the lichen, fucus, and ſeveral other plants of the Cyptogamia claſs.

ALGÆ, FLAGS, or FLAGGERS, form one of the ſeven families of plants in the Linnæan ſyſtem, in which they conſtitute the 3d order of the 24th claſs. See Syſtem of BOTANY, for the characters of this diſtribution in the vegetable kingdom.

ALGALI, an obſolete term in chemiſtry for nitre.

ALGAROL, or ALGAREL, in chemiſtry, implies an Arabic term for an emetic powder, prepared from regulus of antimony diſſolved in acids, and ſeparated by repeated lotions in warm water.

ALGATRANE, a ſort of pitch found in the Bay, formed by the point of St. Helena on the ſouth of the iſle of Plata.

ALGAVAREIA, the ancient language of the Moors who ſettled in Spain, a kind of barbarous dialect of the Arabic, contradiſtinguiſhed from the Adjameia, or real Moriſco, ſpoken in Morocco.

ALGEBRA, in a general ſenſe, implies the method of reſolving problems by equation. For further particulars, ſee New Syſtem of ALGEBRA.

A NEW SYSTEM of ALGEBRA.

ALGEBRA is an art or ſcience of univerſal uſe in mathematics, teaching in a general manner to ſolve difficult Problems, and to diſcover and inveſtigate Propoſitions and Theorems in any particular branch of Science, by comparing, with one another, the relation of the abſtract quantities therein concerned.

It is an art truly ſublime, and of an unlimited extent; for though the nature of the ſubject, to which it is applied, ſhould be ever ſo complex; and the quantities concerned ſhould be ever ſo much entangled, yet it affords means of ſurmounting the utmoſt difficulties, and, by a curious and careful purſuit through the moſt intricate labyrinths, of attaining to the anſwer ſought.

In this art letters or ſymbols are ſubſtituted in the place of numbers, and thereby it obtains an eminent advantage over mere arithmetical operations; becauſe there the numbers become, as it were, metamorphoſed and changed into others; whereas here the quantities are preſerved diſtinct, viſible, and unchanged, from which general rules may be drawn for anſwering all queſtions of a ſimilar nature with that under conſideration.

On account of its extent and uſefulneſs it has been named UNIVERSAL MATHEMATICS, UNIVERSAL ARITHMETIC, and, by way of eminence, *Ars Magna*, or the GREAT ART. In Arabic, it is called *Algiabr Walmokabala*, which ſignifies the *Art* of *Reſtitution* and *Compariſon*, or the *Art* of *Reſolution* and *Equation*; and it is highly probable that it was from the former word, *Algiabr*, that we derived the name Algebra. It is alſo called *Specious Arithmetic*, the *Analitic Art*, &c. And from its wonderful diſpatch and brevity, and uſe of ſymbols, it may likewiſe, with propriety, be termed MATHEMATICAL STENOGRAPHY.

The firſt inventor of this noble art is not certainly known: however, it is highly probable the ancients had ſome ſort of Analyſis, whereby they found out moſt of their excellent Theorems; for it is hardly poſſible to conceive that they could have hit upon them otherwiſe; and indeed there are ſome examples of it in Euclid, at leaſt in *Theon upon Euclid*, who ſays, that the art was firſt communicated by Plato: and hence Plato is by many eſteemed the inventor. There are alſo inſtances of it in *Pappus*, and the effects thereof are diſcoverable in *Archimedes*, *Apollonius*, and others, though they appear to have ſtudiouſly diſguiſed it.

This art however is ſaid to have been in uſe among the Arabs much earlier than among the Greeks, and even they are ſuppoſed to have borrowed it from the Perſians, who alſo, it is conjectured, learned it of the Indians.

It is further aſſerted, that it was firſt introduced into Europe by means of an emigration of the Arabs into Spain, about the beginning of the twelfth century; whence ſome are of opinion, it came into England before Diophantus, who wrote profeſſedly on the art, in or about the third century, was known among us. Diophantus's Treatiſe conſiſted of thirteen books, ſix of which were tranſlated from the Greek into Latin, and publiſhed by Xylander in 1575. He is recorded to be the firſt Grecian who wrote on the ſubject. His works only treat of indeterminate Problems.

In 1494, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, publiſhed at Venice a Treatiſe of Algebra in Italian. This author mentions Leonardus Pſanus, and ſome others, of whom he had learned the art. He eſtabliſhes the received opinion that Algebra came originally from the Arabs, and takes no notice of Diophantus, which makes it probable that that author's works were not then known in Europe. Pacciolus's Treatiſe goes no farther than Quadratic Equations.

Stefelius, Scipio Ferreus, Cardan, and Tartagilla, ſucceeded each other, and gave ſome ſolutions of Cubic Equations.

Next came Bombelli, Nunninus, Romus, Schoner, Salignac, Clavius, and ſome others; but none of them went beyond Quadratics.

About the year 1590, Vieta publiſhed his Syſtem of Algebra, wherein he gave an ingenious method of extracting the Roots of Equations by approximations, which has ſince been greatly improved by Raphſon, Halley, Simpſon, Emerſon, and others.

In 1631, Oughtred and Harriot publiſhed their Treatiſes, both of which were well received.

The celebrated Des Cartes, in 1657, publiſhed his Geometry, wherein he introduced the algebraic Rules of Harriot, and applied them to the higher Geometry, explaining the nature of Curves by Equations, and adding the Conſtruction of Cubics, Biquadratic, and other higher Equations.

Sluſius in 1668, Fermat in 1669, and Barrow in 1670, with ſeveral other authors, improved upon Des Cartes's plan; but none with greater ſucceſs than Thomas Baker in 1684, and Dr. Wallis in 1685. However, as an elementary writer, no author can be more deſerving of praiſe than Kerſey, who publiſhed the firſt Engliſh Treatiſe of Algebra, wherein the nature of Equations are largely explained and illuſtrated by a variety of Examples. The whole ſubſtance of Diophantus is alſo delivered, and many things added concerning Mathematical Compoſition and Reſolution from Ghetaldus.

Preſlet in 1694, Ozanam in 1703, Guiſne in 1704, and L'Hoſpital in 1707, publiſhed with ſucceſſive improvements.

The immortal Engliſh Philoſopher, Sir Iſaac Newton, publiſhed his *Arithmetica Univerſalis*, this year, 1707, which abounds in ſelect Examples, and cóntains ſeveral Rules and Methods invented by the author.

Algebra has been ſince applied to a world of Knowledge, ſurpaſſing all the wiſdom of the ancients, namely, the conſideration and calculous of Infinites, called generally the Doctrine of Fluxions. It is alſo named *Analyſis of Infinites*; and the *Calculus Differentialis*.

Of a modern date, the number of Algebraical authors is almoſt incredible. I muſt however, with deference to the hoſt, name thoſe whom I think the moſt intelligent and uſeful, viz. Saunderſon, Ward, Simpſon, Emerſon, and Maclaurin; but, as a ſchool book, the Treatiſe of Bonnycaſtle is well adapted. He is exceeding methodical, and elegant in his text; and ſo indeed he is in every thing that he has committed to the preſs.

Having, in as brief a manner as I was able, given an hiſtoric view of the rice and progreſs of the art, I ſhall proceed to ſhew the rudiments thereof, by touching on the ſeveral methods whereby Algebraical Operations are principally performed.

I am well aware that the application of Algebra preſents a wide field to the man of ſcience, as well as to the young artiſt, who thirſts for knowledge, ſo that it remains neceſſary to obſerve that thoſe numerous matters cannot be expected to come within the limits appointed for the Syſtem in a Dictionary of Arts and Sciences, eſpecially where unintereſted prolixity is exploded.

Notwithſtanding I am perſuaded the ſtudient will here find the fundamentals of the art ſufficiently treated of, to enable him in a variety of caſes to make the application, and to read with pleaſure thoſe Authors who have written learnedly on the ſubject; and it was under this idea that I have given the names of ſuch as I thought beſt deſerving of his attention.

SECTION I.

DEFINITIONS.

I. As, according to this art, Problems are computed by the means of letters and other characters, ſo it is to be obſerved, that the firſt letters of the Alphabet, as *a*, *b*, *c*, *d*, &c. are uſually put for unknown quantities; and the laſt, as V, X, Y, Z, for quantities unknown, which are always aſſumed as if they were really given or known, and are thus managed in the proceſs according to the rules of art, till at length either the unknown quantities themſelves, or certain powers or roots thereof, are found equal to ſome given quantities; and ſo they become known alſo.

II. The ſign $+$ (*plus*) denotes *addition*. Thus $a+b$, ſignifies *b* added to *a*. This is called a *poſitive* or an *affirmative* ſign; and quantities to be added, are ſtiled *poſitive* or *affirmative* quantities.

III. The ſign — (*minus*) denotes *ſubtraction*. Thus $a-b$, ſignifies *b* ſubtracted from *a*. This is called a *negative* ſign; and quantities to be ſubtracted, are named *negative* quantities.

IV. Like ſigns are either all $+$, or all —: Unlike ſigns are $+$ and —.

V. The ſign of *equality* $=$, is placed between the two quantities, to denote them equal. Thus $a=b$, ſhews that *a* and *b*, are equal to each other.

VI. $\times$, Is the ſign of *multiplication*. So $a\times b$; $b\times c\times d$, denote the product of *a* and *b*, and of *b*, *c*, and *d*, reſpectively:

but the product of ſimple quantities is commonly expreſſed by merely joining or annexing the letters; ſo the products of the above quantities are *ab* and *bcd*. Sometimes the product is denoted by putting a point between each quantity, as $b.\overline{c-d}$ denotes *b* multiplied by *c*—*d*.

VII. ÷, Is the ſign of *diviſion*. Hence $a \div b$, ſignifies *a* divided by *b*; but the ſame is generally written in the manner of a fraction. Thus, $\frac{a}{b}$, and $\frac{a-b}{c+d}$, denote *a* divided by *b*, and *a*—*b* divided by *c*+*d* reſpectively.

VIII. ∽, Is put between two quantities to denote their difference; as $a \backsim b$ ſignifies the difference between *a* and *b*, but without ſhewing which is the greater or leſs quantity.

IX. ⊏ or ⅂, are ſigns of *majority*, and ⊐ or ∠ are ſigns of *minority*. Thus *a*⊐*b*, ſhews that *a* is greater than *b*, and *a*⊐*b* ſhews that *a* is leſs than *b*.

X. √, Is the ſign of *radicality*, and of itſelf denotes the *ſquare root*; the *cube root*, *biquadrate root*, &c. are expreſſed by writing a 3 or 4, &c. over it. Thus $\sqrt{a}$, $\sqrt[3]{a}$, and $\sqrt[4]{a}$, denote the ſquare root, cube root, and biquadrate root *a* reſpectively.

XI. ☊, Is the ſign of *involution*, as ☊ 2 ſignifies involved to the ſquare; ☊ 3, involved to the cube, &c.

XII. ɯ, *evolution*, as ɯ 2, ſignifies the ſquare root, ɯ 3, the cube root, &c.

XIII. The *power of a quantity* is its ſquare, cube, biquadrate, &c. and the figure or letter which is put over a quantity to denote the ſame, is named the *index*, *exponent* or *dimenſion*, of ſuch quantity. Thus a^2, a^3, and a^4, denote the ſquare, cube, and biquadrate of *a* reſpectively; or, which is the ſame, the ſecond, third, and fourth power of *a*; and the figures, 2, 3, and 4, are the indices or exponents, &c. of *a*. Sometimes the power of a quantity is ſhewn by repetitions of the letter. Thus *aa* is the ſame as a^2; and *aaa*, the ſame as a^3, &c.

XIV. *Like quantities* are thoſe that conſiſt of the ſame letters, as *a*, $3a-4a$. Alſo *bb*, $3bb-7bb$; and $2abc, -5abc$, &c.

XV. *Unlike quantities* conſiſt of different letters, or of the ſame letters differently repeated; as *a*, *b*, $2c, -3d$; or as *a*, $2aa$, $-5aaa$.

XVI. *Simple quantities* are thoſe which conſiſt of one term only; as $4b$, $3a^2$, $15dcc$, &c.

XVII. *Compound quantities*, are thoſe which conſiſt of ſeveral terms, as $a+b$, $3a-5c$, $a+2b-3c$, &c.

XVIII. A *line* or *vinculum*, drawn over ſeveral quantities, *a*, *b*, *c*, &c. denote them to be eſteemed a compound quantity, as $\overline{a+b-c}$.

XIX. The *coefficient* of a quantity is the number prefixed to it; as, $5a$, where 5 is the coefficient, and ſignifies that *a* is multiplied by 5.

XX. A *binomial quantity* is one conſiſting of two terms; as $a+b$; a *trinomial*, of three terms, as $a+b+c$; a *quadrimonial*, of four terms, as $a+b+c+d$, &c.

XXI. A *reſidual quantity* is a benomial, where one of the terms is negative.

XXII. A *rational quantity* is that which has no radical ſign.

XXIII. A *ſurd* is a quantity that has not a proper root as the ſquare root of *b*, ($\sqrt{b}$); the cube root of *bb* ($\sqrt[3]{bb}$), &c.

XXIV. An *equation* is the mutual comparing of things equal to one another, the ſign of equality being put between them. A Dependent Equation is that which may be deduced from ſome others. An Independent Equation cannot be produced from the others. A Pure Equation contains but one power of the unknown quantity, as a *ſimple equation*, a *pure quadratic*, a *pure cubic*, &c. An Affected Equation contains ſeveral powers of the unknown quantity, and is denominated according to the higheſt power in it, as an *affected quadratic*, an *affected cubic*, an *affected byquadratic*. Moreover, a Simple Equation contains only the ſimple quantity itſelf. A Quadratic, a quantity of two dimenſions; a Cubic, a quantity of three dimenſions, &c.

Note alſo, that the Roots of Quantities are frequently expreſſed by fractional Exponents, as $a^{\frac{1}{2}}$ denotes the Square Root of *a*; $a^{\frac{1}{3}}$, the Cube Root of *a*; $a^{\frac{1}{4}}$, the Biquadrate Root of *a*, &c. Alſo $a^{\frac{2}{3}}$ denotes the Cube Root of a^2; $a^{\frac{3}{4}}$, the Biquadrate Root of a^3, &c. Likewiſe ∷ is the ſign of disjunct proportion, and ∺ of continued proportion, or geometrical progreſſion.

Theſe explications premiſed, I ſhall lay down the following axioms, and then proceed to Algebraical Operations.

AXIOM 1. If equal quantities be added to equal quantities, the ſums will be equal.

2. If equal quantities be taken from equal quantities, the remainders will be equal.

3. If equal quantities be multiplied by equal quantities, the products will be equal.

4. If equal quantities be divided by equal quantities, the quotients will be equal.

5. The equal Powers or Roots of equal quantities are equal.

6. Quantities ſeverally equal to a third quantity, are equal to one another.

7. The whole is equal to all its parts taken together.

SECTION II.

PRIMARY ALGEBRAICAL OPERATIONS.

ART. I. *To add ſeveral Quantities together.*

RULE. 1. If the quantities are like, and have like ſigns, add together the coefficients, and to the ſum prefix the ſame ſign, ſubjoining the common quantity. 2. If the quantities are like, but have unlike ſigns, take the difference between the ſum of the affirmative coefficients, and the ſum of the negative ones, and thereto prefix the ſign of the greater ſum, annexing alſo the proper quantity. 3. But if the quantities are all unlike with unlike ſigns, write them down one after another, prefixing to each its proper ſign.

EXAMPLES.

$$\begin{array}{lr} & 12ab\\ & 5ab\\ & 7ab\\ \hline \text{Sum} & 24ab. \end{array} \qquad \begin{array}{lr} & 11a^2b+3cd^2\\ & 7a^2b+5cd^2\\ & 10a^2b+7cd^2\\ \hline \text{Sum} & 28a^2b+15cd^2. \end{array} \qquad \begin{array}{lr} & -25x^2y^3-x^4\\ & -37x^2y^3-3x^4\\ & -54x^2y^3-5x^4\\ \hline \text{Sum} & -116x^2y^3-9x^4. \end{array}$$

$$\begin{array}{ll} & -2aa-7bcd+dd\\ & +7aa-20bcd-dd\\ & +3aa+6bcd\\ \hline \text{Sum} & +8aa-21bcd\ *. \end{array} \qquad \begin{array}{ll} & +15a^2-3a+db\\ & -4c^2+ad-5db\\ & +dc-5a+d^2\\ \hline \text{Sum} & +15a^2-4c^2+dc-8a+ad-4db+d^2 \end{array}$$

N. B. Where there is no coefficient prefixed to a quantity, it is underſtood that the coefficient is 1; and where there is no ſign prefixed, the quantity is affirmative.

ART. II. *To ſubtract Algebraical Quantities.*

RULE. Change the ſigns of the quantities to be ſubtracted, and then add the whole together as in addition.

EXAMPLES.

$$\begin{array}{ll} \text{From} & 5a^2b-cd\\ \text{Take} & -3a^2b+2cd\\ \hline \text{Remaind.} & 8a^2b-3cd \end{array} \qquad \begin{array}{ll} \text{From} & 3a^2-2a+cd-d^2-f^2\\ \text{Take} & -2a^2-5a-3ab-2d^2\\ \hline \text{Remaind.} & 6a^2+3a+cd+3ab+d^2-f^2 \end{array}$$

ART. III. *To multiply Algebraical Quantities.*

RULE. Multiply each term of the multiplier into every term of the multiplicand, viz. the coefficients into the coefficients, and the letters into the letters, by placing them together like letters in a word; and prefix + to like ſigns, and — to unlike ſigns. The ſum of all will be the product ſought.

EXAMPLES.

$$\begin{array}{lr} \text{Multiply} & 3a\\ \text{by} & 5b\\ \hline \text{Product} & 8ab \end{array} \qquad \begin{array}{lr} \text{Multiply} & -7a^2\\ \text{by} & -5c^2\\ \hline \text{Product} & +35a^2c^2 \end{array} \qquad \begin{array}{lr} \text{Multiply} & -4cd^2\\ \text{by} & +8a^2\\ \hline \text{Product} & -32cd^2a^2 \end{array}$$

$$\begin{array}{ll} \text{Mult.} & 5a+3b\\ \text{by} & 2a+b\\ \hline & 10aa+6ab\\ & \quad\ +5ab+3bb\\ \hline \text{Prod.} & 10aa+11ab+3bb \end{array} \qquad \begin{array}{ll} \text{Mult.} & 3xx-5ax\\ \text{by} & x+2a\\ \hline & 3xxx-5axx\\ & \qquad\ +6axx-10aax\\ \hline \text{Prod.} & 3xxx+axx-10aax \end{array}$$

$$\begin{array}{ll} \text{Mult.} & a^2+ab-b^2\\ \text{by} & a-b\\ \hline & a^3+a^2b-ab^2\\ & \quad\ -a^2b-ab^2+b^3\\ \hline \text{Prod.} & a^3\ *\ -2ab^2+b^3 \end{array} \qquad \begin{array}{ll} \text{Mult.} & a^2+b^2\\ \text{by} & c^2-d^2\\ \hline & a^2c^2+c^2b^2\\ & -d^2a^2-d^2b^2\\ \hline \text{Prod.} & a^2c^2+b^2c^2-d^2a^2-d^2b^2 \end{array}$$

ART. IV. *To divide one Quantity by another.*

Rule I. In ſimple quantities, which will divide without a remainder, divide the coefficient by the coefficient, and place the anſwer in the quotient, annexing thereto thoſe letters of the dividend which are not found in the diviſor, and obſerving that like ſigns produce +, and unlike ſigns —.

EXAMPLES.

$$\begin{array}{rl} 3ab) & 21abcd\ (7cd\\ & 21abcd\\ \hline & \qquad\quad 0 \end{array} \qquad \begin{array}{rl} -5a^2b) & 25a^3b^3d\ (-5ab^2d\\ & 25a^3b^3d\\ \hline & \qquad\quad 0 \end{array}$$

Rule II. In compound quantities, divide the firſt term of the dividend by the firſt term of the diviſor (the quantities being firſt ranged in due order according to the dimenſions of ſome letter) and place the reſult in the quotient. Multiply the whole diviſor by the quotient, and ſubtract it from the dividend, to which bring down the next term in the dividend, and repeat the operation as in common arithmetic till the work is done.

EXAMPLES.

$$\begin{array}{l} 2b-3c)\,8baa-12caa\,(4aa \\ \qquad\quad \underline{8baa-12caa} \\ \qquad\qquad\quad 0 \end{array} \qquad \begin{array}{l} a+b)\,a^2-b^2\,(a-b \\ \qquad\;\; \underline{a^2+ab} \\ \qquad\quad -ab-b^2 \\ \qquad\quad \underline{-ab-b^2} \\ \qquad\qquad\quad 0 \end{array}$$

$$\begin{array}{l} 3a-b)\,3a^3-12a^2-ba^2+10ab-2b^2\;(a^2-4a+2b \\ \qquad\quad \underline{3a^3 \qquad\quad -ba^2} \\ \qquad\qquad -12a^2 \; * \; +10ab \\ \qquad\qquad \underline{-12a^2 \qquad +4ab} \\ \qquad\qquad\qquad\quad +6ab-2b^2 \\ \qquad\qquad\qquad\quad \underline{+6ab-2b^2} \\ \qquad\qquad\qquad\qquad\quad 0 \end{array}$$

SCHOLIUM. It will often happen that the diviſor will not exactly divide the dividend, in which caſe it will be proper to place the dividend over the diviſor in form of a fraction, throwing out ſuch letters as are found in all the terms of the dividend and diviſor. Thus, if the dividend is $ax+x^2$, and the diviſor $ax-x^2$, the quotient will be $\frac{ax+x^2}{ax-x^2}=\frac{a+x}{a-x}$.

It is alſo obſervable that any power of a quantity is divided by any power of another quantity, by ſubtracting the exponent of the diviſor from the exponent of the dividend.

Thus $\frac{5a^7}{a^3}=5a^{7-3}=a^4$. And $\frac{12b}{9b^3}=\frac{16b^{1-3}}{12b^3}=\frac{16b^{-2}}{12}=\frac{4b^{-2}}{3}$; and this expreſſion is alſo equal to $\frac{4}{3b^2}$, for it is evident from what has been ſaid, that an affirmative power, in the denominator, makes (if transferred) a negative one in the numerator; and of conſequence a negative power in the numerator is transferable to an affirmative one in the denominator.

SECT. III.

OF FRACTIONS.

ART. V. The rules for managing Algebraic Fractions are preciſely the ſame as thoſe for Vulgar Fractions in Arithmetic, and therefore it would be ſuperfluous to preſent them here, as it is preſumed that thoſe who attempt Algebra are at leaſt well verſed in Arithmetical Operations; and if in any inſtance the reader ſhould not perfectly recollect them, he will find ample ſatisfaction by referring to the rules given for fractions in our NEW SYSTEM OF ARITHMETIC. However, that there may not be the leaſt defection in the ſyſtem here advanced, a few Examples follow by way of exerciſes.

EXAMP. I. Let $\frac{a}{b}$ be reduced to a fraction, whoſe denominator is $b-c$. Here $\frac{a}{b}\times\overline{b-c}=a-\frac{ac}{b}$, and $\frac{a-\frac{ac}{b}}{b-c}$ is the fraction required.

EXAMP. II. Let the mixt quantity $a-\frac{b}{c}$ be reduced to a fraction. Here $\frac{ca-b}{c}$ is the fraction required.

EXAMP. III. Let $\frac{bd-b^2}{d}$ be reduced to a mixt quantity. Here, by dividing $bd-b^2$ by d, the quotient will be b, and the remainder will be $-b^2$; and therefore the anſwer will be $b-\frac{b^2}{d}$.

EXAMP. IV. What is the greateſt common diviſor of $\frac{ad+d^2}{b^2a+b^2d}$?

ANSW. $a+d$, and therefore $\frac{d}{b^2}$ is the fraction in its loweſt terms.

EXAMP. V. Reduce $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$, to fractions of the ſame value, having one common denominator.

ANSW. $\frac{adf}{bdf}$, $\frac{cbf}{bdf}$, and $\frac{edb}{bdf}$, are the fractions required: ſo, in like manner, if it were required to add $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$, together their ſum would be $\frac{adf+cbf+edb}{bdf}$.

In the ſame way the ſum of $\frac{\overline{m+n}^{\frac{a}{c}}}{\overline{d+e}^{2}}$ and $\frac{d+e}{\overline{m+n}^{2}}$ will be found

$$=\frac{\overline{m+n}^{\frac{2c+a}{c}}+\overline{d+e}^{3}}{\overline{d+e}^{2}\times\overline{m+n}^{2}}.$$

Alſo $\frac{a+b}{d}-\frac{b^2}{a}=\frac{a^2+ab-db^2}{ad}$.

And $\frac{m}{a^2+b^c}-\frac{a^2+b^c}{m^2}=\frac{m^3-a^2\,\overline{+b^c}}{m^2a^2+m^2b^c}$.

Again, $\frac{5x^2}{y^3}$, multiplied by $\frac{4y^5}{3x^4}=\frac{5x^2\times4y^5}{3x^4\times y^3}=\frac{20x^2y^5}{3x^4y^3}=\frac{20y^2}{3x^2}$ the product.

And $\frac{\overline{a-b}^{2}}{cd}$ divided by $\frac{d^3}{\overline{a-b}^{n}}=\frac{\overline{a-b}^{n+2}}{cd^4}$. The operations of any other Fractions are equally eaſy.

ART. VI. INVOLUTION.

To find the Square, Cube, Biquadrate, &c. of any given Quantity.

RULE. Multiply the quantity into itſelf as often as the index contains units, leſs one, and the laſt product will be the power required; or which is equivalent thereto, and in many caſes is more convenient, multiply the index of the quantity by the index of the power, and you will have the anſwer, due regard being had to the ſigns.

EXAMPLES.

$$\begin{array}{l}\text{If } a\\ \text{be the}\\ \text{Root,}\\ \text{then}\end{array}\left\{\begin{array}{l}a^2=\text{Square}\\ a^3=\text{Cube}\\ a^4=\text{Biquadrate}\\ a^5=\text{5th Power}\end{array}\right\}\left\{\begin{array}{l}\text{If}\\ -2a^2b^2\\ \text{be the}\\ \text{root, then}\end{array}\right.\left\{\begin{array}{ll}+\;4a^4b^4 & =\text{Square}\\ -\;8a^6b^6 & =\text{Cube}\\ +16a^8b^8 & =\text{4thPowr}\\ -32a^{10}b^{10} & =\text{5thPowr}\end{array}\right.$$

$$\begin{array}{l} b+c\text{ Root} \\ \underline{b+c} \\ b^2+bc \\ \underline{\quad\;\, +bc+c^2} \\ b^2+2bc+c^2=\text{Square} \\ \underline{b+c} \\ b^3+2b^2c+bc^2 \\ \underline{\qquad b^2c+2bc^2+c^3} \\ b^3+3b^2c+3bc^2+c^3=\text{Cube} \end{array} \qquad \begin{array}{l} b-c\text{ Root} \\ \underline{b-c} \\ b^2-bc \\ \underline{\quad\;\, -bc+c^2} \\ b^2-2bc+c^2\text{ Square} \\ \underline{b\;+c} \\ b^3-2b^2c+bc^2 \\ \underline{\qquad -b^2c+2bc^2-c^3} \\ b^3-3b^2c+3bc^2-c^3\text{Cube} \end{array}$$

It is obſervable that, in raiſing a Binomial, where one of the quantities is negative, as in the inſtance above $(b-c)$ the terms in every power are + and — alternately. The operation, indeed, is only continued to the 3d Power, but the obſervation is univerſal, and even a young beginner in the art, by continuing the Multiplication, will eaſily raiſe the quantity to any higher power.

In raiſing trinomials, quadrinomials, &c. it will render the work leſs tedious to divide the root into two parts, taking but one term into one of the parts, and aſſuming ſome other letter in lieu of the reſt; by which means the quantity will be reduced to a binomial, which being raiſed to the required power, the anſwer will be obtained by replacing, inſtead of the aſſumed letter, its proper value.

Thus if $b+c+d$ is to be raiſed to the third power, aſſume $b+c=a$, and ſo the trinomial $b+c+d$ is changed into the binomial $a+d$. Then $\overline{a+d}^{3}=a^3+3a^2d+3ad^2+d^3=\overline{b+c}^{3}+3d\times\overline{b+c}^{2}+3d^2\times\overline{b+c}+d^3$. But $\overline{b+c}^{3}=\underline{b^3+3b^2c+3bc^2+c^3}$; and $3d\times\overline{b+c}^{2}=3d\times\overline{b^2+2bc+c^2}=3db^2+6dbc+3dc^2$, alſo $3d^2\times\overline{b+c}=3d^2b+3d^2c$. Therefore $\overline{b+c}^{3}+3d\times\overline{b+c}^{2}+3d^2\times\overline{b+c}+d^3=b^3+3b^2c+3bc^2+c^3+3db^2+6dbc+3dc^2+3d^2b+3d^2c+d^3=$ the cube of $b+c+d$, which was to be effected.

In fractional quantities, the numerator and denominator muſt each be involved to the required power, by which a new fraction will be obtained exhibiting that power of the fraction given.

Thus the 3d Power of $\frac{a^2}{b^3}=\frac{a^6}{b^3}$; the Square of $\frac{a+b}{d+c}=\frac{a^2+2ab+b^2}{d^2+2dc+c^2}$; the 5th Power $\frac{a^m c^n}{b^2 d^r}=\frac{a^{5m}c^{5n}}{b^{10}d^{5r}}$; and the n^{th} Power of $\frac{x^{n+1}}{a+b}=\frac{x^{nn+n}}{\overline{a+b}^{n}}$.

What has been delivered on this head is ſufficient for ſhewing how to involve Algebraic quantities to any power, whether they are ſimple, compound, or fractional. I cannot, however, cloſe the article without introducing the BINOMIAL THEOREM, which, for theſe purpoſes, of all methods is the moſt uſeful, conciſe, and elegant, and will be a laſting ornament to the name of its renowned inventor, the incomparable Sir ISAAC NEWTON. The Theorem is as follows: Let n denote any number at pleaſure, and let $a+b$ be a binomial, then the n^{th} Power thereof will be

$$a^{n}+na^{n-1}b+\frac{n.\overline{n-1}}{2}.a^{n-2}b^{2}+\frac{n.\overline{n-1}.\overline{n-2}}{2.3}a^{n-3}b^{3}+\frac{n.\overline{n-1}.\overline{n-2}.\overline{n-3}}{2.3.4.}a^{n-4}b^{4}+\frac{n.\overline{n-1}.\overline{n-2}.\overline{n-3}.\overline{n-4}.}{2.3.4.5}a^{n-5}b^{5}+\frac{n.\overline{n-1}.\overline{n-2}.\overline{n-3}.\overline{n-4}.\overline{n-5}}{2.3.4.5.6}a^{n-6}b^{6},$$

&c. the law of continuation being manifeſt. And the n^{th} power of $a-b$ will be expreſſed in the ſame manner, only the ſigns of the 2d, 4th, 6th, &c. terms muſt be negative. The uſe of this Theorem will be evident from the following Example.

Let $a+b$ be involved to the 3d power. Here the Index is 3, which muſt be placed inſtead of n in the Theorem, and the firſt term will be a^{3}; the ſecond $3a^{3-1}b=3a^{2}b$; the third $\frac{3\times2}{2}a^{3-2}b^{2}=3ab^{2}$; the fourth, $\frac{3\times2\times1}{2\times3}a^{3-3}b^{3}=b^{3}$; and the fifth and following terms will be found equal to nothing. Therefore, collecting theſe four terms together, the third power of $a+b$ is $a^{3}+3a^{2}b+3ab^{2}+b^{3}$.

N. B. The coefficients increaſe till the indices of the two letters a and b become equal or change values, when they return or decreaſe again, after the ſame order, ſo that having found the coefficients of half the terms, the reſt become known alſo.

ART. VII. EVOLUTION.

To find the Roots of given Powers.

RULE I. In ſimple quantities extract the root of the coefficient for a new coefficient, and divide the index of the letters by the index of the power, and you will have the root ſought.

Thus, the Square Root of $16x^{2}=4x^{\frac{2}{2}}=4x$; the Cube Root of $27x^{3}=3x^{\frac{3}{3}}=3x$; the Square Root of $5a^{\frac{2}{2}}x^{\frac{6}{2}}=a^{\frac{2}{2}}x^{\frac{2}{6}}\sqrt{5}=ax^{3}\sqrt{5}$; the Biquadrate Root $81a^{4}x^{8}=3a^{\frac{4}{4}}x^{\frac{8}{4}}=3ax^{2}$; and ſo for any others.

RULE II. To find the Root of Compound Quantities, range the terms after the dimenſions of ſome letter, ſo that the higheſt power thereof may ſtand firſt in order, and the reſt follow according to their ſeveral ranks; then take the root of the firſt term, and place it in the quotient; and, if it be the Square or Cube Root, ſubtract the ſquare or cube thereof from the firſt term, bringing down two or three of the next terms (accordingly as the caſe ſhall be the ſquare or cube root) for a dividend; then proceed to find a diviſor, and in all reſpects to carry on the work agreeable to the rules given for extracting the Square and Cube Roots in our New Syſtem of ARITHMETIC. But if it be the Root of a higher Power that is wanted proceed according to the GENERAL RULE for extracting the roots of all powers, as delivered in our ſaid New Syſtem.

EXAMPLES.

Let the Square Root of $36x^{4}+108x^{2}+81$ be required.

Operation.

$$\begin{array}{rl} & 36x^{4}+108x^{2}+81\ (\overset{\text{Root}}{6x^{2}+9} \\ & \underline{36x^{4}} \\ 12x^{2}+9) & +108x^{2}+81 \\ & \underline{+108x^{2}+81} \end{array}$$

What is the Cube Root of $x^{3}-6x^{2}y+12xy^{2}-8y^{3}$?

$$\begin{array}{rl} & x^{3}-6x^{2}y+12xy^{2}-8y^{3}\ (\overset{\text{Root}}{x-2y} \\ & \underline{x^{3}} \\ 3x^{2}-6xy+4y^{2}) & -6x^{2}y+12ay^{2}-8y^{3} \\ & \underline{-6a^{2}y+12xy^{2}-8y^{3}} \end{array}$$

What is the Square Root of $x^{2}+4xy+4y^{2}-2xz-4yz+z^{2}$?

$$\begin{array}{rl} & x^{2}+4xy+4y^{2}-2xz-4yz+z^{2}\ (\overset{\text{Root}}{x+2y-z} \\ & \underline{x^{2}} \\ 2x+2y & 4xy+4y^{2} \\ & \underline{4xy+4y^{2}} \\ 2x+4y-z) & -2xz-4yz+z^{2} \\ & -2xz-4yz+z^{2} \end{array}$$

Note, here three terms are brought down, which, at firſt ſight appears rather contrary to the Rule; but the reaſon is, the two terms $-2xz$ and $-4yz$, are conſidered but as one term, becauſe z in the *ſame power* is found in both of them, and they might have been expreſſed in one term. Thus $-2xz-4yz=-\overline{2x-4y}\times z$; ſo that $-\overline{2x-4y}$ may be conſidered as a coefficient to z.

What is the 4th Root of $16a^{4}-96a^{3}b+216a^{2}b^{2}-216ab^{3}+81b^{4}$?

$$\begin{array}{rl} & 16a^{4}-96a^{3}b+216a^{2}b^{2}-216ab^{3}+81b^{4}\ (\overset{\text{Root}}{2a-3b.} \\ & \underline{16a^{4}} \\ 32a^{3}) & -96a^{3}b\ (-3b \\ & \underline{-96a^{3}b} \\ & \underline{16a^{4}-96a^{3}b+216a^{2}b^{2}-216ab^{3}+81b^{4}} \end{array}$$

SCHOLIUM. The Root may ſometimes be diſcovered by extracting the Roots of all the Simple Powers, or terms in the given quantity, and connecting the Roots by the ſigns + and —, according as it ſhall appear to agree with the caſe. Thus in the laſt Example the 4th Root of $16a^{4}$ is $2a$, and of $81b^{4}$ is $3b$, and by connecting them with the ſign —, viz. $2a-3b$, you have the Root required.

It is alſo obſervable, that the even Root of any affirmative quantity, as the 2d, 4th, 6th, &c. may be either + or —, and the odd root of any quantity, as the 3d, 5th, 7th, &c. will have the ſame ſign as the quantity itſelf. The even Root of a negative quantity is impoſſible, for if it had a Root, its ſign muſt be either + or —; but all the even powers of any Root, whether affirmative or negative, are affirmative, and therefore no Root involved an even number of times can produce a negative Power, and of conſequence a negative Power can have no Root.

If a fractional quantity is to be evolved, the Roots of the numerator and denominator make the numerator and denominator of the Root of ſuch fraction. Thus the Square Root of $\frac{4a^{2}}{36b^{4}}=\frac{\sqrt{4a^{2}}}{\sqrt{36b^{4}}}=\frac{2a}{6b^{2}}$, and the Cube Root of $\frac{27a^{6}}{64x^{3}}=\frac{\sqrt[3]{27a^{6}}}{\sqrt[3]{64x^{3}}}=\frac{3a^{2}}{4x}$.

It frequently happens that the quantity given to be extracted has not a perfect Root, and then the Root is called a Surd; and in that caſe it can be no otherways expreſſed than by either inſerting the quantity with its proper radical ſign, or throwing it into an infinite Series. Thus the Square Root of a can be expreſſed no otherways than by $\sqrt{a}$, or $a^{\frac{1}{2}}$; the Cube Root of $b^{2}=\sqrt[3]{b^{2}}$ or $b^{\frac{2}{3}}$; the Cube Root of $\frac{a^{2}b}{c^{2}}=\sqrt[3]{\frac{a^{2}b}{c^{2}}}=\overline{\frac{a^{2}b}{c^{2}}}\Big|^{\frac{1}{3}}=\frac{a^{\frac{2}{3}}b^{\frac{1}{3}}}{c^{\frac{2}{3}}}$ and the Square Root of $a^{2}+x^{2}=\sqrt{a^{2}+x^{2}}=$ (by the common Rule of Extraction) $a+\frac{x^{2}}{2a}-\frac{x^{4}}{8a^{3}}+\frac{x^{6}}{16a^{5}}-\frac{5x^{8}}{128a^{7}}$, &c. The ſeveral ways of managing Surds will be particularly handled in the next article.

SECT. IV.

SURD QUANTITIES.

I HAVE ſaid before, that a Surd is the Root of ſuch a quantity as cannot be perfectly extracted; however, it will ſometimes happen in algebraic operations, that a Root cannot be exhibited in rational quantities, which nevertheleſs is not a Surd in itſelf, but may be perfectly expreſſed in numbers, by ſubſtituting, inſtead of the literal characters, their proper value.

Thus $\sqrt{a^{2}+x^{2}}$ cannot be perfectly extracted in algebraic terms; but if the value of a be 3, and the value of x be 4, then $a^{2}=9$, and $x^{2}=16$, and the Surd becomes $\sqrt{9+16}=\sqrt{25}=5$; a rational number. Whence a Surd, ſtrictly ſpeaking, is ſuch a quantity as is not commenſurable by the ſcale of rational numbers.

Again, Surds, though incommenſurable with rational quantities, may, notwithſtandſtanding, be commenſurate among themſelves.

Thus $\sqrt{2}$, $3\sqrt{2}$, and $5\sqrt{2}$, are each incommenſurate to any rational number; but, with regard to themſelves, they are in the perfect ratio of their coefficients 1, 3, and 5, reſpectively. This being premiſed, I ſhall proceed to the Algorithm of Surd Quantities.

ART. VIII. *To reduce a rational quantity to the form of a Surd.*

RULE. Multiply the index of the quantity, by the index of the Surd, and over the quantity ſo produced, place the radical ſign, and it will be the form required.

Thus, let 3, be reduced to the form of $\sqrt{5}$. By the Rule $3^{1\times2}$, or $3^{2}=9$, and $\sqrt{9}$ is the form required.

Again, let a^{2} be reduced to the form of $\sqrt{b}$. Here $a^{2\times3}=a^{6}$, and $\sqrt{a^{6}}$ is the required form.

In like manner, $a+b$ reduced to the form of $\sqrt{cd}$, is $\sqrt{\overline{a+b}^{2}}$, or $\sqrt{a^{2}+2ab+b^{2}}$; and $\frac{a}{b\sqrt{d}}$ reduced to the form of $\sqrt{c}$, is $\sqrt{\frac{a^{2}}{b^{2}d}}$.

ART. IX. *To reduce Quantities of different Indices to other equivalent ones, which ſhall have one given Index.*

RULE. Divide the indices of the quantities by the given Index, and the quotients will be the new indices for thoſe quantities. Then over the ſaid quantities with their new indices, place the given Index, and they will be the equivalent values required.

EXAMP. Let $12^{\frac{1}{2}}$ and $9^{\frac{1}{4}}$ be reduced to equivalent quantities having the common Index $\frac{1}{3}$. Here $\frac{1}{2}\div\frac{1}{3}=\frac{3}{2}=$ the Index of the firſt quantity; and $\frac{1}{4}\div\frac{1}{3}=\frac{3}{4},=$ the Index of the ſecond quantity; therefore $\left.\overline{12^{\frac{3}{2}}}\right|^{\frac{1}{3}}$ and $\left.\overline{9^{\frac{3}{4}}}\right|^{\frac{1}{3}}$ are the quantities required.

Alſo, if $a^{\frac{1}{3}}$ and $b^{\frac{1}{4}}$ are to be reduced to the common index, $\frac{1}{5}$ they will be found $=\left.\overline{a^{\frac{5}{3}}}\right|^{\frac{1}{5}}$, and $\left.\overline{b^{\frac{5}{4}}}\right|^{\frac{1}{5}}$ reſpectively; and ſo for any others.

ART. X. *To reduce quantities of different Indices to other equivalent ones, having the leaſt common Index.*

RULE. Reduce the Indices of the given quantities to a common denominator, in the leaſt terms.

EXAMP. Reduce $a^{\frac{1}{n}}$ and $b^{\frac{1}{m}}$ to the leaſt common Index.

Here $\frac{1}{n}$ and $\frac{1}{m}$ reduced to a common denominator are $\frac{m}{nm}$ and $\frac{n}{nm}$; and therefore $a^{\frac{m}{nm}}$ and $b^{\frac{n}{nm}}$ are the expreſſions required, or which are the ſame, $\sqrt[nm]{a^m}$, and $\sqrt[nm]{b^n}$.

Alſo, $\sqrt{a+b}$, and $\sqrt[3]{x^2+y^2}$ will in like manner be found $\left.\overline{a+b}\right|^{\frac{3}{6}}$ and $\left.\overline{x^2+y^2}\right|^{\frac{2}{6}}$, or $\sqrt[6]{\left.\overline{a+b}\right|^{3}}$ and $\sqrt[6]{\left.\overline{x^2+y^2}\right|^{2}}$, or $\left.\overline{3a^3+3a^2b+3ab^2+b^3}\right|^{\frac{1}{6}}$ and $\left.\overline{x^4+2x^2y^2+y^4}\right|^{\frac{1}{6}}$.

ART. XI. *To reduce a Surd to its moſt ſimple Terms.*

RULE. Divide by the greateſt power contained in it, and place the root before the quotient, with the radical ſign between them.

Thus let $\sqrt{32}$ be reduced to its moſt ſimple terms. Here 16 is the greater ſquare number that will divide 32; the diviſion being made the quotient is 2; therefore $4\sqrt{2}$ is the Surd required.

Let $\left.\overline{81a^2b}\right|^{\frac{1}{2}}$ be propoſed. Here $81a^2$ is the greateſt ſquare; its root is $9a$; and the quotient is b. Therefore $9a\sqrt{b}$ is the Surd in its moſt ſimple terms.

Again, let $\left.\frac{64a^4b^3}{27b-27a}\right|^{\frac{1}{3}}$ be given. This is $=\left.\frac{64a^3b^3\times a}{27b-27a}\right|^{\frac{1}{3}}$ $=\frac{4ab}{3}\sqrt[3]{\frac{a}{b-a}}$; and thus for any other.

ART. XII. *To find whether Surds are commenſurable or not.*

RULE. Reduce them to the leaſt common index; and the quantities, if fractional, to a common denominator, except where like terms are commenſurable. Then divide them by the greateſt common diviſor, (or by ſuch a one as will give one quotient rational) and if both the quotients are rational, the Surds are commenſurable; but if otherwiſe, they are incommenſurable.

EXAMP. Let $\sqrt{27}$ and $\sqrt{12}$ be propoſed. Theſe have already one common index, and are equal to $\sqrt{3\times9}$ and $\sqrt{3\times4}$ reſpectively. Divide by 3, and the quotients are $\sqrt{9}$ and $\sqrt{4}$, that is, 3 and 2; and therefore they are commenſurable.

Again, let $\sqrt{48}$ and $\sqrt{6}$ be propoſed. Here by dividing by 6 the quotients are $\sqrt{8}$, and $\sqrt{1}$ or 1, and therefore they are incommenſurable.

Alſo if $\left.\frac{b}{c}\right|^{\frac{1}{2}}$ and $\left.\frac{c}{b}\right|^{\frac{3}{4}}$ be propoſed, theſe are reduced to $\left.\frac{b^2}{c^2}\right|^{\frac{1}{4}}$, and $\left.\frac{c^3}{b^3}\right|^{\frac{1}{4}}$, and theſe again to $\left.\frac{b^5}{c^2b^3}\right|^{\frac{1}{4}}$ and $\left.\frac{c^5}{c^2b^3}\right|^{\frac{1}{4}}$. Divide by $\frac{1}{c^2b^3}$, and the quotients are $\left.\overline{b^5}\right|^{\frac{1}{4}}$ and $\left.\overline{c^5}\right|^{\frac{1}{4}}$. Wherefore they are incommenſurable. Furthermore, if $\left.\overline{x^4+x^2y^2}\right|^{\frac{1}{2}}$ and $\left.\overline{x^2y^2+y^4}\right|^{\frac{1}{2}}$ be propoſed. Divide theſe quantities by x^2+y^2 and the quotients are $\sqrt{x^2}$ and $\sqrt{y^2}$, or x and y. Hence the quantities are commenſurable. Theſe inſtances are ſufficient to point out the method of performing all other ſimilar caſes.

ART. XIII. *To add and ſubtract Surd quantities.*

RULE. Reduce quantities with unlike indices to thoſe of like indices; and bring fractions to a common denominator, or elſe to others that have rational denominators or numerators; then reduce the quantities to their ſimpleſt terms (by Art. XI.); and if the Surd part be the ſame in all, annex it to the SUM or DIFFERENCE with the ſign (×) of Multiplication.

If the Surd part is not the ſame in all, the quantities can only be added or ſubtracted by connecting them together with the ſigns + or —.

EXAMP. Let $\sqrt{18}$ and $\sqrt{50}$ be added together. Here $\sqrt{18}=\sqrt{9\times2}=3\sqrt{2}$; and $\sqrt{50}=\sqrt{25\times2}=5\sqrt{2}$, and the ſum $=\overline{3+5}\times\sqrt{2}=8\sqrt{2}=\sqrt{128}$.

Let $\sqrt{4a}$ and $\sqrt[4]{a^6}$ be added. Here $\sqrt{4a}=\sqrt[4]{16a^2}=2\sqrt[4]{a^2}$. And $\sqrt[4]{a^6}=\sqrt[4]{a^4\times a^2}=a\sqrt{a^2}$. Therefore their ſum $=\overline{a+2}\times\sqrt[4]{a^2}=\overline{a+2}\times\sqrt{a}$. In like manner, if it had been required to have ſubtracted $\sqrt{4a}$ from $\sqrt[4]{a^6}$, the remainder would have been $\overline{a-2}\times\sqrt{a}$. — Alſo if $\sqrt[3]{a^2}-\sqrt{a^3}+\sqrt{7}$ is added to $2\sqrt[3]{a^2}+\sqrt{a}-\sqrt{3}$. The ſum is $3\sqrt[3]{a^2}-\sqrt{a^3}+\sqrt{7}+\sqrt{a}-\sqrt{3}$; but, if ſubtracted therefrom the remainder $\sqrt[3]{a^2}+\sqrt{a}-\sqrt{3}+\sqrt{a^3}-\sqrt{7}$.

If $\sqrt{\frac{2}{3}}$ is added to $\sqrt{\frac{24}{25}}$ the ſum is $\sqrt{\frac{50}{75}}+\sqrt{\frac{72}{75}}=\sqrt{\frac{2\times25}{75}}+\sqrt{\frac{2\times36}{75}}=5\sqrt{\frac{2}{75}}+6\sqrt{\frac{2}{75}}=\overline{5+6}\times\sqrt{\frac{2}{75}}=11\sqrt{\frac{2}{75}}$; but if ſubtracted the remainder is $\overline{6-5}\times\sqrt{\frac{2}{75}}=\sqrt{\frac{2}{75}}$. The procedure is the ſame for any other quantities.

ART. XIV. *To multiply and divide Surds.*

RULE. Reduce the Surds to the ſame index; and the product or quotient of the rational quantities being annexed to the product or quotient of the Surds, will give the product or quotient required.

EXAMP. Let $2\sqrt{2}$ be multiplied by $3\sqrt{3}$. Here the Surds have already the ſame index. Therefore $2\times3\times\sqrt{2\times3}=6\sqrt{6}$ is the Product required. Let $a^{\frac{1}{3}}$ be multiplied by $b^{\frac{1}{4}}$. Here $a^{\frac{1}{3}}=\left.\overline{a^4}\right|^{\frac{1}{12}}$, and $b^{\frac{1}{4}}=\left.\overline{b^3}\right|^{\frac{1}{12}}$; and their product is $\left.\overline{a^4b^3}\right|^{\frac{1}{12}}$. Let $x^{\frac{1}{2}}+2y^{\frac{1}{3}}$ be multiplied by $5yx^{\frac{1}{2}}$. Here $x^{\frac{1}{2}}$ (the firſt term) $\times5yx^{\frac{1}{2}}=\overline{1\times5y}\times\sqrt{xx}=5yx$; alſo the ſecond term $+2y^{\frac{1}{3}}=2\sqrt[6]{y^2}$, and $5yx^{\frac{1}{2}}=5\sqrt[6]{y^6x^3}$, and their product $=+\overline{2\times5}\times\sqrt[6]{y^2\times y^6x^3}=+10\sqrt[6]{y^8x^3}$, and therefore the whole product is $5ya+10\sqrt[6]{y^8x^3}$. If both Quantities are compound, the operation will be equally eaſy, due regard being paid as well to the inſtructions in ART. III. as to the Rule here given.

Let $a-a\sqrt{x}$ be multiplied by $b-b\sqrt{x}$. Here the product by b is $ab-ab\sqrt{x}$; and the product by $-b\sqrt{x}=-ab\sqrt{x}+abx$, and their ſum is $ab-2ab\sqrt{x}+abx$, the anſwer ſought.

So in diviſion, if $z^{\frac{1}{2}}$ be divided by $y^{\frac{1}{3}}$, the quotient will be $\left.\frac{z^3}{y^2}\right|^{\frac{1}{6}}$; alſo $\frac{3x^{\frac{1}{n}}y^{\frac{1}{m}}}{4a}$ divided by $\frac{2y^2x^{\frac{1}{3}}}{5b}=\frac{5b\times3\sqrt[mn]{x^my^n}}{4a\times2\sqrt[3]{y^6x}}=\frac{15b}{8a}\sqrt[3mn]{\frac{x^{3m}y^{3n}}{y^{6mn}x^{mn}}}$; and the like for any other; obſerving in compound quantities to divide each term in the dividend by the whole diviſor, and connect the quotients with the ſigns + or —, as the caſe ſhall be, and further, that the dividing of each ſeparate term by the compound diviſor, is the ſame as multiplying it by the reciprocal thereof.

Thus, if any ſingle term, as $x^{\frac{1}{2}}$ is divided by a compound term, as $x^{\frac{1}{3}}+y^{\frac{1}{2}}$, it is the ſame thing as if it was multiplied by $\frac{1}{x^{\frac{1}{3}}+y^{\frac{1}{2}}}$, and therefore the quotient is $\left.\frac{x^3}{x^2+y^3}\right|^{\frac{1}{6}}$.

N. B. A fraction is changed into its reciprocal, by making the numerator, the denominator; and the denominator, the numerator.

SCHOLIUM. With regard, however, to compound Surds, it will not often happen that any advantage can be derived by the above mode of proceeding. Wherefore it will be proper to try to carry on the diviſion in the ſame form as was ſhewn for compound rational quantities, which ſometimes may be done with great facility. When this fails, the quotient can only be expreſſed by writing the diviſor under the dividend in manner of a fraction.

Art. XIV. *Involution and Evolution of Surd Quantities,*

Are performed by multiplying (if it is a ſimple Surd) the Index of the Quantity, by the Index of the Power to which it is to be involved, or by the fraction expreſſing the Root to which it is to be evolved, and where there is a rational part, its proper Power or Root muſt be prefixed thereto. Thus, the Square of $a\surd x = a^2 \times x^{\frac{1}{2}\times 2} = a^2 \times x^{\frac{2}{2}} = a^2 \times x^1 = a^2 x$. The Cube of $a \surd x^{\frac{5}{2}} = a^3 \times x^{\frac{5}{2}\times 3} = a^3 \times x^{\frac{15}{2}} = a^3 x^{\frac{15}{2}}$, or $a^3 \surd x^{15}$.

Alſo the Cube Root of $\overline{a+x}^{\frac{1}{2}} = \overline{a+x}^{\frac{1}{2}\times\frac{1}{3}} = \overline{a+x}^{\frac{1}{6}}$; and the Biquadrate Root of $81 x^{\frac{2}{3}} = 3 x^{\frac{2}{3}\times\frac{1}{4}} = 3x^{\frac{2}{12}} = 3x^{\frac{1}{6}}$, or $3 \sqrt[6]{x}$.

Scholium. Here no difference is made between Roots and Powers, ſave that the Indices of Powers are whole numbers, but thoſe of Roots, Fractions.

Hence, in many caſes, both Involution and Evolution may be performed at one operation. For inſtance, if it is required to involve $\overline{a+x}^{\frac{1}{4}}$ to the 5th Power; and then to extract the Cube Root thereof, it will be done at once, by multiplying the exponent $\frac{1}{4}$ by $\frac{5}{3}$; and ſo the anſwer is $\overline{a+x}^{\frac{5}{12}}$.

Therefore the Indices of Powers and Roots, thus entangled, may with propriety be deemed fractional powers; and hence in general, $x^{\frac{v}{r}}$ raiſed to the $\frac{n^{\text{th}}}{m}$ power, is $x^{\frac{v}{r}\times\frac{n}{m}} = x^{\frac{vn}{rm}}$.

Compound Surds are involved and extracted as integers or rational quantities, due regard being had to the operations of Simple Surds.

In caſes of Evolution, where the Root of Compound Surds cannot be found, it muſt be denoted by a line or vinculum drawn over the whole, together with the proper radical ſign or index.

Operations of theſe kinds may be much facilitated, by aſſuming, inſtead of Surds, ſome rational quantities or letters, to repreſent them; and by having recourſe to the Binomial Theorem, given in Article the VIth, where n may be taken to denote any power either whole or fractional, and ſo it may be made applicable to caſes of Evolution as well as of Involution; and having by this means obtained the terms of the required power, (which, if fractional, will commonly be an infinite ſeries) the Surds may be reſtored in lieu of the aſſumed letters, obſerving to raiſe the indices of the Surds in each term to the Power, denoted by the indices of their ſubſtitutes.

It was obſerved in the 6th Article, that when the quantity to be involved is a reſidual, viz. when one of the terms are negative, as $a-b$, the terms of any power thereof will be + and — alternately; and in Binomials, where both the terms are negative, that all the terms of whatever power will be affirmative: this however is to be underſtood within this limit, namely, when the power of the quantity to be involved is affirmative.

When the power is negative, as $\overline{a+b}|^{-n}$, or $\overline{a-b}|^{-n}$, in the firſt caſe, all the terms in the odd places will be affirmative, and thoſe in the even places negative; but in the latter caſe all the terms will be affirmative.

N. B. A quantity with a negative power is equal to its reciprocal with an affirmative power. Thus $\overline{a\pm b}|^{-n} = \frac{1}{\overline{a\pm b}|^{n}}$.

This follows from what was obſerved in the Scholium of the 4th Article.

There are other methods of extracting Surd Quantities, though I believe the caſes, to which they may be applied, will not frequently occur into practice; but that nothing may be wanting to render the rudiments of this Syſtem as complete as poſſible, I ſhall lay down another rule which I have ſometimes had recourſe to and found uſeful.

It is this, if $B \pm C$ be a binomial or reſidual Surd, then

$$\sqrt{B\pm C} = \sqrt{\frac{B+\sqrt{B^2-C^2}}{2}} \pm \sqrt{\frac{B-\sqrt{B^2-C^2}}{2}}.$$

The uſe whereof is this: Let $3+\surd 5$, be a binomial, whoſe ſquare root is required. Here the firſt term $B=3$; and $C=\surd 5$. Then $\sqrt{B^2-C^2} = \sqrt{9-5} = \surd 4 = 2$ and $\sqrt{\frac{B+\sqrt{B^2-C^2}}{2}} = \sqrt{\frac{3+2}{2}} = \surd\frac{5}{2} = \surd\frac{10}{4} = 2\surd 10$.

Likewiſe $\sqrt{\frac{B-\sqrt{B^2-C^2}}{2}} = \sqrt{\frac{3-2}{2}} = \surd\frac{1}{2} = \surd\frac{2}{4} = 2\surd 2$. The required Root is $2\surd 10 + 2\surd 2$. If the given quantity had been $3-\surd 5$, the anſwer would have been $2\surd 10 - 2\surd 2$.

N. B. In this Rule B, muſt always be the greater quantity.

Art. XV. *To find the Value of a Fraction in an infinite Series.*

Divide the numerator by the denominator, as in common Diviſion, and continue the operation as far as ſhall be thought neceſſary. In many caſes, after a few terms are had in the quotient, the law by which it converges will be diſcovered, and ſo any number of terms may be ſupplied at pleaſure.

Examples.

Let $\frac{1}{1+x^2}$ be thrown into an infinite ſeries.

$$\begin{array}{l}
1+x^2)\ 1\ (1 - x^2 + x^4 - x^6 + x^8 - \text{\&c.} \\
\quad \underline{1+x} \\
\quad -x^2 \\
\quad \underline{-x^2-x^4} \\
\qquad +x^4 \\
\qquad \underline{+x^4+x^6} \\
\qquad\quad -x^6 \\
\qquad\quad \underline{-x^6-x^8} \\
\qquad\qquad +x^8 \\
\qquad\qquad \underline{+x^8+x^{10}} \\
\qquad\qquad\quad -x^{10}
\end{array}$$

Let $\frac{ax}{a-x}$ be expreſſed by an infinite ſeries.

$$\begin{array}{l}
a-x)\ ax\ \left(x + \frac{x^2}{a} + \frac{x^3}{a^2} + \frac{x^4}{a^3}\ \text{\&c.}\right. \\
\quad \underline{ax-x^2} \\
\quad +x^2 \\
\quad \underline{+x^2-\frac{x^3}{a}} \\
\qquad +\frac{x^3}{a} \\
\qquad \underline{+\frac{x^3}{a}-\frac{x^4}{a^2}} \\
\qquad\quad +\frac{x^4}{a^2} \\
\qquad\quad \underline{+\frac{x^4}{a}-\frac{x^5}{a^3}} \\
\qquad\qquad +\frac{x^5}{a^3}
\end{array}$$

In both of theſe ſeries after a few terms are found, the law of continuation is manifeſt.

Scholium. It will however ſometimes be difficult to come at the ſeries by this mode, by reaſon of the coefficients; and then it will be convenient to aſſume a ſeries with unknown coefficients to repreſent it; which being multiplied or involved, as the queſtion requires, and the quantities of the ſame dimenſion being put equal to each other, Equations will be had, from which the coefficients may be eaſily determined. But this will be better underſtood after we have treated of Equations; wherefore, though I ſhall give an inſtance of it here, the reader will do well to paſs it over, till he knows perfectly how to manage Equations.

The method is this: Suppoſe $\frac{1}{a-x}$ be the given quantity; let the aſſumed ſeries be $A + Bx + Cx^2 + Dx^3 + Ex^4$, &c. $= \frac{1}{a-x}$. Multiply both by $a-x$, and there will be $1 =$

$$\begin{array}{l}
aA + aBx + aCx^2 + aDx^3 + aEx^4,\ \text{\&c.} \\
\quad -\ Ax -\ Bx^2 -\ Cx^3 -\ Dx^4,\ \text{\&c.}
\end{array}$$

and by equating the coefficients of the ſame powers of x, $aA = 1$, $aB - A = o$, $aC - B = o$, $aD - c = o$, $aE - D = o$, &c. Hence in the firſt equation $A = \frac{1}{a}$; in the 2d, $B = \frac{A}{a}, = \frac{1}{a^2}$; in the 3d, $C = \frac{B}{a} = \frac{1}{a^3}$; in the 4th, $D = \frac{C}{a} = \frac{1}{a^4}$; and in like manner $E = \frac{1}{a^5}$. Therefore $\frac{1}{a-x}$ brought to a ſeries is $\frac{1}{a} + \frac{x}{a^2} + \frac{x^2}{a^3} + \frac{3}{a^4} + \frac{x^4}{a^5} +$ &c.

Art. XVI. *To involve an infinite Series to any given Power.*

Rule. Subſtitute the particular letters or numbers in the given ſeries inſtead of thoſe in the following general form

$$z^m \times : \overline{a+bx+cx^2+dx^3+ex^4}\Big|^m = z^m \times \text{ into}$$

$$\begin{aligned} & a^m \\ & +\frac{mbA}{a}.x \\ & +\frac{2mcA+\overline{m-1}.bB}{2a}.x^2 \\ & +\frac{3mdA+\overline{2m-1}.cB+\overline{m-2}.bC}{3a}.x^3 \\ & +\frac{4meA+\overline{3m-1}.dB+\overline{2m-2}.cC+\overline{m-3}.bD}{4a}.x^4 \\ & +\frac{5mfA+\overline{4m-1}.eB+\overline{3m-2}.db+\overline{2m-3}.cD+\overline{m-4}.bE}{5a}.x^5 \end{aligned}$$

where A. B. C. D. E. &c. are the coefficients of the terms immediately preceding thoſe wherein they firſt appear; and the law of continuation is evident.

Examp. Required the ſquare of $1+x+x^2+x^3+x^4+$&c. Here $z=1$, $a=1$, $b=1$, $c=1$, $d=1$, &c. and $m=2$, which values being put in the general ſeries in lieu of the letters it becomes $1+\frac{2A}{1}x+\frac{4A+B}{2}x^2+\frac{6A+3B+0}{3}x^3+\frac{8A+5B+2C-D}{4}x^4$ &c. Then the firſt term A, being 1, the 2d is $2x$, and B its coefficient is 2, the 3d term is $3x^2$, and C its coefficient is 3, and ſo on for the reſt. And the ſquare of the given ſeries is $1+2x+3x^2+4x^3+5x^4$ &c. If it was required, inſtead of ſquaring the ſeries, to extract the ſquare root thereof, the proceſs would be juſt the ſame, only m inſtead of being $=2$, would be $=\frac{1}{2}$, and in that caſe the ſeries would become $1+\frac{1}{2}Ax+\frac{A-\frac{1}{2}B}{2}x^2+\frac{A+0-C}{3}x^3+\frac{2A+\frac{1}{2}B-C-\frac{5}{2}D}{4}x^4$ &c. and hence, $1+\frac{1}{2}x+\frac{3}{8}x^2+\frac{5}{16}x^3+\frac{35}{128}x^4$&c.

Various examples might have been given to have illuſtrated this rule, but it is apprehended the above is ſufficient to ſhew its general uſe; and the nature of our plan confines me to paſs on to things more intereſting.

SECT. V.

OF EQUATIONS.

An Equation is the mutual comparing of two equal quantities differently expreſſed with the ſign of ($=$) equality between them, thus $a+b=c-d$ is an Equation, ſhewing the equality of the quantities $a+b$, and $c-d$. See Definition 24th.

Art. XVII. *To turn proportional quantities into Equations, and the contrary.*

Rule. Multiply the extremes together for one ſide of the Equation, and the two means together for the other ſide thereof, or in geometrical progreſſions when there are but three terms, ſquare the middle term for the other ſide of the Equation. If Equations are to be turned into proportions the procedure is juſt the reverſe, for each of the Equations muſt be divided into two factors, and thoſe produced from one ſide of the Equation muſt be made the extremes; and ſo thoſe of the other ſide will be the two means. Thus if the proportion $a : d :: c : x$ be given, the Equation derived from it will be $ax=dc$. Again, if the Equation $ab+ac=ca-de$ be given, it may be transformed into theſe proportions, as $a : 1 :: ca-de : b+c$; or as $a : ca-de :: 1 : b+c$; or as $b+c : 1 :: ca-de : a$; or as $b+c : ca-de :: 1 : a$; or as $1 : a :: b+c : ca-de$, or as $1 : b+c :: a : ca-de$; or as, $ca-de : b+c :: a : 1$; or as $ca-de : a :: b+c : 1$. For the Equation divides into $a\times\overline{b+c}=1\times\overline{ca-de}$ and the factors of each ſide may be made the means or extremes at pleaſure, and alſo each factor may be either of ſuch means or extremes; for by multiplying together the means, and the extremes of any of theſe proportions according to the rule, the given Equation will be produced, which ſhews that their relation with each other has been preſerved.

Art. XVIII. *To reduce an Equation.*

When Algebraical queſtions are brought to an Equation, it muſt be ſo ordered that the quantity ſought may ſtand clear on the firſt ſide of the equation, and the known quantities on the other ſide. To effect which obſerve the following directions, 1ſt. When any quantity is alike concerned on both ſides of the equation it muſt be thrown out of both. Thus if $5x+5y=4c-d+5y$. Here $+5y$ being rejected from both ſides, the Equation becomes $5x=4c-d$, the reaſon of this is evident from Axiom the 2d.

2d. When the known and unknown quantities are both on one ſide, tranſpoſe any of them to the contrary ſide and change its ſign. Thus is $4y+3b=ax-dy$. Then if y be the quantity ſought $-dy$ may be brought to the firſt ſide of the Equation, and $+3b$ may be carried to the ſecond ſide of the Equation by changing their ſigns, and hence it becomes $4y+dy=ax-3b$. This is the ſame as adding $-3b+4y$ (or ſubtracting $+3b-4y$) to both ſides of the Equation, therefore by axioms 1 and 2 the equality is preſerved. 3d. If there be fractions in the Equation, multiply both ſides by the denominators and it will be freed therefrom.

Examp. Let $\frac{a^2}{b}+c=\frac{da}{c}$. Here both ſides being multiplied by b and c (or bc) it becomes $cx^2+bc^2=bda$. This proceſs is founded on Axiom 3.

4th. When any quantity is multiplied into both ſides of the Equation (or into the higheſt term of the unknown quantity) divide the whole equation thereby.

Examp. $5bx^3=3bc$. Here divide the Equation by b, and it becomes $5x^3=3c$; again divide it by 5, and x^3 will be equal to $\frac{3c}{5}$. The truth of this appears from Axiom the 4th.

5th. If the unknown quantity is affected with a ſurd, tranſpoſe the reſt of the terms, and then involve each ſide according to the index of the ſurd. Thus if $\sqrt{x^2+ax}+d=c$, by tranſpoſing d we have $\sqrt{x^2+ax}=c-d$, and by ſquaring both ſides $x^2+ax=c^2-2cd+d^2$, and ſo the equation is freed from ſurds. This is plain from Axiom the 5th.

6th. When the ſide containing the unknown quantity is a pure power (or if being affected it has a rational root) then extract the root on both ſides of the Equation. Thus if $x^2=b^2+dc$, then $x=\sqrt{b^2+dc}$, which if b, c, and d are known quantities may be extracted in numbers, and thence the value of x will be known. So likewiſe if $x^2+6x+9=25c$, by taking the ſquare root we have $x+3=\pm\sqrt{25c}$, and by tranſpoſing 3, $x=\pm\sqrt{25c}-3$, $=\pm5\sqrt{c}-3$.

N. B. All theſe methods are to be uſed as occaſion requires, till the Equation be duly cleared.

EXAMPLES.

Examp. I. What is the value of x in this Equation $24-4x+10=60-12x$? Here $+24$ and $+10$ in the firſt ſide of the Equation being transferred to the other ſide, and $-4x$ in the ſecond ſide of the Equation being transferred to the firſt ſide, it will ſtand thus $-4x+12x=60-24-10$, viz. (by collecting the terms, See Ax. 7.) $8x=26$, and by dividing both ſides by 8, $x=\frac{26}{8}=3\frac{1}{4}$.

Examp. II. What is the value of x in this Equation $ax+b^2=\frac{ax^2+ac^2}{a+x}$. Here, by multiplying both ſides by $a+x$, we have $a^2x+ab^2+ax^2+b^2x=ax^2+ac^2$, whence (by tranſpoſition) $a^2x+ax^2+b^2x-ax^2=ac^2-ab^2$, viz. (by expunging ax^2, it being concerned with both $+$ and $-$) $a^2x+b^2x=ac^2,-ab^2$, and dividing both ſides of this Equation, by a^2+b^2, we have $x=\frac{ac^2-ab^2}{a^2+b^2}$.

Examp. III. Let $\sqrt{a^2+x^2}=\sqrt[4]{b^4+x^4}$ be given to find x. Here by raiſing both ſides of the Equation to the 4th power $a^4+2a^2x^2+x^4=b^4+x^4$, and by tranſpoſition, &c. $2a^2x^2=b^4-a^4$, and dividing by $2a^2$, $x^2=\frac{b^4-a^4}{2a^2}$; hence $x=\overline{\frac{b^4-a^4}{2a^2}}\Big|^{\frac{1}{2}}$

Examp. IV. Let $x=\sqrt{c^2+x\sqrt{b^2+x^2}}-c$. Here, $x+c=\sqrt{c^2+x\sqrt{b^2+x^2}}$, which ſquared gives $x^2+2cx+c^2=c^2+x\sqrt{b^2+x^2}$, or $x^2+2cx=x\sqrt{b^2+x^2}$; and, (dividing by x) $x+2c=\sqrt{b^2+x^2}$, which ſquared gives $x^2+4cx+4c^2=b^2+x^2$. By tranſpoſition, $4cx=b^2-4c^2$ and (dividing by $4c$) $x=\frac{b^2-4c^2}{4c}$.

Art. XIX. *To exterminate an unknown Quantity out of ſeveral Equations.*

Rule. If the quantity has but one dimenſion in the Equations, ſeek the value of the quantity to be expelled in two Equations, and put thoſe values equal to each other, or having found the value in one Equation ſubſtitute it in lieu of ſuch quantity in the reſt of the Equations. Proceed thus with another unknown quantity. But if the quantity to be exterminated be of ſeveral dimenſions, find the value of its higheſt power in two-Equations; then if the coefficients are not the ſame, multiply the leſs ſo that it may become equal to the greater. Then put theſe values equal to each other, and there will come out a new Equation, with a leſs power of the unknown quantity: and by repeating the operation, the quantity will at length be taken away.

EXAMPLES.

Examp. I. Given $7x-5y=28$, and $3x+4y=55$ to find x and y. 1ſt. Let y be exterminated. In the firſt Equation the value of y is $\frac{7x-28}{5}$, which is found by tranſpoſition and diviſion. In the ſecond Equation its value (in like manner) is found $=\frac{55-3x}{4}$. Theſe being put equal to each other we have $\frac{7x-28}{5}=\frac{55-3x}{4}$, an Equation wherein only x is concerned. Multiply this Equation by 4 and 5 (or by their product $=20$) or which is the ſame thing multiply the numerators and denominators croſs wiſe, and we have $28x-112=275-15x$. By tranſpoſition $43x=387$, and by diviſion, $x=\frac{387}{43}=9$; which ſubſtituted in either of the given equations inſtead of x, the value of y will appear. Thus if it be ſubſtituted in the ſecond Equation, then $27+4y=55$ and by tranſpoſition and diviſion $y=\frac{55-27}{4}=7$.

Examp. II. Let it be required to find the values of x, y, and z, in the three following Equations, viz. $x+y=17$; $x+z=18$; and $y+z=19$. Here, by ſubtracting the firſt Equation from the ſecond (in order to exterminate y) we have $2-y=1$, and this added to the third Equation, y is alſo exterminated; and there is found $2z=20$, and conſequently $2=10$, and $y\ (=z-1)=9$, and $x\ (=17-y)=8$.

Examp. III. Let there be given $x+y=a$; and $x^2+y^2=b$ to expunge x. Here by the firſt Equation $x=a-y$, and therefore $x^2=\overline{a-y}|^2$, which being wrote in the other Equation inſtead of x^2 we have $\overline{a-y}|^2+y^2=b$; viz. $a^2-2ay+y^2+y^2=b$; and therefore $y^2-ay=\frac{b-a^2}{2}$; a Quadratic Equation wherein y is the only unknown quantity.

Art. XX, *The Reſolution of Equations.*

In the laſt article I have ſhewn the method of freeing equations from any unknown quantity, whereby two or more equations are reduced to one, containing only one unknown quantity, the value of which, when it is a ſimple Equation, I have alſo ſhewn how to find; but it will often happen that the remaining quantity will be of ſeveral different dimenſions in the Equation, and then ſuch Equation is called a Quadratic, a Cubic, Biquadratic, &c. according to the dimenſion of the higheſt power, and to find the Root or value of the unknown quantity therein, is the buſineſs of which I ſhall now treat.

All Equations may be conſidered as compounded of thoſe of a lower order: thus if $x-b=0$, which is a Simple Equation, be ſquared, there ariſes $x^2-2bx+b^2=0$, a Quadratic; if cubed, we have $x^3-3bx^2+3b^2x-b^3=0$, a Cubic Equation, &c. It is, however, but ſeldom that Equations occur in this regular form, for the coefficients of the terms will generally be greater or leſs than are aſſigned by the involution of one quantity $x-b$, and therefore in general a Quadratic is a compound derived from $\overline{x-b}\times\overline{x-c}$; a Cubic from $\overline{x-b}\times\overline{x-c}\times\overline{x-d}$; a Biquadratic from $\overline{x-b}\times\overline{x-c}\times\overline{x-d}\times\overline{x-e}$, or from a Quadratic ſquared, &c. But the letters b, c, d, &c. may be affirmative, or ſome may be affirmative, and others negative, whereby different ſigns will be produced in the Equations anſwerable to all Caſes.

In an Equation of this ſort the whole being equal to nothing, it is obvious that at leaſt ſome or other of the factors $x-b$, $x-c$, $x-d$, &c. ſhould be equal to nothing; or the Equation (which is their product) could not be ſo. It is alſo evident, that any ſuch Equation may be divided by its factors till there remains only one factor; and as each of the inferior Equations obtained by ſuch diviſion muſt ſtill be equal to nothing, whatever factor was the diviſor, it follows that each of theſe factors are themſelves equal to nothing; and therefore b, c, d, e, &c. exhibit ſo many different values of x, with contrary ſigns; and hence every Equation has as many Roots as there are dimenſions of the unknown quantity in its higheſt power; and where b, c, d, e, &c. are found negative, x is affirmative, and where any of theſe are affirmative, x is negative. By multiplying the factors or Roots together, under different ſigns, it is obſervable, that when b, c, d, &c. are all negative, or, which is the ſame thing, when all the values of x are affirmative, the ſigns in the Equation run $+$ and $-$ alternately; but when there is a negative Root, one affirmative quantity will follow another; wherefore there will be as many affirmative Roots in Equation as there are changes of the ſigns from $+$ to $-$, and from $-$ to $+$, and all the reſt will be negative.

Theſe obſervations, however, are only applicable when all the Roots are poſſible. A Root is impoſſible, or imaginary, when b, c, d, &c. denote the Square, or other even Root, of a negative quantity, and when an Equation is wholly derived from ſuch Roots it is an impoſſible Equation; if there be one poſſible Root, the Equation will admit of one poſſible anſwer. But in applying Algebra, there will frequently be other limitations peculiar to the ſubject, whereby but one Root only will be capable of ſatisfying the enquiry, even when the reſt of the Roots are both poſſible and affirmative.

From the multiplication of the Roots, or Factors, it is further evident, and worthy of notice, that the coefficient of the ſecond term is the ſum of all the Roots with contrary ſigns: the coefficient of the third term is equal to the ſum of the Rectangles of thoſe Roots, or of all the products that can poſſibly ariſe by combining them two and two: the coefficient of the fourth term is equal to the ſum of all the products that can poſſibly ariſe by the combination of them three and three, &c. and ſo on; and the laſt term is always equal to the product of all the Roots with contrary ſigns.

Theſe things being premiſed, I proceed to ſhew how to find the Roots of Equations; and ſhall begin with Quadratics.

If it be a pure Quadratic, as $x^2=b^2$, or $x^2-b^2=0$, it is produced from the Rectangle of $x-b$ and $x+b$, and therefore it has one Root affirmative and the other negative; and the affirmative Root is equal in number to the negative Root. The Root in this caſe is had by extracting the Square Root of the number denoted by b^2. Thus if $x^2=576$, then $x=\pm\sqrt{576}=\pm 24$.

All other Quadratics are comprehended under ſome or other of the following forms, viz. $x^2+2bx\pm d=0$; or $x^2-2bx\pm d=0$; or $2bx-x^2\pm d=0$; and this laſt form by tranſpoſition (or changing the ſigns) becomes the ſame as the ſecond form, ſave that the affirmative Roots are changed into negative ones, and the negative ones into affirmative ones; wherefore it will be ſufficient to conſider the two other forms as applicable to all; and in attempting their ſolution it will be more commodious to tranſpoſe d, and then they will ſtand thus: $x^2+2bx=\pm d$, and $x^2-2bx=\pm d$. Now if to each of theſe Equations we add $+b^2$, (the ſquare of $\frac{1}{2}$ the coefficient of the ſecond term) we ſhall have in the former caſe $x^2+2bx+b^2=\pm d+b^2$; and in the latter $x^2-2bx+b^2=\pm d+b^2$, and by extracting the Square Roots, the Equations become $x+b=\sqrt{\pm d+b^2}$, and $x-b=\sqrt{\pm d+b^2}$ reſpectively; and x in the former caſe $=\sqrt{\pm d+b^2}-b$; and in the latter $=\sqrt{\pm d+b^2}+b$, which expreſſions give the affirmative values of x; but the Square Roots of the above Equations may alſo be $-x-b=-\sqrt{\pm d+b^2}$; and $-x+b=-\sqrt{\pm d+b^2}$ reſpectively, and therefore $-x$ in the former caſe $=-\sqrt{\pm d+b^2}+b$, and in the latter $=-\sqrt{\pm d+b^2}-b$. That is, if B be put $=\sqrt{\pm d+b^2}$ where d is $+$ or $-$, according as it is $+$ or $-$ in the ſecond ſide of the given Equation. Then, in the firſt caſe, where $x^2+2bx=\pm d$, the values of $\pm x$ are $\pm B\mp b$, where b is $-$ or $+$, according as x is affirmative or negative, and in the ſecond caſe, where $x^2-2bx=\pm d$; the values of $\pm x$ are $\pm B\pm b$, where b is $+$, or $-$, as x is $+$ or $-$.

EXAMPLES.

Examp. I. Let $x^2+6x=2295$ required x. Here $b=3$, and $2295=+d$; and $\sqrt{+d+b^2}=\sqrt{2295+9}=48=B$, and $\pm B\mp b=\pm 48\mp 3=+45$ and -51 for the two values of x.

Examp. II. Let $x^2-6x=1755$ be given to find the values of x. Here $b=3$, and $1755=+d$, and $\sqrt{+d+b^2}=42=B$, and $\pm x=\pm B\pm b=\pm 42\pm 3=+45$ and -39 the values ſought.

Examp. III. Let $x^2-11x=-28$. Here $b=\frac{11}{2}$, and $-28=-d$; alſo $b^2=30\frac{1}{4}$. and $\sqrt{-d+b^2}=\sqrt{-28+30.25}=\sqrt{2.25}=1.5=B$ and $\pm B\pm b=\pm 1.5\pm 5.5=+7$ and $+4$ the two values of x, which in this caſe are both affirmative.

Examp. IV. Let $24x-x^2=135$, required x. This Equation being wholly tranſpoſed $x^2-24x=-135$. Here $b=12$; and $-135=-d$. and $\sqrt{-d+b^2}=\sqrt{-135+144}=\sqrt{9}=3=B$; and $\pm B\pm b=\pm 3\pm 12=+15$ and -9 the two Roots, but the Equation having been transformed, the ſigns muſt be changed, and ſo $+9$ and -15 are the Roots required. When d is negative, and greater than b^2, the Roots are impoſſible.

Examp. V. Given $x^2-10x=-32$. Here $b=5$, and $-32=-d$, and $B=\sqrt{-d+b^2}=\sqrt{-32+25}=\sqrt{-7}$. and therefore the Roots are impoſſible, and the Equation is an impoſſible Equation.

ART. XXI. *To increaſe or diminiſh the roots of an Equation.*

RULE. For the unknown quantity ſubſtitute a new letter — the given increment, or + the given decrement. And ſubſtitute the powers thereof in the Equation inſtead of the unknown letter.

EXAMPLE.

Let the roots of this Equation $x^3+x^2-10x+8=0$ be increaſed by 2. Let $x+2=z$, or $\overline{z-2}=x$ then $x^3=\overline{z-2}|^3$; $x^2=\overline{z-2}|^2$ and $-10x=-10\times\overline{z-2}=-10z+20$, then the powers of x being actually involved, and the ſeveral terms collected, we have $x^3+x^2-10x+8=z^3-5z^2-2z+24=0$, where the roots of z are greater than thoſe of x by 2.

SCHOLIUM. By this rule all the negative roots of an Equation may be made affirmative, by increaſing them with a proper quantity.

ART. XXII. *To multiply or divide the Roots of an Equation by a given Quantity.*

RULE. Aſſume a new letter, and divide or multiply it by the given number, and ſubſtitute its powers in the Equation inſtead of the unknown quantity.

EXAMPLE.

Let the roots of the Equation $x^3-2x+\sqrt{3}+0$ be divided by $\sqrt{3}$. Here by putting $x=y\sqrt{3}$ and ſubſtituting it in lieu of x in the given Equation, there ariſes $3y^3\sqrt{3}-2y\sqrt{3}+\sqrt{3}=0$, = (by dividing by $\sqrt{3}$) $3y^3-2y+1=0$, for the Equation required.

Hence by this rule fractions or ſurds may be taken out of an Equation; by dividing the new letter by the common denominator; or by multiplying the new letter by the Surd quantity.

ART. XXIII. *To complete a deficient Equation.*

RULE. Increaſe or diminiſh the roots of the Equation by ſome given quantity; as ſhewn in ART. XXI.

EXAMP. Let $x^3+x-3=0$. Here the Equation is deficient, the 2d term being wanting. Suppoſe $z+1=x$, then $x^3=z^3+3z^2+3z+1$; this added to $x\ (=z+1)-3$, we have z^3+3z^2+4z-1, a complete Equation, in which the roots are each leſs by 1 than in the given Equation.

ART. XXIV. *To take away any Term out of an Equation.*

RULE. Take a new letter for the root, to which add an unknown quantity, and ſubſtitute this ſum and the powers thereof in the given Equation; then any term, or any of thoſe quantities wherein the new letter is of the ſame power, being put into an Equation and made equal to nothing will give the value of the unknown quantity, which being put into the Equation with the new letter, the power of the new letter, which was ſo equated, will vaniſh.

EXAMPLE.

Suppoſe $x^4-3x^3+3x^2-5x-2=0$. Put $y+e=x$.

$$\begin{array}{lllllll} \text{Then } x^4 = & y^4 & +4y^3e & +6y^2e^2 & +4ye^3 & +e^4 \\ -3x^3 = & & -3y^3 & -9y^2e & -9ye^2 & -3e^3 \\ +3x^2 = & & & +3y^2 & +6ye & +3e^2 \\ -5x = & & & & -5y & -5e \\ +2 = & & & & & +2 \end{array}$$

Then, if the ſecond term is to be taken away, we have $4y^3e-3y^3=0$; and, dividing by y^3, $4e-3=0$, or $e=\frac{3}{4}$, which if ſubſtituted in the room of e the ſecond term will vaniſh; if the 3d term is to be taken away we have $6y^2e^2-9y^2e+3y^2=0$, and dividing by y^2, $6e^2-9e+3=0$ from which quadratic Equation e may be determined; in like manner the 4th term may be taken away by ſolving a cubit Equation; the fifth by ſolving a Biquadratic, &c.

SCHOLIUM. From the above proceſs it appears that when the ſecond term is to be taken away, the value of e is obtained by dividing the coefficient of that term, by the index of the higheſt power in the given Equation, ſeeing that the coefficient of the ſecond term of the nth power of a Binomical is n. And this is the moſt uſeful caſe, the reſt being too tedious to be of real ſervice in finding the roots.

ART. XXV. *To extract the Root of a Cubic Equation.*

RULE. Take away the ſecond term of the Equation as by the laſt Article, and then it will be in this form, $x^3+ax=b$, and this general expreſſion $\overline{\frac{b}{2}+\sqrt{\frac{b^2}{4}+\frac{a^3}{27}}}\Big|^{\frac{1}{3}}-\frac{\frac{1}{3}a}{\overline{\frac{b}{2}+\sqrt{\frac{b^2}{4}+\frac{a^3}{27}}}\Big|^{\frac{1}{3}}}$ will give the value of x.

EXAMPLES.

EXAMP. Let $y^3+3y^2+9y=13$. Here, to deſtroy the 2d Term, put $x-1=y$, ſo ſhall $\overline{x-1}|^3+3\times\overline{x-1}|^2+9\times\overline{x-1}=13$, or (by involving the terms, &c.) $x^3+6x=20$.

Therefore $a=6$, and $b=20$; and theſe values ſubſtituted in the above form, we have $\overline{10+\sqrt{100+8}}|^{\frac{1}{3}}-\frac{2}{\overline{10\sqrt{100+8}}|^{\frac{1}{3}}}$ $=\overline{20{,}3923}|^{\frac{1}{3}}-\frac{2}{\overline{20{,}\ 3923}|^{\frac{1}{3}}}=2.732-.732=2=x$; but $x-1=y$, by ſubſtitution, and therefore $y=1$.

SCHOLIUM. The above Rule will as equally hold good when b and a are either or both of them negative. But when b is negative, and $\frac{1}{27}b^3$ is greater than $\frac{1}{4}d^2$, the Equation will be impoſſible, except when the Surd Cubic Root can be extracted; for then the irrational quantities in different parts of the Equation will deſtroy one another, and vaniſh.

However, this Rule is only calculated to ſolve Equations that have but one real Root, and two impoſſible ones.

I might further lay down particular rules for the accurate Solution of Biquadratic and other higher Equations; but they are all more curious than uſeful, and the method of approximating the Roots of Equations, of which I ſhall treat in the next Article, has the deſerved pre-eminence above all others, as well on account of its diſpatch, as of its elegance and univerſality.

ART. XXVI. *To approximate the roots of Equations in general.*

RULE. Chooſe ſome number at pleaſure to denote the unknown quantity and apply it to the given Equation, by which it will be diſcovered whether ſuch number be too big or too little. If it widely differs from the true value, try another number that approaches nearer, and by a few trials in this manner a number will ſoon be found that approaches pretty near the true value. Then aſſume ſome letter, as v, to denote the defect or exceſs of the number ſo found, and put that number + or — v inſtead of the unknown quantity in the Equation, by which a new Equation will be had affected only with v, and known quantities; wherein all the terms that contain two or more dimenſions of v may be rejected as inconſiderable in reſpect of the reſt. This done, the value of v will be found by a ſimple Equation, which added to or ſubtracted from the ſaid number according as it was taken too little or too big, will give a number ſtill nearer the truth. With this number and the letter v proceed as before, to find another value of v which muſt be applied as above; repeat the operation till the quantity, which was unknown, be determined to a ſufficient degree of accuracy.

EXAMPLE.

Let $x^3+24x=587914$, to find x. By a few trials it will be found that x is ſomething above 80; therefore let $80+v=x$; then $x^3=512000+19200v+1680v^2+v^3$, and $24x=1920+24v$. Therefore (rejecting thoſe terms affected with v^2 and v^3) $513920+19224v=587914$, and $v=\frac{587914-513920}{19224}=\frac{73994}{19224}=3.8$; this added to 80 gives 83.8 for the approximate value of x; this being ſubſtituted in the Equation, it will be found too great; therefore, for another operation, take $83.8-v=x$, and $x^3=588480.472-21067.32v$, and $24x=2011.2-24v$, and conſequently $590491.672-21091.32v=587914$, and $v=\frac{2577.672}{21091.\ 32}=0.1222$ nearly. Hence $x=83.8-0.1222=83.6778$. true to five figures, and the 6th being only too much by 2.

The operation repeated, will give the anſwer true to eleven figures. But when five or ſix figures of the Root have been obtained, and ſtill more exactneſs is requiſite, it will ſhorten the operation to ſeek a correction for v inſtead of one for the whole Root, which will be had by ſubſtituting the laſt value of v + or — (new) v inſtead of the laſt v in the Equation, including all the powers of the laſt v; but (in the Equation thence ariſing) rejecting thoſe of new v as before.

Thus in the laſt Example the whole Equation including the terms affected with v^2 and v^3 is $513920+19224v+1680v^2+v^3=587914$, or $19224v+1680v^2+v^3=73994$, and in this Equation putting $3.8-v$ inſtead of v, and rejecting the terms of v^2 and v^3 as before a correction will be obtained for the laſt found v, which will give the anſwer as above. In like manner a ſecond or a third, &c. correction may be found, to any degree of accuracy. This Rule doubles the number of figures true in the Root at each Operation. If the term wherein v^2 is found be retained, v will be had by ſolving a Quadratic, and then treble the number of figures will be had each time; wherefore, if the firſt figure only be taken true, nine or ten figures will be had at two Operations.

From this principle may be deduced various Theorems for ſolving particular Equations, as well as general formulas adapted to all, of which I ſhall give an inſtance or two, and then conclude the Article.

Let r be a number taken near to the true root; and v (as before) $=$ its exceſs or defect. Then if $x^2+bx=c$ be a quadratic, then $r\pm v=x$, and $x^2=\overline{r\pm v}^2=r^2\pm 2rv+v^2$; and $bx=br\pm bv$; hence $r^2+br\pm\overline{2r+b}.\times v+v^2=c$, and by tranſpoſition and diviſion $v=\dfrac{c-r^2-br}{\pm\overline{2r+b}+v}$, which is a general formula for all quadratics, obſerving that when b is negative in the given equation, that is, when the 2d term is negative, then $-br$ in the numerator becomes $+br$, and $+b$ in the denominator becomes $-b$; alſo, if the given equation be $x^2=c$, then $b=0$, and thoſe terms wherein it is concerned will vaniſh, and the expreſſion will be $\dfrac{c-r^2}{\pm 2r+v}$ which is the common rule for extracting the ſquare root, only it is uſual to take r leſs than juſt, and ſo the negative ſign is excluded from the denominator. To give an Example of this method,

Let $x^2+6x=61495=c$. Here by trial it will be found that x is above 200: therefore let $200=r$; then $-b=-1200$; and $c-r^2-br=20295$: the method of performing the diviſion is as follows:

OPERATION.

$$\begin{array}{r l}
2r+b=406 & \\
v'=\underline{\ \ 40} & \Big)\ 20295\ \Big(\ 45=v,\ \text{and}\ r+v=200+45= \\
2r+b+v'=446 & \quad 1784 \qquad\qquad\qquad\qquad (245=x. \\
\underline{40} & \quad \overline{} \\
2r(new)+b=486 & \Big)\ 2455 \\
v''=\underline{\ \ 5} & \Big)\ 2455 \\
2r+b+v''=\underline{\underline{491}} & \quad \overline{} \\
 & \quad \dots
\end{array}$$

Again, for a cubic Equation. Let $x^3+bx^2+dx=c$. Put $r\pm v=x$. So will $x^3=r^3\pm 3r^2v+3rv^2\pm v^3$; $bx^2=br^2\pm 2brv+bv^2$, and $dx=dr\pm dv$. Hence $r^3+br^2\pm\overline{3r^2+2br+d}\times v+\overline{3r+b}\times v^2+dr=c$ (v^3 being rejected as ſmall in compariſon of the reſt); and by tranſpoſition $\pm\overline{3r^2+2br+d}\times v,+\overline{3r+b}\times v^2=c-r^3-br^2-dr$; and $v=\pm\dfrac{c-r^3-br^2-dr}{\overline{3r^3+2br+d}+\overline{3r+b}.v}$ to be wrought after the ſame manner as the laſt Example; or if $\pm\dfrac{\overline{3r^2+2br+d}}{3r+b}$ be put $=2m$, and $\dfrac{c-r^3-br^2-dr}{3r+b}=p$ then (per quadraties) $v=\sqrt{p+m^2}\pm m$. When three or four figures are found they muſt be taken for new r, and the operation muſt be repeated.

Or, if $\pm\overline{3r^2+br+d}$ be put $=g$, and $\overline{3r+b}=h$, and $c-r^3-br^2-dr=p$, then (ſince $\dfrac{p}{g}=v$ nearly) $\dfrac{p}{\pm g+h\times\frac{p}{g}}$ will be $=v$ more nearly. Or the ſame may be rendered general, after this manner.

Let n be the higheſt power, and A, B, C, &c. be the aggregate coefficients of v, v^2, v^3, &c. and if the given Equation be $x^n,+ax^{n-1}+bx^{n-2}+cx^{n-3}+$ &c. (to px) $=\mathrm{N}$, then $\pm\mathrm{A}v+\mathrm{B}v^2\pm\mathrm{C}v^3+$ &c. $=\mathrm{N}-r^n-{}^n a r^{n-1}-br^{n-2}-cr^{n-3}-$ &c. (to pr) $=\mathrm{P}$; and, by taking the firſt two terms of the ſeries as ſufficient for an approximation, we have $\pm\mathrm{A}v+\mathrm{B}v^2=\mathrm{P}$, and therefore $v=\sqrt{\dfrac{\mathrm{P}}{\mathrm{B}}+\dfrac{\mathrm{A}^2}{4\mathrm{B}^2}}\mp\dfrac{\mathrm{A}}{2\mathrm{B}}$; or $v=\dfrac{\mathrm{P}}{\pm\mathrm{A}+\mathrm{B}v}$; and, taking the firſt approximate, $\dfrac{\mathrm{P}}{\mathrm{A}}$ for v, we have $\dfrac{\mathrm{P}}{\pm\mathrm{A}+\frac{\mathrm{BP}}{\mathrm{A}}}$, for the value of v, either of which Rules are general, and will converge ſufficiently ſwift.

ART. XXVII. *To approximate the Roots of Exponential Equations.*

RULE. Let $x^x=c$ be given to find x. Seek a number (by trial) which ſhall be near the Root, and take the logarithm thereof; multiply this logarithm by the ſaid number, then take the difference between this product and the log. of the given number c, and note it down with the ſign + or — according as the product exceeds or falls ſhort of the log of c. Proceed in like manner with another number (taken for the Root) and by the method of trial and error as given in our New Syſtem of Arithmetic find the value of x.

If it be not exact enough, freſh numbers may be taken very near the Root, whereof the value of x laſt found may be one, and by thus repeating the operation as often as ſhall be requiſite, x may be had to any degree of accuracy.

EXAMP. Let $x^x=256$, required x. Suppoſe $x=3$; then the logarithm of 256 is 2,40824, and the logarithm of $3=,4771213$; this multiplied by 3 the product will be found deficient of 2.40824, by 1.07788, and therefore the ſuppoſition 3 is too little.

Again, ſuppoſe $x=5$; then its logarithm .69897 multiplied by 5 will be found too much by 1,08661; and theſe ſuppoſitions and errors being managed according to the method above-mentioned, x will be found $=3.996$, erring only 4 in the laſt figure, the true anſwer being four; and by taking 3.996 as a new ſuppoſition, along with ſome other number nearly equal to it, the anſwer would be had with far more exactneſs. There are other ways of ſolving theſe Equations, but none that will more quickly approximate to the true value than this exceeding eaſy one.

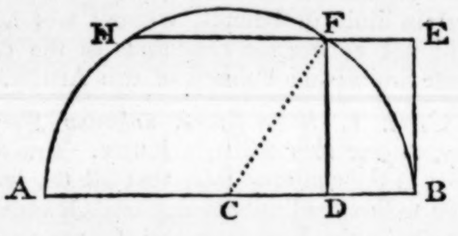
SECTION VI.

CONSTRUCTION OF EQUATIONS.

WHEN in the Solution of an Equation, ſtrict accuracy is not required, the anſwer may be determined geometrically, by drawing right lines or curves after ſuch a manner, as, by their interſections, ſhall limit and determine its Roots: but ſince the extraction of Roots by approximation has been brought to ſuch perfection, ſo that either a few, or as many figures as one pleaſes, may be readily obtained, Geometrical Conſtructions have, in a great meaſure, been laid aſide, particularly in Equations of high dimenſions, where recourſe muſt be had to the Conic Sections and other Curves ſtill more difficult to delineate; as the trouble in ſuch caſes would be almoſt infinite, and at laſt fail of producing a correct anſwer.

I ſhall therefore only give the conſtruction of Quadratic and Cubic Equations, which may be done without much pains by means of a Circle paſſing over thoſe of the higher orders, as well as thoſe of Simple Equations for which no preciſe Rule can be given; but the methods will be different as the unknown quantity is differently entangled with others, and the aſſiſtance alſo of Geometrical Propoſitions, too various to enumerate here, are frequently called in.

ART. XXVIII. *To conſtruct Quadratic Equations.*



PROBLEM 1. To extract the Square Root, or to find the Root or Side of a given Square, as x in this Equation, $x^2=nm$. RULE. The given quantity being divided into two factors, as n and m, take AD $=$ one factor (n) and DB $=$ the other (m); divide AB equally in c, and from thence as a center deſcribe the Semicircle AFB; erect from D perpendicular to AB, and DF will be equal to x, for by the Property of the Circle, AD ($=n$) $\times$ DB ($=m$) $=\mathrm{DF}^2$, and therefore DF$=x$.

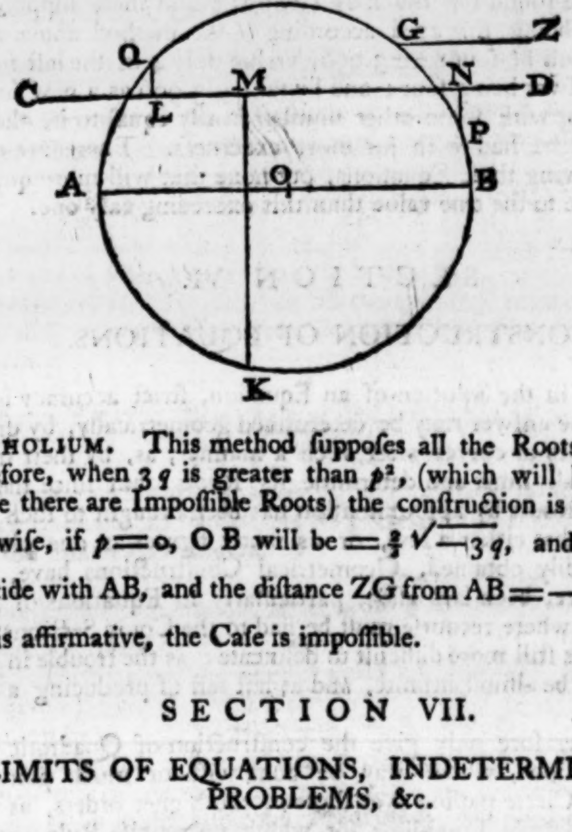
PROB. 2. To conſtruct a Quadratic of this form, $x^2\pm bx=cd$. RULE. Find the Side of a Square equal to the rectangle cd by the laſt Problem, which call n, then from any point C in a line AB drawn at pleaſure, ſet off, to the right, CD $=\frac{1}{2}b$, if b is affirmative; but to the left if b is negative: erect a perpendicular from D, and take DF$=n$, then from C as a center, with the Radius CF deſcribe the Circle AFB, ſo will BD and DA be the two Roots, that to the right hand of D being affirmative, and that to the left negative.

PROB. 3. To conſtruct a Quadratic Equation of this kind, namely, $x^2\pm bx=-nn$. RULE. Here the given Quantity $-nn$ being divided into two equal factors (but of contrary affections) by Problem 1, namely, $+n$ and $-n$, let a circle be deſcribed from any point C as a centre in the right line AB: with the radius $=\frac{1}{2}b$, erect a perpendicular at B, on the right, if it be $+b$ (but, at A on the left if it is $-b$); take BE$=n$; through E draw EFH parallel to AB, interſecting the Circle in F and H, ſo will EF and EH be the two Roots required, which if they lie towards the right of E are affirmative; but, if towards the left, they are negative.

N. B. If the parallel does not cut the circle or touch it, the Equation is impoſſible,

ART. XXIX. *To conſtruct Cubic Equations.*

Let the Equation be $x^3\pm px^2\pm qx=r$; to conſtruct which, obſerve this Rule, with the Radius $\frac{2}{3}\sqrt{p^2-3q}$, deſcribe the Circle BGAK (as in the following figure) drawing the diameter AB and CD parallel thereto, above or below the ſame, at the diſtance of $\frac{1}{3}p$, according as p is + or —; then draw ZG parallel to AB, and above or below it, at the diſtance of $\dfrac{qr-pq}{p^2-3q}+\frac{2}{3}p$, as the ſame diſtance ſhall be an affirmative or negative quantity; cutting the Circle in G. Alſo take the arch BP $=\frac{1}{3}$BG, and let PQ, QK and KP divide the whole Circle into three equal parts. Let fall the perpendiculars QL, KM and BN upon the line CD, and they will be the Roots of the Equation, thoſe which are affirmative being above the line, but thoſe which are negative, below it.



Scholium. This method ſuppoſes all the Roots real, and therefore, when $3q$ is greater than p^2, (which will be the caſe where there are Impoſſible Roots) the conſtruction is impoſſible. Likewiſe, if $p = 0$, O B will be $= \frac{2}{3}\sqrt{-3q}$, and C D will coincide with AB, and the diſtance ZG from AB $= -\frac{3r}{q}$: and if q is affirmative, the Caſe is impoſſible.

SECTION VII.

LIMITS OF EQUATIONS, INDETERMINATE PROBLEMS, &c.

Art. XXX. *To find the Limits of Equations.*

WHEN an Equation contains ſeveral unknown quantities, it will admit of an infinite number of Solutions, if both fractional and negative numbers are admitted; for all of them, except one, may be taken at pleaſure, and their values being aſſigned and ſubſtituted in the Equation that ſingle quantity will be determined. However, ſometimes queſtions are ſo propoſed as not only to exclude negative quantities, but fractional quantities alſo; and an Equation under ſuch circumſtances will be confined to a determinate number of Solutions; for the unknown quantities will have certain limits or bounds, without which, if they be taken they will not anſwer the conditions of the caſe in hand. To aſſign thoſe limits is the buſineſs of this Article.

Case I. *When ſeveral unknown Quantities are in one Equation, to find their limits.* **Rule.** Tranſpoſe the negative Quantities to the contrary ſide, that all the terms may be affirmative; then to find the limits of any one Quantity, ſuppoſe all the reſt to vaniſh in the Equation, and ſo the value of that one will become determinate, and will be one limit thereof. And to know which limit it is, ſuppoſe the other Quantities to increaſe and become of ſome certain value: then if, by this procedure, the value of the unknown quantity under conſideration increaſes, it is the leaſt limit; but if it decreaſes, it is the greateſt.

This Rule includes fractional Quantities. If, however, fractional Quantities are to be excluded, then, inſtead of ſuppoſing the other Quantities to vaniſh, put each of them $= 1$, and an Equation will be had from which the limit of the remaining quantity will be determined as before. Proceed in the ſame manner to find the limits of the reſt of the unknown Quantities.

Examp. Let $4x + 5y = 67$, to find the limits of x and y, including fractions. Let $y = 0$, or be ſuppoſed to vaniſh, and then $4x = 67$, and $x = 16\frac{1}{4}$. Now let y be ſuppoſed $=$ to ſome quantity, and then it is plain, that while y increaſes, x decreaſes; therefore $16\frac{1}{4}$ is the greater limit; whence x is leſs than $16\frac{1}{4}$.

If $x = 0$, then $5y = 67$, and $y = 13\frac{2}{5}$. If now y be ſuppoſed to increaſe, it is plain x will decreaſe, and therefore $13\frac{2}{5}$ is the greater limit of y. Whence y is leſs than $13\frac{2}{5}$; and the leſs limit of both x and y is 0.

Again, let the ſame be propoſed, excluding fractions; then to find a limit for x, put $y = 1$, and the Equation becomes $4x + 5 = 67$; or $4x = 62$, and $x = 15\frac{1}{2}$, its greater limit; viz. x is leſs than $15\frac{1}{2}$. Alſo by putting $x = 1$, we have $5y + 4 = 67$, or $5y = 63$, and $y = 12\frac{3}{5}$; and hence y is leſs than $12\frac{3}{5}$; the leſs limit of both x and y is 1, viz. neither x nor y can be leſs than 1.

Case II. *When three or more unknown Quantities are in two Equations, to determine their Limits.*

Rule. Having pitched upon a quantity to be limited, expunge one of the other quantities, and there will be had one limiting Equation. Then do the ſame with another unknown quantity, and there will be had another limiting Equation; from each of which Equations, find a limit for the quantity pitched on.

Examp. Let $x + y + z = 56$, and $32x + 20y + 16z = 1232$, to limit x. Firſt, in order to exterminate y, multiply the firſt Equation by 20, and there will be $20x + 20y + 20z = 1120$. Subtract this from the ſecond Equation, and $12x - 4z = 112$. Then (excluding fractions) the leſs limit of x in this Equation is $9\frac{2}{3}$.

Again, to exterminate z, multiply the firſt Equation by 16, and ſubtract the product from the ſecond Equation, and you will have $16x + 4y = 336$. And the greater limit of x, in this Equation, is $20\frac{1}{4}$. Hence x is greater than $9\frac{2}{3}$, and leſs than $20\frac{1}{4}$. In like manner may y and z be limited; and ſo alſo for any other Equation.

Scholium. When three numbers are ſought by two Equations, all the values of each of them, in whole numbers, make three ſeries of Arithmetical Progreſſion, taken within their proper limits.

Art. XXXI. *Of indeterminate Problems.*

Lemma. Let $\frac{ax \pm b}{c}$ be an Algebraic Fraction in its loweſt terms, x being indeterminate, and a, b, and c, being given whole numbers; then the leaſt integer for the value of x, that will alſo cauſe the value of the ſaid Fraction, to be an integer, will be found by the following method.

Divide the denominator (c) by the coefficient (a) of the indeterminate quantity; alſo divide the diviſor by the remainder, and the laſt diviſor, again, by the laſt remainder, and ſo on till an unit only remains. Write down all the quotients in a line as they follow, under the firſt of which write an unit, and under the ſecond write the firſt; then multiply theſe two together; and, having added the firſt term of the lower line (or an unit) to the product, place the ſum under the 3d Term of the upper line; multiply in like manner the next two correſponding terms of the two lines together, and having added the ſecond term of the lower to the product, put down the reſult under the fourth term of the upper one. Proceed on in this way till you have multiplied by every number in the upper line. Then multiply the laſt number thus found, by the abſolute quantity (b) in the numerator of the given fraction, and divide the product by the denominator; ſo ſhall the remainder be the true value of x required, provided that the number of terms in the upper line be even, and the ſign of b be negative; or that the number be odd, and the ſign of b be affirmative, but if the number of terms be even, and the ſign of b be affirmative, or vice verſa, then the difference between the ſaid remainder and the denominator of the fraction, will be the true anſwer.

N. B. In this method it is ſuppoſed that a is leſs than c, and that they are prime to each other; for were they to admit of a common meaſure, whereby b is not diviſible, no integer could be aſſigned for x, ſo as to give the value of $\frac{ax+b}{c}$ an integer.

Examp. Let the given quantity be $\frac{71x+10}{89}$, then the operation will ſtand as below.

$$\begin{array}{l} 71)\,\underline{89}\,(1 \\ \quad 18)\,\underline{71}\,(3 \\ \qquad 17)\,\underline{18}\,(1 \\ \qquad\qquad 1 \end{array} \qquad\qquad \begin{array}{rrrrl} 1 & 3 & 1 & & \text{Quotients} \\ 1 & 1 & 4 & 5 & \\ & & & \underline{10} & = b \\ & & & 50 & \textit{Product.} \end{array}$$

Now if the Product (50) be divided by 89, the remainder is 50, which is therefore $=$ the leaſt value of x.

Quest. I. required the leaſt whole number, which, being divided by 17, ſhall leave a remainder of 7; but, if divided by 26, the remainder ſhall be 13? Here let $x =$ the quotient by 17, and then will $17x + 7 =$ number ſought; alſo, ſince this number, when 13 is ſubtracted from it, is diviſible by 26, it follows, that $\frac{17x + 7 - 13}{26}$ or $\frac{17x - 6}{26}$ muſt be a whole number, from which fraction x will be found by the above lemma $= 8$; and conſequently $17x + 7 = 143$ is the number ſought.

Quest. II. Given $24x - 13y = 16$ to find the leaſt values of x and y in whole numbers. Here by tranſpoſing $-13y$, and dividing by 24, we have $x = \frac{13y + 16}{24}$; and by the Lemma, the leaſt value of y in the fraction $= 8$; and therefore the leaſt value of $x = 5$.

Quest. III. How many different ways is it poſſible to pay 100 £. in guineas and piſtoles only; a guinea being 21*s.* and a piſtole 17? Put $x =$ number of guineas, and $y =$ number of piſtoles; then $21x + 17y = (100 \times 20) = 2000$ by the queſtion; and therefore $x = \frac{2000 - 17y}{21} = 95 + \frac{5 - 17y}{21}$, $=$ a whole number; and therefore (by tranſpoſition) $\frac{17y - 5}{21}$ is alſo a whole number; whence by the lemma, the leaſt value of y is 4; and therefore the correſponding or greateſt value of $x = 92$. Now to find the leaſt value of x and the greateſt value of y, take the value of y in terms of x: and $y = \frac{2000 - 21x}{17} = 117 - x - \frac{4x + 11}{17} =$ a whole number; and therefore $\frac{4x - 11}{17} =$ a whole number, and by the Lemma, the leaſt value of x is 7, and the correſponding, or greateſt value of $y=109$; now ſince the ſeveral values of x are, as is evident, in an arithmetical progreſſion whoſe common difference is 17, and thoſe of y, in a like progreſſion, whoſe common difference is 21, the intermediate values of x and y are eaſily determined, and are as under:

$$x = 92,\ 75,\ 58,\ 41,\ 24,\ 7,$$
$$y = 4,\ 25,\ 46,\ 67,\ 88,\ 109$$

N. B. Having found the greateſt value of either of the unknown quantities, the leaſt value thereof may be more readily obtained thus: Divide the greateſt value by the coefficient of the other unknown quantity, and the remainder will be the leaſt value. Alſo the quotient $+1$ will be the number of anſwers. This however ſuppoſes the coefficients to be prime to each other; and, therefore, when they are not ſo, the Equation muſt be reduced by dividing by the greateſt common meaſure.

QUESTION IV. The reckoning of a certain number of men and boys came to 23 ſhillings; to the defraying of which each man paid 3s. 6d. and each boy 1s. 6d. What number of men and boys were there in company?

Let $x=$ the number of men, and $y=$ the number of boys; then $7x+3y=46$ per queſtion, and $x=\frac{46-3y}{7}=6-\frac{3y+4}{7}$ $=$ a whole number; and therefore $\frac{3y-4}{7}=$ a whole number; whence the leaſt value of y is 6, and conſequently the greateſt value of x is 4; and this, divided by 3, leaves a remainder of 1 for the leaſt value of x, and 13 is the correſponding value of y. Alſo the quotient $+1=2$, which ſhews that there are no more ways of paying the reckoning. But as the queſtion ſuppoſes a plurality, both of men and boys, the two former numbers, only, can ſatisfy the demand. Hence, there were 4 men and 6 boys.

QUESTION V. Required the leaſt integer, which being divided by 4, 5, and 6, there ſhall remain 1, 2, and 3, reſpectively.

Here let $x=$ the quotient by 4, then $4x+1$ will be the required number; and, by the ſecond condition of the queſtion, $\frac{4x+1-2}{5}=\frac{4x-1}{5}=$ whole number; then by the lemma $x=4$; and $4x+1=17=$ the leaſt whole number that will anſwer the two firſt conditions. Now the leaſt whole number that is diviſible by 4 and 5, will (as they are prime to each other) $=4\times5=20$; then ſince the required number, by the nature of the queſtion, muſt be ſome multiple of 20 increaſed by 17, it is evident that it may be repreſented by $20y+17$; and this number, leſs 3, is alſo diviſible by 6; therefore, $\frac{20y+17-3}{6}$ is a whole number; viz. $3y+2+\frac{2y+2}{6}=$ a whole number; and therefore, $\frac{2y+2}{6}$, or $\frac{y+1}{3}=$ a whole number; and, by the lemma, the leaſt value of y is 2; and conſequently, $20y+17=57$, $=$ the leaſt whole number; which being divided by 4, 5, and 6, reſpectively, will leave the given remainders 1, 2 and 3. In like manner the method may be extended to any numbers of diviſors and given remainders, by proceeding ſtep by ſtep, till a number is found that will anſwer the whole; and conſequently the ſame will be applicable in the ſolution of indeterminate Equations, where three, four, or more quantities are concerned. But when the number of the unknown quantities exceed the number of Equations by more than one, the limits of the quantities muſt be found by ART. 30, and, then the values of ſome unknown quantity muſt be aſſumed, at repeated operations $=$ to the ſucceſſive numbers between its leaſt and greateſt limits, and ſo all the values of the reſt of the unknown quantities will be determined by the preceding methods; viz. for inſtance, if there be three unknown quantities in one Equation, and if it is found that a quantity cannot exceed 10 nor be leſs than 1, aſſume its value $=1$, and then the Equation will be reduced to two unknown quantities, to be determined as hath been already ſhewn. This done, aſſume its value $=2$, and determine the reſt as before; then put 3 for its value, and ſo on, till all the numbers from its leaſt to its greateſt limits are exhauſted. The ſum of all the anſwers thus obtained, will exhibit all the poſſible ways by which the queſtion can be ſolved.

ART. XXXII. *Of rational Square and Cube Numbers.*

For queſtions of the following nature no certain rule can be given, but the methods of ſolving them as well as thoſe of ſome others that come under the laſt article, reſt chiefly in the invention of the artiſt, whoſe penetration and ſagacity, alone, muſt ſuggeſt what ſteps will be requiſite to accompliſh the end of his enquiries. On this account, and becauſe the limits of our plan will not permit us to enlarge, I ſhall only lay down ſome general obſervations reſpecting them, with a few examples, and then add ſome queſtions for the further illuſtration of what has been delivered in this Syſtem; at the ſame time informing the contributors to this undertaking, that many intereſting matters wherein Algebra is applied will be occaſionally interſperſed in the courſe of the work under their proper heads, ſo that it ſhall unequivocally merit the Title of "THE NEW ROYAL ENCYCLOPÆDIA," and not, like a certain upſtart production, ſkip over ſyſtems by referring to other articles where the ſubjects are alſo wholly untouched on.

Obſervations on Square Numbers.

1ſt. All even ſquare numbers are diviſible by 4, and therefore if a number conſiſt of two even ſquare numbers, it will alſo be diviſible by 4.

2d. Any odd ſquare number divided by 4, leaves a remainder of 1, and therefore, if a number, conſiſting of two odd ſquare numbers, be divided by 4, there will be a remainder of 2.

3d. It follows from the above, that if a number, conſiſting of an even and an odd ſquare number, be divided by 4, there will be a remainder of 1.

4th. Hence alſo, if any number which is compoſed of two ſquare numbers, be divided by 4, it cannot leave a remainder of 3; and conſequently a number, which is compoſed of two ſquare numbers, cannot fall within this progreſſion, 3, 7, 11, 15, 19, 23, &c.

5th. Any number ending in 2, 3, 7, or 8, is not a ſquare number.

6th. The ſum of any number of terms of the ſeries, 1, 3, 5, 7, 9, 11, &c. beginning with the firſt, is a ſquare number, whoſe root is equal to the number of terms.

7th. The difference between any two ſquare numbers is equal to the product of the ſum and difference of their roots. Thus, if a and b be the roots, then $\overline{a+b}\times\overline{a-b}=a^2-b^2$; and the ſame is alſo equal to the ſum of the two roots, together with twice the ſum of the roots of all the intermediate ſquare numbers. Thus the difference between 36 and $9=\overline{6+3}+2\times\overline{\sqrt{16}+\sqrt{25}}=9+18=27$.

In attempting to ſolve queſtions of this claſs, the chief point in view, is to make ſuch aſſumptions for the root of the required ſquare or cube, as ſhall, when involved, cauſe either the given number, or the higheſt power of the unknown quantity, to vaniſh out of the Equation, whereby at length there will be only one dimenſion of the unknown quantity, and ſo the queſtion will be ſolved, by reducing the Equation.

EXAMPLES. QUESTION I.

What two ſquare numbers are thoſe, the difference whereof is 57? Here I try to divide 57 into two unequal integer factors, which in any caſe may be done if one of them is taken an unit. But here I find 3 and 19 will do. Hence as the rectangle of the ſum and difference of the roots is equal to the difference of the ſquares, $=$ to the rectangle of 3 and 19, I conclude that the ſum of the two roots is 19 and the difference 3: then if $x=$ greateſt root, and $y=$ leſs, $x+y=19$ and $x-y=3$; and adding the two Equations together, and dividing by 2, we have $x=11$, and conſequently $y=8$; or, which is a well known theorem, half the ſum $+$ half difference $=$ greater number, and half ſum $-$ half difference $=$ leſs number. Hence the two ſquare numbers are 121, and 64 reſpectively. If an unit had been taken for one of the factors, then $\frac{56+1}{2}=29$ for the greater root, and $\frac{57-1}{2}=28$, the leſs root, and the ſquare numbers themſelves are 841, and 784, reſpectively, which likewiſe anſwer the conditions of the queſtion.

SCHOLIUM.

In order to have the anſwer in whole numbers; if the given difference be an odd number, both the factors muſt be taken odd, which may always be done by means of an unit; and, ſo it will always be a poſſible caſe. But if the propoſed difference be an even number, it muſt be divided into factors that are even, or the anſwer will not be had in whole numbers: when it is a poſſible caſe, one of the factors may be 2. By thus dividing the given difference into factors all the poſſible anſwers will be readily exhibited. If fractional numbers are included, the anſwers will be innumerable.

QUEST. II. To divide a given ſquare number (100) into two other ſquare numbers. Let the given ſquare number $(100)=b^2$, and put $x^2=$ one of its parts, ſo will $b^2-x^2=$ the other part, which is alſo a ſquare number. Aſſume this number alſo $=\overline{rx-b}|^2$; then theſe values being put equal to each other, and the Equation reduced, $x=\frac{2br}{r^2+1}$; and by ſubſtituting this in lieu of x in the aſſumed value of the other root, viz. $rx-b$, we have $\frac{br^2-b}{r^2+1}$. And hence $\frac{2br}{r^2+1}$, and $\frac{br^2-b}{r^2+1}$, are the roots of the required ſquares; where r may be any number (above 1) taken at pleaſure. Now if the value of b $(=10)$ be reſumed, and r be taken $=2$, the roots of the required ſquares will be 8, and 6 reſpectively; and conſequently the ſquare numbers are 64 and 36. If no value of r will give the anſwer in whole numbers, the given ſquare number is not compoſed of two integer ſquares.

QUEST. III. To find a ſquare number, which if multiplied by a known ſquare number $(=9)$ and a given number (288) be added to the product, the reſult ſhall be a ſquare number. Put $9=a^2$; $288=d$; and $z^2=$ the required number. Then $a^2z^2+d=$ a ſquare number $(=y^2)$ per queſtion. Aſſume $v-az=y$, then

$y^2 = v^2 - 2vaz + d = v^2 - 2vaz + a^2z^2$. Now, putting theſe two values of y^2 equal to each other, viz. $a^2x^2 + d = v^2 - 2vaz + a^2z^2$ and reducing the Equation, we have $z = \frac{v^2 - d}{2av}$, where v may be taken at pleaſure: but with this proviſion, if the anſwer is required in whole numbers, that $v^2 - d$, will divide by $2av$. In the above Example take $v = 24$, and reſume the values of a $(=3)$ and d $(=288)$, and z is had $=2$; hence $z^2 = 4$, which numbers anſwers the demands of the queſtion.

QUEST. 4. To divide a given number (25) conſiſting of two known ſquare numbers (16 and 9) into two other ſquare numbers.

Put $16 = d^2$ and $9 = b^2$, and aſſume $ra - d =$ ſide of one ſquare, and $sa - b =$ ſide of the other, then $\overline{ra - d}^2 + \overline{sa - b}^2 = d^2 + b^2$ (per queſtion). By involution and tranſpoſition $r^2a^2 + s^2a^2 = 2rad + 2sab$; and dividing by $ar^2 + as^2$, we have $a = \frac{2rad + 2abs}{ar^2 + as^2} = \frac{2rd + 2bs}{r^2 + s^2}$, and this ſubſtituted for a in the aſſumed expreſſions, $ra - d$, and $sa - b$, they become $\frac{dr^2 + 2bsr - ds^2}{r^2 + s^2}$, and $\frac{2rds + bs^2 - br^2}{r^2 + s^2}$, for the two roots of the ſquare numbers required. Now, if the values of d and b be reſumed, and r be taken $= 2$, and $s = 1$, we ſhall have $\frac{24}{5}$ and $\frac{7}{5}$ for the roots; and therefore $\frac{576}{25}$ and $\frac{49}{25}$ are the ſquare numbers required.

N. B. r and s may be any numbers whatever, provided r be greater than s, and that their ratio be not as that of d to b, or of $d + b$ to $d - b$. In Ronayne's Algebra, through taking r leſs than s, and aſſuming $ra + b =$ one of the given ſides, the ſolution to this problem is wrong.

QUEST. 5. To find three cube numbers, whoſe ſum may be both a ſquare and a cube number.

Put a, e, and y, for their reſpective roots, and $x^6 =$ ſum of their cubes; then, $a^3 + e^3 + y^3 = x^6$ per queſtion. Aſſume $\frac{x^4}{a^2}v - a = e$, and $x^2 - v = y$; then $a^3 + \overline{\frac{x^4}{a^2}v - a}\Big|^3 + \overline{x^2 - v}\Big|^3 = x^6$; the compound parts of which Equation being involved, and then the whole properly reduced, v is found $= \frac{3a^3x^2}{x^6 + a^3}$, where x and a may be taken at pleaſure; and this value of v being ſubſtituted in the aſſumed values of e and y, above ſpecified, they will become known. If $x = 1$, and $a = \frac{1}{2}$, then $v = \frac{1}{3}$, whence $e = \frac{5}{6}$, and $y = \frac{2}{3}$, and conſequently the cube numbers are $\frac{1}{8}$, $\frac{125}{216}$, and $\frac{8}{27}$, which fulfil the conditions of the queſtion; their ſum being $(=1)$ both a ſquare and a cube number. And by taking different values for x and a, various anſwers may be obtained.

SECT. VIII.

ALGEBRAIC QUESTIONS.

QUEST. I. What two numbers are thoſe, whereof the ſum is 108, and the proportion of the leſs to the greater as 5 to 7?

Let $x =$ the greater number; then $108 - x =$ the leſs. And as $108 - x : x :: 5 : 7$ per queſtion. This brought into an Equation by Art. 17, we have $5x = 756 - 7x$, and by tranſpoſing $7x$, there is $12x = 756$: hence, by dividing by 12, $x = 63$, the greater number; and $108 - 63 = 45$, the leſs number.

QUEST. II. There are three numbers in arithmetical progreſſion; the common difference is 2; and the product of the ſaid numbers is 960. What are thoſe numbers?

Let $x =$ the middle term of the progreſſion, and then $x + 2$, and $x - 2$, will be the two other terms: and $x \times \overline{x + 2} \times \overline{x - 2} = 960$ per queſtion. The terms being actually multiplied, $x^3 - 4x = 960$; which Equation ſolved, either by Art. 25, or Art. 26, gives $x = 10$; and therefore the three numbers are 8, 10, and 12.

QUEST. III. A ſervant bought apples at 6 a penny, and pears at 5 for two-pence. The number of apples and pears together was an hundred; and the money given for them was 2s. 2d. I demand how many there were of each ſort?

Let $a =$ the number of apples; then $100 - a$ will be the number of pears: and, as $6 : 1\text{d} :: a : \frac{a}{6} =$ price of the apples. Alſo, as $5 : 2\text{d} :: 100 - a : \frac{200 - 2a}{5} =$ price of the pears; then $\frac{a}{6} + \frac{200 - 2a}{5} = 2\text{s. } 2\text{d.}$ $(= 26\text{d.})$ per queſtion. This Equation, multiplied by 30, we have $5a + 1200 - 12a = 780$. By tranſpoſition, $7a = 1200 - 780 = 420$, and by diviſion $a = 60$, the number of apples; and $100 - 60 = 40$, the number of pears.

QUEST. IV. It is required to divide the number 128 into four ſuch parts, that if the firſt be added to 7, the ſecond ſubtracted from 7, the third multiplied by 7, and the fourth divided by 7, the reſults may be equal among themſelves.

Let, v, x, y, and z, be the required parts. Then $v + 7, = x - 7, = 7y, = \frac{z}{7}$, per queſtion. And from the equality of the two firſt, $x = v + 14$; from the equality of the firſt and third, $y = \frac{v + 7}{7}$, and from the equality of the firſt and fourth $z = \overline{v + 7} \times 7 = 7v + 49$. Therefore (by collecting theſe together) $v + v + 14 + \frac{v + 7}{7} + 7v + 49 = 128$. By collecting the terms and tranſpoſition, $9v + \frac{v + 7}{7} = 65$; and by multiplying this by 7, collecting the terms, tranſpoſing, and dividing, $v = 7$; and hence $x = 7 + 14 = 21$; $y = \frac{7 + 7}{7} = 2$; and $z = \overline{7 + 7} \times 7 = 98$; the ſeveral parts required.

QUEST. V. There are two cubical pieces of marble, and the ſide of one, exceeds the ſide of the other, by three inches, and the ſolid inches in both are 2457 inches. Of what length is the ſide of each cubical piece?

Let the ſide of the leſs be x, then the ſide of the greater will be $x + 3$; and $x^3 + \overline{x + 3}^3 = 2547$ inches, per queſtion. Hence, $2x^3 + 9x^2 + 27x = 2430$. This Equation ſolved, $x = 9$, and conſequently $y = 12$.

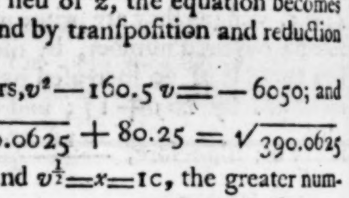
QUESTION VI. The ſum of two numbers multiplied by the greater is 110, and their difference multiplied by the leſs is 9, what are thoſe numbers?

Put $110 = a$, and $9 = b$, and let x and y be the two numbers, whereof x is the greater; then $\overline{x + y} \times x = x^2 + xy = a$; and $\overline{x - y} \times y = xy - y^2 = b$, per queſtion.

Again: Put $v = x^2$, and $z = y^2$; ſo will $v + \sqrt{vz} = a$, and $\sqrt{vz} - z = b$; and ſubtracting the latter Equation from the former, $v + z = a - b$; hence $z = a - b - v$; by tranſpoſing the former Equation, $\sqrt{vz} = a - v$, and ſquaring both ſides, $vz = a^2 - 2av + v^2$. Then by ſubſtituting $a - b - v$, in lieu of z, the equation becomes $av - bv - v^2 = a^2 - 2av + v^2$; and by tranſpoſition and reduction $v^2 - \frac{\overline{3a - b}}{2} \cdot v = -\frac{a^2}{2}$. In numbers, $v^2 - 160.5v = -6050$; and therefore, $v = \sqrt{-6050 + 6440.0625} + 80.25 = \sqrt{390.0625} + 80.25 = 19.75 + 80.25 = 100$, and $v^{\frac{1}{2}} = x = 10$, the greater number. $z = a - b - v = 110 - 9 - 100, = 1$; and therefore $z^{\frac{1}{2}} = 1 = y$ the leſs number.

N. B. This queſtion is the ſame as the ſecond in the *Gentleman's Diary* for the enſuing year (1789) only there the numbers a and b are taken larger.

QUESTION VII. Let the ſides of the triangle ABC be as follow; viz. AB=24, AC=28, and BC=18, it is required to find the ſegments of the baſe AD, and DC, made by a perdendicular let fall from B.



Take AE=DC, and divide AC into two equal parts as at O; then becauſe AE=DC, ED=the difference of the ſegments; and becauſe AO=OC, EO=OD=½ difference: alſo AO+OD=AD, the greater ſegment =OC+OD; and OC−OD=DC= leſs ſegment. Now put half difference of ſegments EO or OD$=x$, and let AB$=a$, BC$=b$, and AO or OC$=\frac{1}{2}$AC$=c$; ſo will $c + x =$ AD, and $c - x =$ DC. Then, by the Pythagorean Theorem (ſee GEOMETRY) $a^2 - \overline{c + x}^2$ $(= \text{BD}^2) = b^2 - \overline{c - x}^2$; and therefore, $a^2 - c^2 - 2cx - x^2 = b^2 - c^2 + 2cx - x^2$; viz. $a^2 = b^2 + 4cx$, or $a^2 - b^2 = 4cx$; or, which is the ſame, $\overline{a + b} \times \overline{a - b} = 4cx$. This reſolved into a proportion by (Art. 17.) we have as $2c : \overline{a + b} :: \overline{a - b} : 2x$; viz. as the baſe AC is to the ſum of the ſides AB and BC, ſo is the difference of thoſe ſides to ED, the difference of the ſegments of the baſe: a well-known theorem in Trigonometry. Or by taking $4c$ for the firſt term, and x for the laſt, it will be, as twice the baſe is to the ſum of the ſides; ſo is the difference thereof to half the difference of the ſegments.

Wherefore, in the preſent example, as (2AC) 56 : (AB+BC) 42 :: (AB−BC) 6 : $\frac{42 \times 6}{56} = \frac{21 \times 6}{8} = \frac{21 \times 3}{14} = \frac{3 \times 3}{2} = 4\frac{1}{2} =$ ½ difference of ſegments, then 14 (AO or OC) $+ 4\frac{1}{2} = 18\frac{1}{2} =$ AD, the greater ſegment; and $14 - 4\frac{1}{2} = 9\frac{1}{2} =$ DC, the leſs ſegment.

N. B. The greater ſegment is always adjacent to the greater remaining ſide, and the leſs ſegment is adjacent to the leſs remaining ſide.

QUEST.

ALGEBRA.

Quest. VIII. Having a conical veſſel full of liquor ſtanding upon its leſs end, the radius of which is 20 inches, into which I immerſed a cone of equal baſe and altitude, the convex ſurface whereof is 2827.44, and is equal to the area of the top of the veſſel. Required its content and the quantity of liquor in ale gallons that overflowed by ſo doing. Let the top diameter of the veſſel be x, and its height y, = alſo the height of the cone; and let $20 = a$, and $2827.44 = b$. Alſo put $.7854 = p$, then $px^2 = b$, per queſtion, and therefore $x^2 = \frac{b}{p}$. But the reciprocal of $\frac{1}{p} = 1.27324$, and therefore $x^2 = 1.27324 \times b = 3600$; and $x = \sqrt{3600} = 60$ inches, the top diameter of the veſſel.

Alſo (per Menſuration) $\sqrt{\frac{a^2}{4} + y^2}$ = the ſlant ſide of the cone, and $2pa \times \sqrt{\frac{a^2}{4} + y^2}$ = convex ſurface of the cone $= b$; therefore $\sqrt{\frac{a^2}{4} + y^2} = \frac{b}{2pa}$; and $\frac{a^2}{4} + y^2 = \frac{b^2}{4p^2a^2}$, and conſequently $y^2 = \frac{b^2}{4p^2a^2} - \frac{a^2}{4}$. and $y = \sqrt{\frac{b^2}{4p^2a^2} - \frac{a^2}{4}} = \sqrt{4996.51 \times \overline{1.27324}|^2} = \sqrt{4996.51 \times 1.62114} = \sqrt{8100.} = 90$, the height of the veſſel, and altitude of the cone.

Then $\overline{20 \times 60 + 20^2 + 60^2} \times \frac{90}{3} \times .7854 = 207345.6$ cubic inches, the content of the veſſel = 735,27 ale gallons. And $\overline{20}^2 \times 30 \times .7854 = 9424.8$ cubic inches, the content of the cone, = 33.42 ale gallons, which overflowed by its immerſion.

N. B. This is the 4th queſtion in the *Ladies' Diary*, for the enſuing year, (1789.)

Question IX. Given the cuve ſurface of the ſegment of a ſphere = 1600, and the difference between its ſolid content and that of a cylinder of the ſame diameter and altitude, = 1800; to determine both the diameter and altitude. Let. $z = \frac{1}{2}$ the diameter, and x = the altitude, and let $.7854 = p$. Then $\overline{z^2 + x^2} \times 4p$ = the curve ſurface of the ſegment, = 1600 (per queſtion.) And $z^2 + x^2 = \frac{400}{p}$. Alſo, $\overline{3z^2 + x^2} \times \frac{2px}{3}$ = its ſolidity; and $4pz^2x$ = the ſolidity of the cylinder. (vide menſuration). Therefore $\overline{3z^2 + x^2} \times \frac{2px}{3} - 4pxz^2 = 1800$ (per queſtion). Divide by $\frac{2p}{3}$, and $3z^2x + x^3 - 6xz^2 = 1800 \times \frac{3}{2p} = \frac{2700}{p}$; or $x^3 - 3xz^2 = \frac{2700}{p}$.

Now from the Equation above, viz. $z^2 + x^2 = \frac{400}{p}$, we have $z^2 = \frac{400}{p}, - x^2$, which ſubſtituted in this laſt Equation, there is $x^3 - \frac{1200x}{p} + 3x^3 = \frac{2700}{p}$, or (by reduction) $x^3 - \frac{300x}{p} = \frac{675}{p}$. The reciprocal of $\frac{1}{p} = 1.27324$. Therefore the Equation is $x^3 - 300 \times 1.27324x = 675 \times 1.27324$; or $x^3 - 381.972x = 859.437$, which cubic Equation, ſolved, $x = 20.584548$ inches the altitude, and $z^2 = \frac{400}{p} - x^2 = 400 \times 1.27324 - {}^2x = 509.296 - 423.723616$, &c. $= 85.572384$, &c. and $z = \sqrt{85.572384}$, &c. $= 9.250534$, and $2z = 18.501068$, inches the required diameter.

N. B. This is the 6th queſtion in the Ladies Diary for the next year 1789.

Quest. X. There is a cubical block of marble, whoſe ſide in inches is expreſſed by two digits; the ſuperficies of the block is equal to 864 times the ſum of the ſaid digits; and its ſolidity is equal to 576 times the ſquare of the ſum of the ſaid digits: required the dimenſions.

Let x = the digit in the tens place, and y = the digit in the place of units, then $10x + y$ = ſide of the cube, and $\overline{10x + y}|^2 \times 6 = 864 \times \overline{x + y}$; or $\overline{10x + y}^2 = 144 \times \overline{x + y}$. Alſo, $\overline{10x + y}^3 = 576 \times \overline{x + y}^2$ per queſtion; and multiplying theſe Equations croſswiſe, $\overline{10x + y}^2 \times 576 \times \overline{x + y}^2 = 144 \times \overline{x + y} \times \overline{10x + y}|^3$ Now, dividing both ſides by $144 \times \overline{x + y} \times \overline{10x + y}^2$, we have $\overline{x + y} \times 4 = 10x + y$, or $x4 + 4y = 10x + y$, and by tranſpoſition $3y = 6x$, and therefore $y = 2x$. This being ſubſtituted for y in the former Equation ($\overline{10x + y}^2 = 144 \times \overline{x + y}$) there is $\overline{10x + 2x}|^2 = 144 \times \overline{x + 2x}$, or $144x^2 = 144 \times 3x$, and dividing by $144x$, we have $x = 3$, and $y = 2x$ 6; and therefore the ſide of the cube is 36.

N: B. This is the 10th queſtion in the *Ladies' Diary* for next year.

Quest. XI. On what day in the following year (1789) will the ſun's right aſcenſion be equal to the complement of his declination, the obliquity of the ecliptic being 23° 28'?

Let radius = 1, and the co-tangent of 23° 28' $= 2.3035064 = a$; alſo put z = tangent of the declination. Then (per Trigonometry) $\frac{1}{\sqrt{1 + z^2}}$ = coſine of the declination = ſine of the right aſcenſion: But (per Aſtronomy) as $1 : a :: z : az$ = ſine of right aſcenſion. Therefore $az = \frac{1}{\sqrt{1 + z^2}}$ and $a^2z^2 = \frac{1}{1 + z^2}$; by Multiplication, $a^2 = z^2 + a^2z^4 = 1$; and by diviſion $z^4 + z^2 = \frac{1}{a^2}$. Hence, (putting $x = z^2$) $x = \sqrt{\frac{1}{a^2} + \frac{1}{4}}| - \frac{1}{2} = \sqrt{\frac{a^2 + 4}{4a^2}} = \frac{1}{2} = \frac{1}{2a}\sqrt{a^2 + 4} - \frac{1}{2}$; = (by reſtoring the value of a, and extracting the root, &c.) .1622811; and $\sqrt{x} = z = \sqrt{.1622811} = .4028413$ = tangent 21° 56'½, the ſun's declination, which, from the nature of the queſtion, muſt be north increaſing; and therefore it is anſwerable to the 31ſt of May, when the ſun's right aſcenſion will be equal to the complement of his declination.

Quest. XII. It is required to find a ſeries of whole numbers, each term of which being divided by 14, ſhall leave a remainder of 4; divided by 50, ſhall leave a remainder of 30; divided by 85, ſhall leave a remainder of 45; and alſo each term divided by 95, ſhall leave a remainder of 85; by a general method which may be applied to the ſolution of any other queſtion of the like nature. This is the Prize Queſtion in the *Gentleman's Diary* for the enſuing year; to ſolve which, we ſhall firſt proceed to find the leaſt term in the ſeries.

Let x = the quotient, when divided by 14. Then $14x + 4$ = the required number. Alſo $\frac{14x + 4 - 30}{50}$ = a whole number per queſtion $= \frac{7x - 13}{25}$; now the leaſt value of y by the lemma delivered in Art. 31 is 9; which ſubſtituted in the above expreſſion $(14x + 4)$ we have 130, which is the leaſt number that will anſwer the firſt two conditions.

Now it is plain, that the number which will anſwer three of the conditions, muſt be ſuch a one as will divide by 14 and 50, without a remainder, +130. The leaſt number that will do this is 350, (ſee ſection of Fractions in our new Syſtem of Arithmetic). But as it may be ſome multiple thereof, let z be the multiple; ſo will $350z + 130$ be the number; and $\frac{350z + 130 - 45}{85}$ = a whole number per queſtion; $= \frac{70z + 17}{17} = 4z + 1 + \frac{2z}{17}$; and therefore $\frac{2z}{17}$ = a whole number; and becauſe 2 and 17 are prime to each other, the leaſt whole number for z is 17; this ſubſtituted in the foregoing expreſſion $(350z + 130)$ it makes $5950 + 130 = 6080$, which is the leaſt number that will anſwer three of the conditions.

Now the number that will anſwer all the conditions muſt be the ſum of this number and ſome other that will divide both by 350, and 85, without a remainder. The leaſt number that will do this $= 350 \times 17 = 5950$; but as it may be ſome multiple thereof, let $5950y + 6080$ = the required number; and then $\frac{5950y + 6080 - 85}{95}$ = a whole number per queſtion, $= \frac{1190y + 1199}{19} = 62y + 63 + \frac{12y + 2}{19}$. Therefore $\frac{12y + 2}{19}$ = a whole number; and the leaſt value of y, by the ſaid lemma, is 3, which ſubſtituted for y, we have the value of the leaſt number in the required ſeries $= 17850 + 6080 = 23930$. Furthermore the leaſt number that will divide by 5950, and 95 without a remainder $= 5950 \times 19 = 113050$; by the continual addition of which, an Arithmetical ſeries will be formed, exhibiting all the poſſible numbers that will ſatisfy the enquiry. Thus 23930, 136980, 250030, 363080, 476130, &c. *ad infinitum*, will, ſeverally, if divided by the propoſed numbers, 14, 50, 85, and 95, leave the given remainders 4. 30, 45, and 85, reſpectively. There are other ways of coming at the ſame thing; but I know of none, ſo *clear*, ſo *general*, and withal ſo *eaſy*.

What has been digeſted in this ſyſtem is amply ſufficient to initiate any one of a mathematical genius into the method of Algebraical operations, as well as to ſhew the extenſiveneſs of the art in cultivating and improving different branches of ſcience; for there is not a ſubject within the reach of human contemplation, but it may be applied to it with ſucceſs, provided the firſt principles thereof are comprehended in the mind.

ALGEBRA.

As our ultimate end is to lay before the public a complete repoſitory of uſeful and ſcientific knowledge, and as we would only wiſh to eſtabliſh our reputation upon the due claims of merit, we are determined that nothing ſhall be wanting, either of expence or pains, to give the work a diſtinguiſhed pre-eminence over the paultry and vague performances of our puſillanimous competitors.

In this Syſtem I have purpoſely omitted certain articles which are to be met with in ſome books of Algebra, apprehending that they may be introduced with greater propriety under other heads. Such are, the methods of ſumming and reverting Infinite Series *and Queſtions of the* Maxima *and* Minima, *which I ſhall treat of in the Doctrine of* Fluxions *and Method of* Increments; *alſo* Figurate *and* Poligonal Numbers, *&c. which will come in order in the New Syſtem of* Arithmetic; *and as Mr.* Cooke *has placed confidence in my abilities, and engaged me to undertake ſuch parts of the Work as are connected with the Mathematics; I pledge the honour of my reputation, both to him and the public, that, in thoſe matters, the* New Royal Encyclopædia *ſhall excel every other* Dictionary of Arts and Sciences *that has yet been publiſhed.*

ROBERT MOODY.

ALGEBRAICAL, ſomething that relates to Algebra; as an Algebraical Curve denotes a curve wherein the relation of the abſciſſes to the ſemidiordinates may be defined by an Algebraical Equation. Theſe are alſo called geometrical lines; and ſtand contradiſtinguiſhed to mechanical or tranſcendental ones.

ALGEBRAISM, implies the application of Algebra; but is ſeldom uſed in this ſenſe, unleſs affectedly to ſignify an abſtruſe ſubject.

ALGEBRAIST, a perſon ſkilled in the ſcience of Algebra.

ALGEDO, implies an accident which ſometimes happens in a gonorrhœa, by ſtopping the diſcharge too ſoon; the ſymptoms of which are pains in the lower extremities, and a bearing down of the body in ſtools. The only remedy in this caſe, ℞, about two grains of prepared calomel abſorbed on the tongue, which will purge the patient and bring back the running, ſo that all danger and difficulties will diſappear. It is to be remarked that the ſafeſt and beſt mode in this ſtage, is to take the calomel, an hour before breakfaſt in the morning during the ſummer ſeaſon; but in the autumn, winter or ſpring, it will be beſt an hour after ſupper.

For further particulars on the general treatment of this diſeaſe, ſee Syſtem of Surgery.

ALGENEB, or Algenib, in aſtronomical obſervations, implies a fixed ſtar of the ſecond magnitude on the right ſide of the Conſ. Perſeus. Long. 27° 46′ 12″ of ♉, Lat. 30° 5′ 28″ N.

ALGIABARII, a Mahometan ſect of predeſtinarians, who impiouſly attribute good and evil to flow promiſcuouſly and ſpontaneouſly from the Deity.

ALGOIDES, in botany, implies a ſynonomy of zannichellia.

ALGOL, commonly called Meduſa's head, a name given to a fixed ſtar of the third magnitude in Perſeus. Long. 21° 50′ 42″ of ♉, Lat. 23° 23′ 47″ N.

ALGONQUIN, a technical word, implying one of the chief languages of the native Indians in North America, contradiſtinguiſhed from the other principal tongue called the Hûron.

ALGOR, in medical language, denotes a particular coldneſs of any member of the body, which indicates a dangerous ſymptom.

ALGORAB, a fixed ſtar of the third magnitude, ſituated on the right wing of the conſtellation Corvus.

ALGORITHM, ſignifies the fundamental rules of Arithmetic; i. e. numeration, addition, ſubtraction, multiplication and diviſion. The word is derived from the Arabic, *algoraf*, to number.

ALGOSAREL, an obſolete ſynonyme in botany, for the daucus ſylveſtris, or wild carrot.

ALGUAZIL, a name given to the repreſentative of a Spaniſh judge, who preſides over decretal orders of magiſtracy.

ALHABOR, a name given by the Arabian aſtronomers to the ſtar, which we generally call Sirius.

ALHAGI, a ſpecies of thorny broom, which grows in Syria; from this plant the natives gather a new ſort of manna. The leaves are aſtringent, but the flowers are laxative.

ALHANDAL, implies colocynth, in the Arabian pharmacy.

ALHEN, a ſynonyme in botany, of the lawſonia of Linnæus.

ADHIDADE, or Alidade, the index of an inſtrument uſed in alimetry or longimetry.

ALHIRTO, in aſtronomy, ſignifies a fixed ſtar of the 3d magnitude, placed in the conſtellation Capricorn, or 10th ſign of the zodiac; ſometimes called the roſtrum gallinæ.

ALI, gives the denomination to a ſect, or diviſion, among the Mahometans, who adhere to the right of ſucceſſion of Ali the fourthcaliph or ſucceſſor of Mahomet, and to the reform of Muſſulmaniſm introduced by him.

The ſectaries of Ali are more particularly called Schiites; and ſtand oppoſed to the Sunnites, or ſect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar.

Ali was couſin of Mahomet, and ſon-in-law of that prophet, having married his daughter Fatimah. After Mahomet's death, great diſputes aroſe about the ſucceſſion. Many ſtood for Ali; but Abubeker was preferred, and elected the firſt kalif. Ali took his turn, after the death of Othman.

The Perſians are the chief adherents to the ſect of Ali, whom they hold to have been the legitimate ſucceſſor of Mahomet, and Abubeker an uſurper.

On the contrary, the Turks are of the ſect of Omar; and hold Ali in execration, having raiſed a furious civil war among the Muſſulmans.

The diſtinguiſhing badge of the followers of Ali is a red turban, which is worn by the Perſians, who are hence called in deriſion, by the Turks, kiſilbachi, q. d. red-heads.

Ali is reputed the author of ſeveral works, part of which has been publiſhed in Engliſh by Mr. Ockley.

ALJAMEIA is a name which the Moriſcoes in Spain give to the language of the Spaniards. Among other articles agreed on by the junto, which was appointed by the emperor Charles V. in 1526, in favour of the Moriſcoes, this was one, that the Moriſcoes ſhould no longer ſpeak Algavareia, i. e. Mooriſh or Arabic; but ſhould all ſpeak Aljameia, i. e. Spaniſh, as it was called by the Moors, and all their writings and contracts ſhould be in that language.

ALIARBUCHA, in zoology, implies a ſpecies of the mus kind, about the ſize of a Norway rat, and eaten by the modern Arabs, with as good reliſh as the Europeans do the rabbit.

ALIAS, in law, a ſecond or farther writ iſſued from the courts of Weſtminſter, after a capias, &c. ſued out without effect.

ALIBI, in law, denotes the abſence of the accuſed from the place where he is charged with having committed a crime; or his being elſewhere, as the word imports, at the time ſpecified.

ALICA, a name given to gruel made of grots, or oatmeal cutlings. A phraſe which has been criticiſed to very little purpoſe; unleſs to the manifeſt ridicule of the critic.

ALICARIÆ, in antiquity, implies common proſtitutes.

ALICATA *Chlamys*, or Alicula, was a ſort of veil with ſleeves, worn by the Roman boys till the age of thirteen, at which time they put on the prætexta.

ALICATICA, an Arabian weight, anſwering to about four ounces.

ALICES, in medicine, imply the ſpots preceding the ſmall pox, which are generally red under the ſkin, and rough previous to the irriguous excreſſences or irruptions.

ALIDES imply the ſectariſts in the Mahometan religion, who hold the tenets of their religion from the doctrine of Ali, the ſon-in-law of the prophet; which the Turks in ridicule call Fatimites, from Fatima, the daughter of the prophet, and wiſe of the legiſlator.

ALIE KRUYK, a name given by Swammerdam to the ſea ſnail.

ALIEN, in law, implies a perſon born in a ſtrange country not within the king's allegiance; in contradiſtinction to a denizen, or natural ſubject. The word is formed from the Latin *alius*, "another"; q. d. one born in another country.

An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament.

No alien is intitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unleſs where an alien is partly in a cauſe, when the inqueſt is compoſed of an equal number of denizens and aliens.

It is to be underſtood nevertheleſs, that all thoſe who are born in the king's dominions are not aliens but denizens, ſo that the children of foreigners born here are natural born ſubjects.

Alſo it is to be remarked that the children of natural born ſubjects, although they were born under the controul or in the dominions of a foreign power, yet they have a right to the privileges and protection of the king of Great Britain as his ſubjects, as much ſo as if they were born in his dominions; for in the eye of the law they are actually bona fide ſubjects of the Imperial crown of this realm.

Among the Romans, only the Cives Romani were eſteemed freemen; but when their territories increaſed, all the Italians were made free, under the name of Latins, though they had not the privilege of wearing gold rings till the time of Juſtinian. Afterwards all born within the pale of the empire were conſidered as citizens.

Alien *Duty*, an impoſt laid on all goods imported by aliens, over and above the cuſtoms paid for ſuch goods imported by Britiſh, and on Britiſh bottoms.

Aliens *Duty* is otherwiſe called petty cuſtoms, and navigation duty. Fiſh dried or ſalted, and cod-fiſh or herring not caught in Britiſh veſſels and dured by Britiſh, pay a double aliens-duty.

ALIEN *Priories*, denoted a kind of inferior monaſteries, formerly very numerous in England, and ſo called from their belonging to foreign abbeys.

ALIENATION, in law, denotes the act of making over a man's property in land, tenements, &c. to another perſon.

ALIENATION, in mortmain, implies the making over lands, tenements, &c. to a body-politic, or to a religious houſe, for which the king's licence muſt firſt be obtained, otherwiſe the lands, &c. alienated, will be forfeited to the crown.

ALIENATION, in fee, is the ſelling the fee-ſimple of any land, or other incorporeal right.

All perſons who have a right to lands may generally alien them to others; but ſome alienations are prohibited: ſuch as alienations by tenants for life, &c. whereby they incur a forfeiture of their eſtate. By the ſtatute of Edward I. a bar was put to alienations by what we call entails, which is an expedient for procuring perpetuities in families; but counter expedients were deviſed to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reverſions by recoveries.

The ſtatute for alienations in Henry VII.'s time had a great effect on the conſtitution of this kingdom; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people.

By the ſtat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbade any clerk to alienate his benefice, &c.

By the laws of the ancient Jews, lands could only be alienated for the ſpace of 50 years. At each return of the jubilee all returned again to the primative owners, or their deſcendants, to whom the lands were originally allotted at the firſt diſtribution of Canaan.

ALIENATION *Office*, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries ſuffered, are carried, to have fines for alienation ſet down and paid thereon.

ALIFORMES, or ALIFORMIS MUSCULIS, in anatomy, implies the name of a pair of muſcles ariſing from the prerygoid bone, and ending in the neck of the lower jaw, towards the internal ſeed of the head. See Syſtem of ANATOMY, under the article MUSCLE.

ALIFORMES, or ALIFORMIS PROCESSUS, in anatomy, ſignifies the *os cuneiforme*.

ALII MULTI, ALII DE REGNO, in antiquity, imply the commonalty of that part of Great Britain called England.

ALIMA, in mineralogy, ſignifies a ſandy lead ore.

ALIMENT implies food both ſolid and liquid; from which, by the proceſs of digeſtion, is prepared a very mild, ſweet, and whitiſh liquor, reſembling milk, and diſtinguiſhed by the name of chyle; which being abſorbed by the lacteal veins, by them conveyed into the circulation, and there aſſimilated into the nature of blood, affords that ſupply of nutrition which the continual waſte of the body is found to require.

Next to air, food is the moſt neceſſary thing for the preſervation of our bodies; and as on the choice thereof our health greatly depends, it is of material importance to underſtand, in general, what is the moſt proper for our nouriſhment; and, in particular deviations from health, what is the beſt adapted to reſtore us.

Our blood and juices naturally incline to become putrid and acrimonious: freſh chyle, duly received, prevents this deſtructive tendency, and preſerves in them that mild ſtate which alone conſiſts with health.

An animal diet affords the moſt of this mild nutritious mucilage; watery fluids dilute the too groſs parts, and carry off what is become unfit for uſe. It is only the ſmall portion of jelly which is ſeparated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the uſe of vegetables prevents both repletion and a too great tendency to a putreſcent acrimony of the blood.

In hot climates, as well as againſt the conſtitutional heat of particular perſons, vegetables are neceſſary in the largeſt portion.

Animal ſubſtances afford the higheſt reliſh while our appetites continue; but will ſatiate the appetite before the ſtomach is duly filled.

Vegetables may be eaten after either fleſh or fiſh: few herbs or fruits ſatiate ſo much as that the ſtomach may not be filled with them, when it is already ſatisfied with fleſh or fiſh; whence it may be obſerved, that no diet which is very nouriſhing can be eat to fulneſs, becauſe its nutritious parts are oily and ſatiating.

Health depends almoſt wholly on a proper craſis of the blood; and to preſerve this a mixture of vegetables is always required; for a loathing is ſoon the conſequence of animal food alone: hot acrid habits, likewiſe, receive from milk and vegetables the needful for correcting their exceſſes; but in cold, pituitous, and nervous habits, which want moſt nouriſhment from leaſt digeſtion, and from the ſmalleſt quantity of food, animal diet is to be uſed more freely.

In winter a healthy perſon may eat freely, but drink ſparingly: roaſt meat is to be preferred, and what is drank ſhould be ſtronger than at other ſeaſons.

In ſummer, let thirſt determine the quantity to be drank; cold ſtomachs never require much: boiled meats and vegetables, if not otherwiſe contradicted, may now be more freely uſed.

Lax habits require the winter's diet to be continued all the year, and rigid ones ſhould be confined to that of ſummer.

Thoſe who are troubled with eructations occaſioned by their food ſhould drink but little, and uſe moderate exerciſe.

The thirſty ſhould drink freely, but eat ſparingly.

In general, moderation ſhould be obſerved. After very high-ſeaſoned meats, a glaſs of water acidulated with the acid elixir of vitriol, or in very weak ſtomachs, the ſweet elixir of vitriol is far more aſſiſtant to the work of digeſtion than the common method of taking ſpirituous liquors.

ALIMENTARII PUERI, in the Roman code, implied certain children maintained and educated by the munificence of the emperors, in a ſort of public places, not unlike our hoſpitals. Trajan was the firſt who brought up any of theſe alimentary boys. He was imitated by Adrian. Antoninus Pius did the ſame for a number of maids, at the ſolicitation of Fauſtina; and hence, in ſome medals of that empreſs, we read PVELLAE FAVSTINIANAE. Alexander Severus did the like at the requeſt of Mammæa; and the maids thus educated were called Mammæanæ.

ALIMENTARY, an epithet applied to every thing relating to aliment or food.

ALIMENTARY DUCT, a ſynonyme of the Thoraic Duct.

ALIMENTARY DUCT, or CANAL, is a name given by Dr. Tyſon and ſome others to that part of the body through which the food paſſes, from its reception into the mouth to its exit at the anus; including the gula, ſtomach and inteſtines.

This duct has been ſaid to be the true characteriſtic of an animal, or *in proprium quarto modo*; there being no animal without it, and whatever has its being properly enough ranged under the claſs of animals. Plants receive their nouriſhment by the numerous fibres of their roots, but have no common receptacle for digeſting the food received, or for carrying off the recrements. But in all, even the loweſt degree of animal life, we may obſerve a ſtomach and inteſtines, even where we cannot perceive the leaſt formation of any organ of the ſenſes, unleſs that common one of feeling, as in oyſters. Phil. Tranſ. Nº 269, p. 776, ſeq.

Dr. Wallis brings an argument from the ſtructure of the alimentary tube in man, to prove that he is not naturally carnivorous, to which Dr. Tyſon makes ſome objections. See Phil. Tranſ. Nº 269, p. 777.

ALIMENTARY LAW, *lex alimentaria*, was an old law among the Romans, whereby children were obliged to find ſuſtenance for their parents.

ALIMENTATION, an epithet which implies nutrition, and may be properly called a ſynonyme of that word.

ALIMONY, in law, implies that allowance which a married woman ſues for, and is intitled to, upon any occaſional ſeparation from her huſband.

ALIMOS, a Greek botanic name for the common liquoriſh, or liquorice.

ALINDESIS, αλινδος, in antiquity, implies an oily ſubſtance with which gymnaſtic exerciſers were wont to beſmear their ſkin, and then roll themſelves in the duſt to harden their fleſh, and to cloſe up the pores of their ſkin, ſo that they were ſecure from bruiſes either by falls or blows.

ALIOS, in ichthyology, a ſynonime of the Lophius and Ranus, or Rana piſcatrix.

ALIPÆNOS, in the medicine of the ancients, implied a topical remedy freed from oily juices or fatneſs. Galen calls it αλιπη, which was uſually applied to freſh wounds to prevent inflammation, at the ſame time heal up the orifice.

ALIPILARIUS, or ALIPILUS, in Roman antiquity, a ſervant belonging to the baths, whoſe buſineſs it was, by means of waxen plaſters, and an inſtrument called volſella, to take off the hairs from the arm-pits, and even arms, legs, &c. this being deemed a point of cleanlineſs.

ALIPTERIUM, in antiquity, a place in the ancient paleſtræ, where the athletæ were anointed before their exerciſes.

ALIQUANT PART, in arithmetic, is that number which cannot meaſure any other exactly without ſome remainder. Thus 7 is an aliquant part of 16; for twice 7 wants two of 16, and three times 7 exceeds 16 by 5.

ALIQUOT PART, is that part of a number or quantity which will exactly meaſure it without any remainder. Thus 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c.

ALISANDERS, or ALEXANDERS, in botany, a ſynonyme of SMYRNIUM.

ALISMA, or WATER-PLANTAIN, a genus of the polygynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 5th order tetrapetaloideæ. For the characters, ſee Syſtem of BOTANY.

Of this genus there are eight ſpecies, viz. The plantago, or great water-plantain, which grows in all the marſhy parts of this country; the ranunculoides, or leſſer water-plantain; the natans, or creeping water-plantain; the damaſonium, or ſtar-headed water-plantain; all which are natives of Britain. The flava, cordifolia, ſubulata, and parnaſſifolia, are natives of America, where they are generally found in ſtagnating waters, and other ſwampy places.

ALITES, in Roman antiquity, a deſignation given to ſuch birds as afforded matter of augury by their flight.

ALKA, in ornithology, is a water-fowl of the diver kind belonging to the order of anſeres in the Linnæan ſyſtem, which is the ſame as that bird well known in England under the denomination of the razor bill.

ALKAHEST, or Alcaheſt, in alchemy, an univerſal menſtruum capable of reſolving all bodies into their firſt principles.

ALKAHESTIC, implies a body which is powerfully ſolvent, and may be taken as a ſynonyme of menſtruous, or menſtruum, with this difference; that the latter imports a leſs ſolutive power than the former.

ALKALESCENT, denotes a matter ſlightly alkaline, or which begins to turn to the alkaline and putrid fermentation.

ALKALI, or Alkaly, in chemiſtry, one of the general diviſions of ſalts, comprehending that claſs of chemical elements which, by their union with acids, form perfect neutrals, in oppoſition to the ſalts formed of acids with metals or earths, which are called imperfect ſalts.

Alkaline ſalts are divided into two kinds, viz. the fixed and the volatile; the former into two ſpecies, vegetable and mineral. All of theſe poſſeſs ſome properties in common, yet moſt of them have peculiar qualities of themſelves.

Thoſe which they have in common are, 1. An acrid and pungent taſte, which, when the ſalts are very pure and ſtrong, degenerates into abſolute cauſticity, and would entirely deſtroy the organ of ſenſation if long applied to it. 2. A tendency to diſſolve animal ſubſtances, and reduce them to a gelatinous ſubſtance, which all of them will do when very ſtrong. 3. An attraction for acids, with a power of ſeparating earths and metals from them, though previouſly combined with the ſame. 4. They change the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. They unite with oils, and deſtroy, or cauſe to fade, almoſt all kinds of colours that can be put upon cloth, whence their uſe in bleaching, clearing, &c.

The properties common to both kinds of fixed alkalies are, 1. They reſiſt the action of fire to a great degree, ſo that they can eaſily be reduced to a ſolid form by evaporating any liquid in ſhhich they happen to be diſſolved. 2. By an intenſe fire, they flow into a liquid which concretes into an hard and ſolid maſs in the cold. 3. When mixed in certain proportions with thoſe earths or ſtones called vitrifiable, they melt in a heat ſtill more intenſe, into glaſs. 5. Mixed with ammonical ſalts, with animal ſubſtances, or with ſoot, they extricate a volatile alkali.

The volatile alkali differs from the other two in being unable to reſiſt the fire, and being entirely reſolvable into an inviſible and permanently elaſtic fluid, called alkaline air.

In conſequence of this volatility, it always affects the olfactory nerves very perceptibly, and its ſmell is the general criterion by which its ſtrength may be judged of. Its attraction for acids, power of changing colours, &c. are alſo conſiderably weaker than thoſe of the fixed alkalies.

Though two ſorts of volatile alkali are commonly ſold under the names of ſpirits of hartſhorn and of ſal ammoniac, the one differs from the other only in its degree of purity. The former is ſo called from its being originally made from the horns of deer; but this material has long been laid aſide, and the bones of horſes, the flints, as they are called, of the horns of cattle, the parings of hoofs, &c. have been ſubſtituted in their ſtead. This kind, however carefully prepared, always contains a portion of animal oil, the ſmell of which is very perceptible; the other, prepared from pure ſal ammoniac, is totally free of any empyreumatic ſmell, and is as pure as it can be obtained by any means whatever; therefore ſhould be always preferred to the former.

Efferveſcence with acids was formerly ſuppoſed to be a diſtinguiſhing property of alkalies, though it was always known that by a mixture with quick lime they might be deprived of this property. However, it has been ſhown, that the efferveſcing with acids is no property of pure alkali, but is occaſioned only by the eſcape of fixed air from it: of conſequence, when quick lime is added, which attracts the whole or greateſt part of the fixed air, no efferveſcence can be perceived.

In the ſtate in which the fixed alkalies are commonly met with, indeed, efferveſcence with acids may be ſaid to be an eſſential property; but this is entirely owing to the cauſe juſt mentioned, viz. a quantity of fixed air, to which they are united during the proceſs by which they were originally formed. The quantity of this air, however, is never ſo great as to ſaturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly ſaid to be in a mild ſtate. But the truth is, that now they are in a kind of intermediate ſtate between what may be called perfectly mild and perfectly cauſtic. In their perfectly mild ſtate, they are united with ſuch a large quantity of fixed air as entirely overpowers their alkaline properties; and therefore they are no more entitled to the name of alkalies in this ſtate, than when combined with the marine, nitrous, or any other acid; in which caſe the compounds are called neutral ſalts. But it is a much more laborious and tedious proceſs to ſaturate an alkali completely with fixed air than with any other acid; nor does it very eaſily retain the aerial acid after it has once been combined with it. Hence the cauſtic taſte and properties of the alkali almoſt always predominate, and the ſalt contains a portion of pure and cauſtic alkali, to which alone its virtues are to be aſcribed.

Vegetable alkali is obtained in its greateſt purity by deflagrating nitre with charcoal, provided we make uſe of no more of the latter than is barely ſufficient to deſtroy the nitrous acid. It is, however, a very difficult matter to adjuſt this proportion with ſufficient accuracy; for if we employ too much charcoal, the ſalt will be conſiderably phlogiſticated; if too little, ſome part of the nitre will remain undecompoſed. Burnt tartar, therefore, purified by ſolution and filtration, may be looked upon as the beſt alkali we have.

The common alkalies, or aſhes as they are called, and ſaid to be obtained from the aſhes of vegetables, are always mixed with much phlogiſton, and ſometimes with lime, ſalt, or other hetorogeneous matter; for which reaſon they are not to be employed in the nicer chemical experiments, without being purified by ſolution in water, by filtration, and cryſtallization. The pureſt of all theſe ſalts is that called the blue pearl, which is imported from Hungary.

The vegetable alkali when thus purified, and containing near one half its weight of fixed air, is of a white colour when dry, with a very hot and cauſtic taſte, poſſeſſing, in an eminent degree, all thoſe qualities which have been aſcribed to the alkaline ſalts in general. It runs *per deliquium* when expoſed to the air; and is uſually incapable of being chryſtallized, though it acquires this property after being employed in the rectification of ardent ſpirit. It adheres more cloſely to acids than any ſubſtance hitherto diſcovered; though, from ſome experiments, Bergman was induced to believe that pure terra ponderoſa attracted acids ſtill more powerfully. But this has been diſcovered to be a miſtake by Dr. Withering, who, in a paper publiſhed in the 74th volume of the Philoſophical Tranſactions, ſhows, that unleſs where the earth is united with vitriolic acid, not only the vegetable, the foſſil, but even the volatile alkali in its pure or cauſtic ſtate, will ſeparate it from any other with which it may be combined. Terra ponderoſa, therefore, will always decompoſe vitriolated tartar, Glauber's ſalt, or vitriolic ammoniac; whence the miſtake of this celebrated chemiſt probably has proceeded. After this alkali has been once united with marine acid, it appears to have undergone ſome change; for the ſalt then produced, by combining it with the vitriolic acid, reſembles Glauber's ſalt almoſt as much as it does vitriolated tartar. It ſeems, therefore, to have made ſome approach towards the nature of foſſil alkali; but chemiſts have not enquired what would be the conſequence of repeated combinations of this kind.

The foſſil alkali differs from the vegetable in having a ſmaller attraction for acids, in being more eaſily fuſible by itſelf, and forming a more ſoluble compound with the vitriolic acid. It is alſo eaſily cryſtallizable, even without the addition of more fixed air than it naturally contains: and experience has determined it to be more proper for glaſs or ſoap manufactures than the vegetable alkali.

The foſſil, or mineral alkali, was antiently called natron or nitre, and is ſpoken of by Pliny and Tacitus as an ingredient in glaſs, &c. and the Scriptures inform us that it was uſed in baths. The knowledge of this ſalt was loſt in the general obſcuration of ſcience which took place on the decline of the Roman empire; nor do we find it mentioned till the time of the Hon. Mr. Boyle; and, even ſince that time, though M. du Hamel gave an accurate account of it in a Memoir for the year 1736, little farther notice was taken of it till within theſe laſt twelve years.

We are now certainly informed that the mineral alkali is found a native in many parts of the world, which never is the caſe with the vegetable alkali. The places where it abounds moſt are, Egypt, the country of Tripoli in Barbary, the peak of Teneriffe in one of the Canary Iſlands, Hungary, ſeveral of the provinces of Ruſſia, ſome parts of Aſia, particularly the neighbourhood of Smyrna, &c. though it has not hitherto been found in any of the Weſtern countries of Europe, excepting in the neighbourhood of volcanoes, or in mineral waters; and in theſe laſt only in very ſmall quantities.

The great ſource of the mineral alkali, is the natural baſis of ſea-ſalt; and could any method of readily procuring it from this ſalt be fallen upon, it would no doubt be a moſt valuable ſecret.

The demand in this country for foſſil or mineral alkali is ſupplied from the aſhes of kali and other ſea plants, from which it is ſeparated in the ſame manner as the vegetable alkali from the aſhes of other plants. The pureſt kind of aſhes containing this ſalt is called ſoda or barilla, and is imported chiefly from Spain and Portugal; that which is obtained from the ſea-weed growing on our own coaſts, and known by the name of kelp, is very impure, and ſcarce admits of being thoroughly analized according to the rules of chemiſtry.

Both theſe alkalies may be deprived of their fixed air, and rendered pure and cauſtic, by the addition of quick lime. In this ſtate the difference between them is much leſs perceptible than in any other acid; always ſhews that no eſſential charge has taken place in either.

In this highly cauſtic ſtate they deſtroy the parts of animals in a manner ſimilar to that of fire; whence they are called potential cauteries, as the former is called the actual cautery.

Both alkalies attract moiſture from the air when reduced to a ſolid form in their cauſtic ſtate, though neither the foſſil alkali nor its combinations do ſo in any other caſe. In their cauſtic ſtate they only unite with oils, or diſſolve in ſpirit of wine; which laſt they have been ſuppoſed to purify, though it is more than probable that they decompoſe and communicate diſagreeable qualities to it.

The volatile alkali, when procured immediately by the diſtillation of any ſubſtance capable of yielding it, is obtained in a ſtate ſimilar to that in which the alkalies are uſually met with, viz. half mild and half cauſtic. By expoſing the liquid alkali to a great quantity of fixed air, we may at laſt have it perfectly mild and neutraliſed; in which ſtate [illegible]ppears as a white ſalt extremely volatile, though leſs ſo than the pure cauſtic alkali. It diſſolves very readily in water; but unleſs ſome cauſtic ſpirit, or ſome lime or fixed alkali be added, in order to abſtract part of the fixed air, it will ſcarcely exhibit the characteriſtic of volatile alkali, i. e. a pungent and urinous ſmell. The addition of fixed air, however, makes very little difference with regard to the chemical combinations of this ſalt; for as fixed air has a very ſlender power of acidity, it is expelled by every other acid with the greateſt eaſe, and the ſame combinations formed as though it had not been preſent. The only difference is, that when a mild alkali is added to an acid, a ſtrong effervescence takes place by reaſon of the eſcape of the fixed air through the liquid, while with the cauſtic alkali the mixture is made quietly and without diſturbance.

The various combinations of the alkaline ſalts with the different acids, and the neutral compounds thence reſulting, will be exhibited in the Syſtem of CHEMISTRY.

With oil the vegetable fixed alkali forms a ſoap, though leſs perfect than that made with the cauſtic mineral alkali. When combined with fixed air they ſcarcely unite with oils. Boiled with ſulphur, or melted with it in their dry ſtate, they unite into a very fetid compound called ***hepar ſulphuris***, which is ſoluble in water, but totally and very quickly decompoſed by the contact of air.

Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fuſion. It does not act upon gold in its metallic ſtate; but if a ſufficient quantity be added to a ſolution of gold in aqua regia, the calx of the metal will be firſt precipitated and afterwards diſſolved.

Vegetable alkali is a principal ingredient in the powders called fluxes, uſed for the fuſion of metalline ores. It promotes the fuſion of earths, and forms glaſs with the cryſtalline kind. It is ſoluble in an equal weight of diſtilled water; and, when expoſed to the air, it ſoon attracts moiſture from it and flows into a liquid. In its cauſtic ſtate it diſſolves in ſpirit of wine, and forms with it a red tincture called Van Helmont's tincture of ſalt of tartar, formerly uſed both as an internal and external remedy, but now fallen into diſrepute.

Foſſil or mineral alkali in its cauſtic ſtate unites with oil into an harder ſoap than that made with vegetable alkali. With ſulphur it forms a hepar ſulphuris in the ſame manner as the vegetable alkali, and yields a tincture with ſpirits of wine, which diſſolves part of the ſalt whilſt hot, but lets it fall again in a cryſtalline form when cold. Gold, ſilver, or quickſilver, are not affected by a ſolution of this ſalt; but copper and tin are diſſolved by it in the open air. It affects tin, lead, regulus of antimony, and cobalt, ſlightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, biſmuth, zinc, antimony, and regulus of cobalt, fuſed with two parts of foſſil alkali, are almoſt entirely diſſolved in a very ſtrong heat; but tin, lead, and regulus of antimony, treated in the ſame manner, only ſuffer a partial ſolution.

All the alkalies are of conſiderable uſe in medicine, though the particular virtues of vegetable and foſſil alkali have not hitherto been properly aſcertained. It is probable, however, that there muſt be a conſiderable diverſity in their operations on the human body, as the vegetable alkali ſhows itſelf ſo much more acrid and powerful than the foſſil. Both of them unite immediately with acids, and change them into mild neutral ſalts; hence, if any of the ſtrong mineral acids ſhould fall upon any part of the human body, and begin to corrode and give pain, the immediate application of the lixivium tartari, or of a ſolution of any of thoſe alkaline ſalts in water, or of the ſalts themſelves in powder, will deſtroy their cauſticity, and prevent their doing further miſchief: or if any of theſe acids ſhould drop on cloaths, linen, or other ſubſtances, and alkaline ſalts are immediately applied, they will neutralize the acid, and prevent its further corroſion: or if a perſon ſhould, through miſtake, ſwallow any of the mineral acids, or corroſive ſublimate, or any other corroding ſalt which an alkali will decompoſe, the taking down into the ſtomach ſolutions of the alkaline ſalts, or the ſalts themſelves in proper doſes, are the moſt likely means of affording relief, if not given too late.

With regard to the mineral acids, an exception ſeems to take place if oil of vitriol in its concentrated ſtate ſhould happen to be ſwallowed; for this contracts ſuch a degree of heat on the contact of any aqueous fluid as would deſtroy the patient, independent of another cauſe. An inſtance we have ſeen where a perſon unhappily miſtook a bottle of oil of vitriol for water in the night-time. He recovered by ſwallowing inſtantly a great quantity of milk. Another recovered by drinking a bottle of Florence oil.

The vegetable as well as the foſſil alkali applied externally in a cauſtic ſtate, firſt irritate and inflame the ſkin, and afterwards act as fire in mortifying and deſtroying it; and therefore has been much uſed by ſurgeons for opening buboes and other abſceſſes, and for eating away proud or fungous fleſh that ſprouts out from ſores.

The alkaline ſalts, when much diluted with water, have been uſed as waſhes for removing pimples from the face; but if ſuch waſhes are continued long, they are apt to ſpoil the ſkin. It has been proved that alkaline ſalts preſerve animal ſubſtances from putrefaction; on which account ſome practitioners have concluded that they act as ſtrong antiſeptic remedies when ſwallowed as medicines, and are taken up by the lacteal veſſels, and by them carried to the ſubclavian vein to be mixed with the blood. Experience, however, has ſhewn that they have effects directly oppoſite, and that by ſtimulating the veſſels and quickening the circulation, they contribute towards the diſſolution of the vital fluid; of which Dr. Monro ſays he has ſeen ſeveral inſtances.

Alkalies promote the ſecretions in general, particularly by the kidnies; but by the help of warm liquors and bed-clothes, their operation may be directed towards the ſkin. They have alſo been employed in caſes of heartburn, and others where an acid prevails in the ſtomach and bowels, or where theſe organs are loaded with viſcid phlegm. They are likewiſe given with a view to aſſiſt the operation of the bile when it is too weak and inert, either by themſelves, or mixed with purgative or other medicines.

The foſſil alkali has been alleged to be a more powerful ſolvent of the human calculus than the vegetable, though perhaps without any juſt foundation. It is given from 5 to 20 grains three times a-day; and in ſome caſes even to double that quantity. It may be taken in any common liquor, or in clear broth made of lean meat, from which the fat has been ſkimmed off; or the powdered ſalts may be made up into pills or boluſes mixed with liquorice powder, by means of mucilage of gum arabic or conſerve.

The vegetable alkali has long been uſed as a diuretic in dropſies with great ſucceſs; and Dr. Monro affirms, that he has ſeen a number of caſes of anaſarca in which the water was carried off by it. As diuretics, it may be taken from ten grains to half a drachm, or more, two or three times a-day, mixed with ſome diſtilled water, ſyrup, broth, or water-gruel, or with two ounces of white-wine, which partly neutralizes the ſalt. When added to infuſions of juniper-berries, broom-tops, horſe-radiſh, muſtard-ſeed, winter's-bark, &c. in wine and beer, they prove powerful diuretics.

The moſt remarkable property of theſe ſalts, however, is that of diſſolving the human calculus; for the diſcovery of which, Mrs. Stephens, in the year 1740, obtained a parliamentary reward of 5000l. At that time Dr. Jurins being afflicted with the ſtone, tried a number of experiments on theſe medicines; from which he concluded, that their efficacy depended entirely on the alkaline ſalts and lime which they contained; and therefore he began to try what effects a ſoap-ley would have on himſelf. At firſt he took only a few drops, but gradually increaſed his doſe till he came to an ounce, and ſometimes an ounce and an half, in a proper vehicle, in 24 hours. This produced the diſcharge of ſome ſmall calculi, and relieved him of the ſymptoms of the ſtone.

Dr. Hartley, likewiſe, laboured under this complaint; and believing that the efficacy of Mrs. Stephens's medicines depended on the ſoap, lime, and alkaline ſalts which they contained, ordered a paſte to be prepared for himſelf, made of eight ounces of ſoap, one of oyſter-ſhell lime, a drachm of ſalt of tartar, and as much water as formed the whole into a ſoft maſs; of which he took large quantities, and found himſelf greatly relieved, though not cured, as a ſtone was found in his bladder after his death.

Theſe and other inſtances of ſucceſs, ſoon brought the medicines into general uſe: but though many found relief from them, others, particularly thoſe who were afflicted with the ſtone, had all the ſymptoms of their diſtemper aggravated, by the ſalts rendering the blood, and other liquors of the body, particularly the urine, ſharp and acrid, ſo as to irritate and inflame the bladder, which was already in too irritable a ſtate, from the conſtant friction of the calculus lodged within it.

The late experiments of Mr. Scheele and Sir Torburn Bergman, however, have made it evident, that the human calculus is compoſed of a concrete acid, joined to a ſmall portion of animal earth.

Moſt people, therefore, who are afflicted with the ſtone or gravel, ſhould try the efficacy of theſe remedies, rather than ſubmit to the dangerous operation of lithotomy.

The volatile alkali has many of the virtues of the fixed, but affects animal ſubſtances, particularly in its cauſtic ſtate, leſs powerfully than they do. It gives a briſk and ſtrong ſtimulus to the nerves and fibres of living animals; and is therefore employed in diſeaſes where the pulſe is low and the circulation too languid; in low fevers, where the patient is in danger of ſinking; in apoplectic and lethargic diſorders of elderly people of phlegmatic bits, in paralitic caſes, fainting fits, &c. where a briſk and ſtimulating remedy is wanted.

It may be uſed as a diaphoretic and ſudorific in caſes of rheumatiſm, in the end of fevers, catarrhs, and other diſeaſes, where a plentiful diaphoreſis or ſweat is required; and it is principally owing to this quality that the alkalies have obtained their reputation of being efficacious remedies againſt the bites of mad dogs, ſerpents, &c. It is equally efficacious againſt mineral acid poiſons with the fixed alkali.

We have not ſufficient evidence to determine poſitively whether the vegetable alkali be produced by the force of fire, or whether it exiſted originally in the ſubſtances from which it is prepared.

With regard to the volatile alkali, however, we have abundant evidence of its being produced from ſubſtances which could not poſſibly be ſuppoſed to contain it originally. Dr. Stahl aſſures us, that if any dry fixed alkaline ſalt be well rubbed in a mortar with ſuch a quantity of oil of turpentine as is ſufficient to make it of the conſiſtence of a pulp, and digeſted for ſome weeks in a cucurbit or retort, we obtain a volatile alkali. Mr. Geoffroy relates, that having placed a large retort in a ſand furnace, and adapting a tubulated receiver to it, afterwards heating the bottom of the retort red hot, he put into it, by means of a long tube riſing from the upper part of the neck, a powder compoſed of equal parts of nitre and charcoal, on which there came over into the receiver a liquor highly impregnated with volatile alkali. Boerhaave and Macquer have both affirmed, that the vegetative proceſs itſelf produces a volatile alkali; and that the juices got by bruiſing muſtard-ſeed and other alkaleſcent vegetables, as they are called, contain a volatile alkali which efferveſces with acids: but this is denied by Cartheuſer and Vogel, who affirm that they could diſcover no traces of volatile alkali in theſe juices by any experiments they made.

But whatever may be concluded from the experience of former chemiſts, the late diſcoveries of Dr. Prieſtley and Mr. Cavendiſh have deciſively ſhown, that the volatile alkali is by no means a ſimple element or natural principle, but a compound, and which may be artificially prepared. Dr. Prieſtley informs us, that by the union of nitrous air with iron, a volatile alkali is generated; and Mr. Cavendiſh, that by the action of the electric fluid, or pure elementary fire, upon phlogiſticated air, united to a great quantity of elementary fire.

In like manner, if we can ſuppoſe this ſubtile element to enter into the ſubſtance of any kind of earth in ſuch a manner as to exert its peculiar action when that ſubſtance is applied to any other, we may reaſonably conclude that the fixed alkalies alſo are not ſimple and permanent principles, but capable of artificial compoſition and decompoſition.

It is certain that the action of alkaline ſalts is extremely ſimilar to that of fire; and as we know that this element is combined in a latent ſtate with fluids, there can be no abſurdity in ſuppoſing it capable of combining with ſolids.

Alkali, in botany, a name given to ſalt-wort.

ALKALINE, in a general ſenſe, denotes ſomething that has got a tincture of alkali. This term may with propriety be prefixed to the various chemical ſalts in a particular ſenſe.

Alkaline *Acrimony*, in medicine, ſignifies a morbid quality of the blood, nearly tending to putrefaction, which requires the ſame remedies as the ſea-ſcurvy.

ALKALIZATE *Bodies*, in chemiſtry, are thoſe whoſe pores are naturally formed, to be pierced and put into motion by the points of an acid poured over them.

ALKALIZATION, the chemical proceſs of impregnating liquors with alkaline ſalt.

ALKANET, in botany, the Engliſh name of the plant called anchuſa.

ALKEKENGI, in botany, the trivial name of the lawſonia.

ALKERMES, in pharmacy, a compound cordial medicine made in the form of a confection, deriving its name from the kermes-berries uſed in its compoſition.

ALKES, a ſtar in the conſtellation Crater.

ALKUSSA, in ichthyology, a Swediſh name for the fiſh called ſilurus by Artedi.

ALKY, in chemiſtry, ſignifies the ſweet juice which proceeds from lead in infuſion.

ALL-SAINTS, in the calendar, denotes a feſtival celebrated on the firſt of November, in commemoration of all the ſaints in general; which is otherwiſe called All-hallows. The number of ſaints being ſo exceſſively multiplied, it was found too burdenſome to dedicate a feaſt-day to each. In reality, there are not days enough, ſcarce hours enough, in the year, for this purpoſe. Hence an expedient was had recourſe to, by commemorating ſuch in one day as had not their own days.

Boniface IV. in the ninth century, introduced the feaſt of All-Saints in Italy, which was ſoon after adopted into the other churches.

ALL-SOULS, in the calendar, denotes a feaſt-day, held on the ſecond of November, in commemoration of all the faithful deceaſed.

The feaſt of All-Souls was firſt introduced in the eleventh century, by Odilon, abbot of Cluny, who enjoined it on his own order; but it was not before it became adopted by the neighbouring churches.

ALL-SPICE, ſynonymous with Myrtus and Calycanthus.

ALLA, or Allah, the name by which the profeſſors of Mahometaniſm call the Supreme Being.

The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the ſame with the Hebrew *Eloah*, which ſignifies the adorable Being.

ALLAMANDA, in botany; a genus of the monogynia order, belonging to the pentandria claſs of plants. For its characters ſee Syſtem of Botany. There is but one ſpecies, the cathartica, a native of Surinam.

ALLANTOIS, or Allantoides, a gut-ſhaped veſicle inveſting the fœtus of cows, goats, ſheep, &c. filled with an urinous liquor conveyed to it from the urachus. Anatomiſts are not agreed whether the allantois has any exiſtence in the human ſpecies or not. See Syſtem of Comparative Anatomy.

ALLAT, in mythology, a name given to an Arabian idol; the word is derived from the Arabic, *Allah*, God.

ALLAY, the ſame as Alloy.

ALLEGATA; a word anciently ſubſcribed at the bottom of reſcripts and conſtitutions of the emperors; as *ſignata*, or *teſtata*, was under other inſtruments.

ALLEGATION, in civil law, denotes the act of producing certain papers or writings in court, to prove ſome aſſertion already in the pleadings.

It is ſometimes uſed as a quotation proof in a literary ſenſe.

ALLEGEAS, or Allegias, a ſtuff manufactured in the Eaſt-Indies. There are two ſorts of them; ſome are of cotton, and others of ſeveral kinds of herbs, which are ſpun like flax and hemp. Their length and breadth are of eight ells, by five, ſix, or ſeven eighths; and of twelve ells, by three-fourths, or five-eighths.

ALLEGIANCE, in law, is the tie or *ligamen*, which binds the ſubject to the king, in return for that protection which the king affords the ſubject.

It is founded in reaſon and the nature of government; the name and the form are derived to us from our Gothic anceſtors. Under the feodal ſyſtem, every owner of lands held them in ſubjection to ſome ſuperior or lord, from whom, or from whoſe anceſtors, the tenant or vaſſal had received them: and there was a mutual truſt or confidence ſubſiſting between the lord and vaſſal, that the lord ſhould protect the vaſſal in the enjoyment of the territory he had granted him; and, on the other hand, that the vaſſal ſhould be faithful to the lord, and defend him againſt all his enemies.

This obligation on the part of the vaſſal was called his *fidelitas* or fealty: and an oath of fealty was required by the feodal law to be taken by all tenants to their landlord, which is couched in almoſt the ſame terms as our ancient oath of allegiance; except that, in the uſual of fealty, there was frequently a ſaving or exception of the faith due to a ſuperior lord by name, under whom the landlord himſelf was, perhaps, only a tenant or vaſſal. But when the acknowledgment was made to the ſuperior himſelf, who was vaſſal to no man, it was no longer called the oath of fealty, but the oath of allegiance; and therein the tenant ſwore to bear faith to his ſovereign lord, in oppoſition to all men, without any ſaving or exception.

Land held by this exalted ſpecies of fealty, was called *feudum ligium*, a liege fee; *homines ligii*, or liege men; and the ſovereign their *dominus ligius*, or liege lord. And when ſovereign princes did homage to each other for lands held under their reſpective ſovereignties, a diſtinction was always made between ſimple homage, which was only an acknowledgment of tenure, and liege homage, which included the fealty before-mentioned, and the ſervices conſequent upon it.

In Britain, it becoming a ſettled principle of tenure, that all lands in the kingdom are holden of the king as the ſovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was neceſſarily confined to the perſon of the king alone. By an eaſy analogy, the term of allegiance was ſoon brought to ſignify all other engagements which are due from ſubjects to their prince, as well as thoſe duties which were ſimply and merely territorial. And the oath of allegiance, as adminiſtered in England for upwards of 600 years, contained a promiſe, "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to know or hear of any ill or damage, without defending him therefrom." But, at the revolution, the terms of his oath being thought, perhaps, to favour too much the notion of non-reſiſtance, the preſent form was introduced by the convention parliament, which is more general and indeterminate than the former; the ſubject only promiſing "that he will be faithful and bear true allegiance to the king," without mentioning "his heirs," or ſpecifying in the leaſt wherein that allegiance conſiſts.

The oath of ſupremacy is principally calculated as a renunciation of the pope's pretended authority; and the oath of abjuration, introduced in the reign of king William, very amply ſupplies the looſe and general texture of the oath of allegiance; it recognizing the right of his majeſty, derived under the act of ſettlement; engaging to ſupport him to the utmoſt of the juror's power; promiſing to diſcloſe all traiterous conſpiracies againſt him; and expreſsly renouncing any claim of the deſcendants of the late pretender, in as clear and explicit terms as the Engliſh language can furniſh.

This oath muſt be taken by all perſons in any office, truſt, or employment; and may be tendered by two juſtices of the peace to any perſon whom they ſhall ſuſpect of diſaffection. But the oath of allegiance may be tendered to all perſons above the age of twelve years, whether natives, denizens, or aliens.

ALLEGIANCE, both expreſs and implied, is however diſtinguiſhed by the law into two ſorts or ſpecies, the one *natural*, the other *local*; the former perpetual, and the latter temporary.

Natural ALLEGIANCE is ſuch as is due from all men born within the king's dominions immediately upon their birth, as natural born ſubjects intitled to the king's protection in every part of the world.

Local ALLEGIANCE is ſuch as is due from an alien, or ſtranger born, for ſo long time as he continues within the king's dominion and protection; and it ceaſes the inſtant ſuch ſtranger transfers himſelf from this kingdom to another.

ALLEGORY, in compoſition, conſiſts in chooſing a ſecondary ſubject, having all its properties and circumſtances reſembling thoſe of the principal ſubject, and deſcribing the former in ſuch a manner as to repreſent the latter.

The principal ſubject is thus kept out of view, and we are left to diſcover it by reflection: and may be compared to an hieroglyphic which raiſes two images in the mind; one ſeen, that repreſents one that is not ſeen: an allegory does the ſame; the repreſentative ſubject is deſcribed, and the reſemblance leads us to apply the deſcription to the ſubject repreſented.

There cannot be a finer or more correct allegory than the following, in which a vineyard is made to repreſent God's own people the Jews:

"Thou haſt brought a vine out of Egypt; thou haſt caſt "out the heathen, and planted it. Thou didſt cauſe it to take "deep root, and it filled the land. The hills were covered "with its ſhadow, and the boughs thereof were like the goodly "cedars. Why haſt thou then broken down her hedges, ſo that "all that paſs do pluck her? The boar out of the wood doth "waſte it, and the wild beaſt doth devour it. Return, we be"ſeech thee, O God of hoſts: look down from heaven, and "behold, and viſit this vine and the vineyard thy right-hand "hath planted, and the branch thou madeſt ſtrong for thyſelf." Pſal. lxxx.

Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. Yet moſt writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe.

Allegories, as well as metaphors and ſimilies, are unnatural in expreſſing any ſevere paſſion which totally occupies the mind; therefore ſhould be carefully avoided in heroics, or ſoliloquies.

ALLEGRO, in muſic, an Italian word, generally written at the beginning of an air, denotes, from quick to ſlow, the ſecond of the five principal degrees of movement diſtinguiſhed in Italic harmony. But we muſt not think that on that account, this movement is proper for gay ſubjects only; it is often applicable to tranſports of paſſion, diſtraction, or deſpair, which partake of nothing leſs than of gaiety.

The diminitive allegretto denotes a more moderated gaiety, and a little leſs vivacity in the meaſure.

Piu ALLEGRO, ſignifies that the part it is joined to ſhould be ſung or played quicker; as

Poco piu ALLEGRO intimates, that the part to which it refers ought to be played or ſung only a little more briſkly than allegro alone requires.

ALLELENGYON, in ancient hiſtory, denotes the tax paid by the rich, for the poor's privilege to be abſent from the army in time of war.

ALLELOPHAGI, in natural hiſtory, the denomination of a certain kind of flies, which entomologiſts affirm, devour each other as their only proper food. Hence the diſtinction heterophagi, or thoſe that fed on other kinds of food, adopted by writers on the ſubject.

ALLELUJA, in botany, a name given by many to the common wood-ſorrel.

ALLELUJAH, or HALLELUJAH, a word ſignifying, *praiſe ye the Lord*, and is to be met with at the beginning and end of ſome pſalms: ſuch is Pſalm cxlv. and thoſe that follow, to the end. Allelujah was ſung upon ſolemn days of rejoicings, Tobit xiii. 12. St. John in tho Revelation (xix, 1, 3, 4, 6.) ſays, that he "heard a great voice of much people in heaven, who ſaid, Allelujah; and the four and twenty elders, and the four beaſts, fell down and worſhipped God that ſat on the throne, ſaying Allelujah." This hymn of joy and praiſes was transferred from the ſynagogue to the church. St. Jerom tells us, that at the funeral of Fabiola ſeveral pſalms were ſung with loud Allelujahs; and that the monks of Paleſtine were awakened, at their midnight watchings, with the ſinging of Allelujahs. So much energy has been obſerved in this term, that the ancient church thought proper to preſerve it, without tranſlating it either into Greek or Latin, for fear of impairing the beauty and ſoftneſs of it. The ſinging Allelujah was oftentimes an invitatory or call to each other to *praiſe the Lord*.

ALLEMAND, a ſort of grave ſolemn muſic, with good meaſure, and a ſlow movement.

ALLEMANDE, a briſk kind of dance, very common in Germany, Switzerland, and France.

ALLEMANNIC, in a general ſenſe, denotes any thing belonging to the ancient Germans.

ALLER, in ancient authors, ſerves to make the expreſſion of ſuperlative ſignification. Hence *aller-good*, is the greateſt good. Sometimes it is written *alder*.

ALLERION, or ALERION, in heraldry, a ſort of eagle without a beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas thoſe of the martlet are cloſe; and denote Imperialiſts vanquiſhed and diſarmed; for which reaſon they are more comman in French than in German coats of arms.

ALLEU, or ALLODE, ſynonymies of ALLODIUM.

ALLEVIARE, in law, a word uſed in ancient records for paſſing a fine, agreeably to the preſent practice uſed in conveyancing.

ALLEVEURE, a ſmall braſs Swediſh coin, worth about ½d. Engliſh money.

ALLEVIATION, in grammar, denotes the making a thing lighter, and eaſier to bear or endure. It ſtands oppoſed to aggravation.

ALLEVIATION, in medical language, implies an eaſement or freedom from pain. It is generally applied to thoſe remedies which operate inſtantaneouſly.

ALLEY, in gardening, a ſtraight parallel walk, bounded on both ſides with trees, ſhrubs, &c. and uſually covered with gravel or turf.

ALLEY, among builders, denotes a narrow paſſage leading from one place to another.

ALLEY, in perſpective, that which, in order to have a greater appearance of length, is made wider at the entrance than at the termination.

ALLEY, in agriculture, implies the vacant ſpace between the outermoſt row of corn on one bed and the neareſt row to it on the next parallel bed; and it is uſually about four feet in breadth, excluſive of the partitions between the rows of corn in the beds.

ALL-GOOD, in botany, implies the chenopodium, or gooſe foot.

ALL-HEAL, in botany, are names given to two ſorts of plants, namely, Hercules's all-heal, or wound wort, and Clown's all-heal, or hore-hound.

ALLIANCE, in the civil and canon law, the relation contracted between two perſons or two families by marriage.

ALLIANCE is alſo uſed for a treaty entered into by ſovereign princes and ſtates, for their mutual ſafety and defence. In this ſenſe, alliances may be diſtinguiſhed into ſuch as are offenſive, whereby the contracting parties oblige themſelves jointly to attack ſome other power; and into defenſive ones, whereby they bind themſelves to ſtand by and defend each other in caſe they are attacked by others.

Alliance, with the ancient Romans, though a ſort of ſervitude, was much coveted. Ariarathes, we are told by Polybius, offered a ſacrifice to the gods by way of thankſgiving for having obtained this alliance. The reaſon was, that thence-forwards people were ſure not to receive any injuries except from them. There were different ſorts of allies: ſome only united to them by a participation of the privileges of Romans, as the Latini and Hernici; others by their very foundation, as the colonies; others by the benefactions they received from them, as Maſſiniſſa, Eumenes, and Attalus, who owed their kingdoms to Rome; others by free treaties, which laſt, by a long alliance, became ſubjects, as the kings of Bithynia, Cappadocia, Egypt, and moſt of the cities of Greece: laſtly, others by compulſive treaties, and the law of ſubjection, as Philip and Antiochus. For they never granted peace to an enemy, without making an alliance with him; that is, they never ſubdued any people without uſing it as a means of ſubduing others.

Alliances among the Jews and Chaldeans, heifers or calves were ſacrificed; among the Greeks, bulls or goats; and among the Romans, hogs were ſacrificed on this occaſion.

Alliances among the ancient Arabs, were confirmed by drawing blood out of the palms of the hands of the two contracting princes with a ſharp ſtone, dipping herein a piece of their garments, and therewith ſmearing ſeven ſtones, at the ſame time invoking the gods Vrotalt and Alilat, i. e. according to Herodotus, Bacchus and Urania.

ALLIANCE, in a figurative ſenſe, is applied to any kind of union or connection; thus we ſay, there is an alliance between the church and ſtate.

ALLIARIA, in botany, ſignifies dame's violet, whoſe deſcription as a ſynonyme comes under its real name.

ALLIGATI, in Roman antiquity, the baſeſt kind of ſlaves, who were uſually kept fettered. The Romans had three degrees, or orders, of ſlaves or ſervants; the firſt employed in the management of their eſtates; the ſecond in the menial or lower functions of the family; the third called *alligati*, above mentioned.

ALLIGATION, the name of a method of ſolving all queſtions that relate to the mixture of one ingredient with another. See Syſtem of ARITHMETIC, under the heads of Alligation, Medial and Alternate.

ALLIGATOR, in zoology, a ſynonyme of the lacerta crocodilus.

ALIGATOR *Pear*, a fruit well known.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. For the characters, ſee Syſtem of BOTANY. The violeacea and incarnata, both natives of America.

ALLIOTH, a ſtar in the tail of the greater bear, much uſed for finding the latitude at ſea.

ALLIOTICUM, a galenical, to cleanſe the blood.

ALLITERATION, an ornament of language chiefly uſed in poetry, and conſiſting in the repetition of the ſame letter at certain intervals. I do not remember to have ever ſeen any ſatisfactory account of alliteration in the writings of the critics.

Many chapters have been compoſed on quantity, on the expreſſion reſulting from different arrangements of long and ſhort ſyllables, and on the powers of pauſes as they are variouſly placed, without a word of alliteration. This is the more extraordinary, as one ſhould think it impoſſible for any man to examine minutely, and, as it were, diſſect a number of verſes, without perceiving the vaſt abundance of this ornament.

I do not pretend to ſay, that the ſweetneſs and energy of verſification depends chiefly on this circumſtance, yet I cannot help believing that it may claim ſome ſhare: for it is a conſtant appearance, as far as I have ever obſerved, that the poets whoſe fame is higheſt for verſification, are moſt extenſive dealers in this article.

The trifling poor appearance of the ornament itſelf, upon a ſuperficial view, and the frequent abuſe of it, are circumſtances indeed which give no encouragement to a ſerious inquiry into its nature and operation. How common is it for writers, who affect to be comic, when in want of other means for raiſing a ſmile, to uſe affected alliteration with ſucceſs. But, in the fine arts, no beauty nor grace is beyond the power of ridicule. The nobleſt attitudes in painting have been rendered laughable by caricatura. St. Paul preaching at Athens, in the deſign of Raphael, appears elegant, noble, and in ſome degree awful. The ſame apoſtle, repreſented by Hogarth in nearly the ſame attitude, pleading before the governor Felix, ſeems altogether ridiculous. So the language and verſification of Milton in the Paradiſe Loſt appear only proper for the moſt elevated ſubjects. In the Splendid Shilling of Philips, they appear equally proper for the loweſt. So fares it alſo with alliteration. Nor ought we to be mortified at the diſcovery, that much of the delight afforded by verſification ariſes from a cauſe ſo pitiful as the repetition of the ſame letter twice, or oftener, on the accented parts of a verſe; for there are many other cauſes of pleaſure, which, when thus detected and taken to pieces, ſeem equally contemptible.

A few lines will ſuffice to illuſtrate this grace taken from Grey, who ſeems to have paid particular attention to it.

"*R*uin ſeize thee, *r*uthleſs king."
"To *h*igh-born *H*oel's *h*arp, or ſoft *L*lewe*l*lyn's *l*ay."
"*W*eave the *w*arp, and *w*eave the *w*oof."
"Stamp we our vengeance *d*eep, and ratify his *d*oom."
"Regardleſs of the *ſ*weeping whirlwind's *ſ*way."
"That huſh'd in grim re*p*oſe, ex*p*ects his ev'ning *p*rey."

Again —

"Eyes that *g*low, and fangs that *g*rin,
"Thoughts that *b*reathe, and words that *b*urn."
"*H*auberk craſh, and *h*elmet ring."

A compoſer who aims at expreſſion will not hunt after fugues; but if they offer, ſpontaneouſly from the ſubject, he will not reject them. So in like manner a good poet ought not to ſelect an epithet merely for beginning with a certain letter, unleſs it ſuits his purpoſe in every other reſpect; for the beauty of alliteration, when happy, is not greater than its deformity when affected. A couplet from Pope will exemplify both; the firſt line being bad, and the ſecond good:

"Eternal beauties grace the *ſ*hining *ſ*cene,
"*F*ields ever *f*reſh, and *g*roves for ever *g*reen."

ALLIUM, from 'αλεω, "to avoid or ſhun," becauſe many ſhun the ſmell of it, GARLIC: a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking in the 9th order, Spathaceæ. For its characters, ſee Syſtem of BOTANY. Of this genus 40 different ſpecies are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks.

1. The ſativum, or garlic, has a bulbous root, of an irregularly roundiſh ſhape, with ſeveral fibres at the bottom; each root is compoſed of a number of leſſer bulbs, called *cloves* of garlic, incloſed in one common membranous coat, and eaſily ſeparable from one another. All the parts of this plant, but more eſpecially the roots, have an acrimonious, and almoſt cauſtic taſte, wlth a ſtrong offenſive ſmell, which laſt has induced thoſe who preſerved ſome of the ſpecies in gardens on account of their yellow flowers, to eradicate them.

This pungent root warms and ſtimulates the ſolids, and attenuates tenacious juices; for which it is well adapted, on account of its being very penetrating; inſomuch that, when applied to the feet, its ſcent is ſoon diſcovered in the breath; and, when taken internally, its ſmell is communicated to the urine, or the matter of an iſſue, and perſpires through the pores of the ſkin. Hence in cold eucophlegmatic habits, it proves a powerful expectorant, diuretic, and emmenagogue; and, if the patient is kept warm, ſudorific.

It is of great ſervice in humoral aſthmas and catarrhous diſorders of the breaſt, and in other diſorders proceeding from a laxity of the ſolids, and cold ſluggiſh indiſpoſitions of the fluids.

It is alſo frequently of ſervice in the dropſy; in the beginning of which it is particularly recommended by Sydenham, as a warm ſtrengthening medicine: we have even many examples where it acts ſo powerfully as a diuretic, as to carry off all the water of dropſies. It may be taken the length of a dram or two in ſubſtance for a doſe. We have a ſyrup and oxymel made with it, which may be employed for the ſame purpoſes as the garlic in ſubſtance; but they are moſtly uſed in pulmonic diſorders.

Externally applied, it inflames and ulcerates the ſkin, and is ſometimes employed for this uſe in ſinapiſms.

It has likewiſe been recommended by Sydenham as a moſt powerful revellent; for which purpoſe he was led to make uſe of it in the confluent ſmall-pox. His method was to cut the root in pieces, and apply it, tied in a linen cloth, to the ſoles of the feet, about the eighth day of the diſeaſe, after the face began to ſwell; renewing it once a-day till the danger was over. When made into an unguent with oils, and applied externally, garlic is ſaid to reſolve and diſcuſs cold tumors, and has been by ſome greatly celebrated in cutaneous diſorders.

The acrimonious qualities of this root, however, render it manifeſtly improper on many occaſions. Its liberal uſe is apt to occaſion head-achs, flatulencies, thirſt, febrile heats, inflammatory diſtempers, and ſometimes diſcharges of blood from the hemorrhoidal veſſels. In hot bilious conſtitutions, where there is already a degree of irritation, where the juices are too thin and acrimonious, or the viſcera unſound, it never fails to aggravate the diſtemper.

In Kamtſchatka, the allium urſinum, or wild garlic, is very common and uſeful in medicine as well as food. Both Ruſſians and natives gather it in great quantities for winter ſervice. They ſteep it in water, then mix it with cabbage, onions, and other ingredients, and form out of them a ragout which they eat cold. It is alſo their principal remedy for the ſcurvy: for as ſoon as this plant appears above the ſnow, they ſeem to put this dreadful diſorder at defiance, and find a cure almoſt in its worſt ſtages.

Garlic is very hardy, and will thrive in almoſt any ſoil or ſituation; and is eaſily propagated either by the roots or ſeeds.

2. The aſcalonicum, or eſchalot, was found wild in Paleſtine by Dr. Haſſelquiſt. The root is conglobate, conſiſting of many oblong roots bound together by thin membranes. Each of theſe ſmall roots ſends forth two or three fiſtulous, long, awl-ſhaped leaves, iſſuing from a ſheath, and are nearly like thoſe of the common onion. The root of this ſpecies is very pungent, has a ſtrong, but not unpleaſant ſmell, and therefore is generally preferred to the onion for making high-flavoured ſoups and gravies.

3. The ſcorodopraſum, or rokambole, grows naturally in Denmark and Sweden. It hath a heart-ſhaped ſolid root, which ſtands ſidewiſe of the ſtalk. The roots are uſed for the ſame purpoſe as the former.

4. The ſchœnopraſum, cives, or ſhives, is an inhabitant of Siberia, and is a very ſmall plant compared with the former, the leaves and ſtems ſeldom exceeding ſix inches in length, and the roots never producing any bulbs. Its taſte, ſmell, and virtues, are much the ſame as thoſe of the common onion.

5. The cepa, or common onion, differs from the garlic only in the ſwelling pipy ſtalk, which is much larger in the middle than at either end. Their nature is to attenuate thick, viſcid juices; conſequently, a plentiful uſe of them in cold phlegmatic conſtitutions, muſt prove beneficial. Many people ſhun them on account of the ſtrong, diſagreeable ſmell they communicate to the breath. This may be remedied by eating a few raw parſley-leaves immediately after, which will effectually overcome the ſcent of the onions, and cauſe them to ſit more eaſy on the ſtomach.

The varieties are, the Spaniſh, and the Egyptian onions. They are propagated by ſeeds, which ſhould be ſown the latter end of February, or the beginning of March, on good, light, rich ground, well dug and levelled, and cleared from weeds.

The ſcallions, or eſcallions, and Welſh onions, were formerly in great repute; both of which never form any bulbs at the roots, and are chiefly uſed in the ſpring for green onions.

6. The portum, or leek, has been ſo long cultivated, that its native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in Numbers xi. where it is ſaid the Iſraelites longed for leeks in conjunction with onions; and are now in great eſteem with the Welſh and Iriſh, as well as the Dutch and Flemiſh nations.

ALLOBROGES (Inſcriptions, Livy, Velleius, Flarus); from *allobrox* (Horace): a people of Gallia Narbonenſis, ſituated between the rivers Iſara and Rhodanus, and the Lacus Lemanus; commended by Cicero for their fidelity, diſcommended by Horace on account of their fondneſs for novelty.

ALLOCATION denotes the admitting or allowing of an article of an account, eſpecially in the exchequer. Hence,

Allocatione Facienda, is a writ directed to the lord treaſurer, or barons of the exchequer, commanding them to allow an accountant ſuch ſums as he has lawfully expended in the execution of his office.

ALLOCATO Comutato, or Comitatu, implies a new writ of exigent iſſued before any other county court is held, on account of the former not being complied with.

ALLOCUTIO, an oration or ſpeech of a general addreſſed to his ſoldiers, to animate them to fight, to appeaſe ſedition, or to keep them to their duty. A mount of earth was, in ancient times, uſually raiſed upon theſe occaſions, as a kind of tribunal of turf. From this the general pronounced his harangue to the army, which was ranged in ſeveral ſquadrons round him, with their captains and other officers at their head. When the time and circumſtances would not admit of a formal harangue, the general went through the ranks, and called each by his name, putting them in mind of their courage upon former occaſions, mentioning the victories they had won, and making promiſes of ſpoils and booty.

ALLODIAL, ſynonymous with Allodium, or in a general ſenſe, implies an inheritance, held without any acknowledgment to a ſuperior; contradiſtinguiſhed from feudal. In a modern ſenſe, it is underſtood by that well-known epithet, freehold. See Syſtem of Laws, under the article Freehold.

ALLODIARIUS, in law, the lord paramount of a manor, or proprietor of a barony or lordſhip.

ALLODIUM, or Alleud, denotes lands which are the abſolute property of their owner, without being obliged to pay any ſervice or acknowledgment whatever to a ſuperior lord.

ALLOPHYLLUS, in botany; a genus of the monogynia order, belonging to the octandria claſs of plants. For the characters ſee Syſtem of Botany. There is but one ſpecies, the zeylanicus, a native of Ceylon.

ALLONGE, in fencing, ſignifies a paſs or thruſt with a ſmall ſword, at an antagoniſt or enemy.

ALLOTING, or Allotment of Goods, in matters of commerce, is when a ſhip's cargo is divided into ſeveral parts, bought by divers perſons, whoſe names are written on as many pieces of paper, which are applied by an indifferent perſon to the ſeveral lots or parcels; by which means the goods are divided without partiality.

ALLOY, or Allay, ſignifies a proportion of a baſer metal mixed with a finer one.

The alloy of gold is eſtimated by carats, that of ſilver by pennyweights.

In different nations, different proportions of alloy are uſed; whence their monies are ſaid to be of different degrees of fineneſs or baſeneſs, and are valued accordingly in foreign exchanges.

The chief reaſons alledged for the alloying of coin, are: 1. The mixture of the metals, which, when ſmelted from the mine, are not perfectly pure. 2. The ſaving the expence it muſt otherwiſe coſt if they were to be refined. 3. The neceſſity of rendering them harder, by mixing ſome parts of other metals with them, to prevent the diminution of weight by wearing in paſſing from hand. 4. The melting of foreign gold or coin which is alloyed. The charges of coinage, which muſt be made good by the profit ariſing from the money coined. 6, and laſtly, The duty belonging to the ſovereign, on account of the power he has to cauſe money to be coined in his dominions.

Alloy, in a more general ſenſe, implies a chemical proceſs of the union of different metallic matters.

ALLSEED, an obſolete name for flax-ſeed.

ALLSPICE, a trivial name given to pimento, a ſpecies of pepper.

ALLUM, the ſame as Alum, under which orthography the word properly belongs, as the former as well as the corrupt word Allom, is contrary to its derivative power from the Greek, ἅλς, *ſalt*.

ALLUMEN Plumosum, in chemiſtry, implies the baſilian ſublimate of mercury, formed of arſenic, united with vitriolic acid.

Allumen Scagliolæ, or Scaiolæ, a flaky ſtone, ſometimes called *lapis ſpecularis*, which the antients called *Schiſton*.

Allumen Catini, ſignifies the alkaline taſte of the herb Kali, uſed in making glaſs, and is a ſynonyme of alkali.

Allumen Foecis, a ſort of powder made from the lees of wine, much uſed by the Italian ladies to dye their hair yellow, a colour much admired in that country.

ALLUMINOR, from the French *allumer*, "to lighten," is uſed for one who coloureth or painteth upon paper or parchment; and the reaſon is, becauſe he gives light and ornament by his colours to the letters or other figures. Such ornaments are ſtiled illuminations. The word is uſed in ſtat. 1. R. III. cap. 9. But now ſuch a perſon is called a limner.

ALLUMINOUS, an epithet, applied to ſuch things as partake of the nature of allum. Hence all mineral ſprings are ſaid to be alluminous, as being impregnated with particles of that ſalt.

ALLUSION, in rhetoric, a figure by which ſomething is applied to, or underſtood of, another, on account of ſome ſimilitude between them.

ALLUVION, in law, denotes the gradual increaſe of land along the ſea-ſhore; or on banks of rivers.

ALLY, in matters of polity, a ſovereign prince or ſtate that has entered into alliance with others.

ALMACANTERS, a ſynonyme of Almucanters.

ALMADE, or Almadie, a kind of canoe, or ſmall veſſel, about four fathoms long, commonly made of bark, and uſed by the negroes of Africa.

ALMADIE is alſo the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and ſix or ſeven in breadth. They are exceedingly ſwift, and are otherwiſe called cathuri.

ALMAGEST, in matters of literature, is particularly uſed for a collection or book compoſed by Ptolemy, containing various problems of the ancients both in geometry and aſtronomy.

Almagest is alſo the title of other collections of this kind. Thus, Riccioli has publiſhed a book of aſtronomy, which he calls the New Almageſt; and Pluckenet, a book which he calls Almageſtrum Botanicum.

ALMAGRA, a fine deep red ochre, with ſome admixture of purple, very heavy, and of a denſe yet friable ſtructure, and rough duſty ſurface. It adheres very firmly to the tongue, melts freely and eaſily in the mouth, is of an auſtere and ſtrongly aſtringent taſte, and ſtains the ſkin in touching. It is the Sil Atticum of the antients: it ferments very violently with acid menſtruums; by which ſingle quality, it is ſufficiently diſtinguiſhed from the Sil Syricum, to which it has in many reſpects a great affinity. It is found in immenſe quantities in many parts of Spain. It is uſed in painting, and in medicine as an aſtringent.

ALMALECI, in medical hiſtory, implies a ſyſtem of Arabian phyſic, in much eſteem by the ancients.

ALMANAC, or Almanack, a book, or table, containing a calendar of days and months, the riſing and ſetting of the ſun, the age of the moon, the eclipſes of both luminaries, &c. Authors are divided with regard to the etymology of the word; ſome deriving it from the Arabic particle al, and manach, to count; ſome from almanah, new-year's gifts, becauſe the Arabian aſtrologers uſed at the beginning of the year to make preſents of their ephemerides; and others, from the Teutonic almaen-achte, obſervations on all the months. Mr. Johnſon derives it from the Arabic particle al, and the Greek *μην*, a month. But the moſt ſimple etymology appears from the common ſpelling; the word being compoſed of two Arabic ones, al manack, which ſignify the diary.

Regiomontanus appears to have been the firſt in Europe, who reduced almanacks into their preſent form and method, gave the characters of each year and month, foretold the eclipſes and other phaſes, calculated the motions of the planets, &c. His firſt almanack was publiſhed in 1474.

Almanacks differ from one another, chiefly, in containing ſome more, others fewer, particulars.

The eſſential part is the calendar of months and days, with the riſings and ſettings of the ſun, age of the moon, &c. To theſe are added various parerga, aſtronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipſes, ſolar ingreſſes, prognoſtics of the weather, tables of the tides, terms, &c. liſts of poſts, offices, dignities, public inſtitutions, with many other articles political as well as local, and differing in different countries.

The modern almanack anſwers to the faſti of the ancient Romans.

Almanacks for one year printed on one ſide of paper, pay for duty 4d.; thoſe for more years pay for three years 1d.; but perpetual almanacks are to pay only for three years at 2d. Out of the duties by this act there ſhall be paid to each univerſity £.500 per ann. half yearly, at Midſummer and Chriſtmas, and the ſurplus ſhall be paid into the exchequer to go to the ſinking fund. Selling unſtamped almanacks incurs the ſame penalty as for ſelling unſtamped newſpapers. Almanacks in bibles and common prayer books are exempted.

Almanack, among antiquaries, is alſo the name given to a kind of inſtrument, uſually of wood, inſcribed with various figures and Runic characters, and repreſenting the order of the feaſts, dominical letters, days of the week, and golden number, with other matters neceſſary to be known throughout the year; uſed by the ancient northern nations, in their computations of time, both civil and eccleſiaſtical.

Almanacks of this kind are known by various names, among the different nations wherein they have been uſed; as rimſtocks, Primſtaries, runſtocks, runſtaffs, *Scipiones Runici*, *Baculi Annales*, clogs, &c. They appear to have been uſed only by the Swedes, Danes, and Norwegians. From the ſecond of theſe people, their uſe was introduced into England, whence divers remains of them in the counties.

ALMANIA, in Arabian aſtronomy, or rather aſtrology, ſignifies the dominion one planet has over another.

ALMANDIN, or Alabandin, a precious ſtone, of the ruby kind, of great value.

ALMARIA, in eccleſiaſtical and other ancient records, implied the archives of a church, or the like. Hence Almarian laws, or laws of uſage.

ALMARIC *Hereſy*, a tenet broached in France by one Almaric, in the year 1209. It conſiſted in affirming, that every Chriſtian was actually a member of Chriſt; and that without this faith no one could be ſaved.

His followers went farther, and affirmed, that the power of the Father laſted only during the continuance of the Moſaic law; that the coming of Chriſt introduced a new law; that at the end of this began the reign of the Holy Ghoſt; and that now confeſſion and the ſacraments were at an end, and that every one is to be ſaved by the internal operations of the Holy Spirit alone, without any external act of religion. Their tenets were condemned by a public decree of the council of Sens, in the year 1209.

ALME, or Alma, ſinging and dancing girls in Egypt, who, like the Italian *improviſatori*, can occaſionally pour fourth "unpremeditated verſe." They are called Almé, from having received a better education than other women. They form a celebrated ſociety in this country. To be received into it, according to Mr. Savary, it is neceſſary to have a good voice, to underſtand the language well, to know the rules of poetry, and be able to compoſe and ſing couplets on the ſpot, adapted to the circumſtances. The Almé know by heart all the new ſongs. Their memory is furniſhed with the moſt beautiful tales. There is no feſtival without them; no entertainment of which they do not conſtitute the ornament. They are placed in a roſtrum, from whence they ſing during the repaſt. They then deſcend into the ſaloon, and form dances which have no reſemblance to ours. They are pantomime ballets, in which they repreſent the uſual occurrences of life.

Theſe Almé are ſent for into all the harams. They teach the women the new airs; they amuſe them with amorous tales, and recite in their preſence poems, which are ſo much the more intereſting, as they furniſh a lively picture of their manners. Theſe girls, who have a cultivated underſtanding, are very agreeable in converſation. They ſpeak their language with purity. The habit of dedicating themſelves to poetry renders the ſofteſt and moſt ſonorous expreſſions familiar to them. They repeat with a great deal of grace. In ſinging, nature is their only guide. Sometimes two of them ſing together, but always with the ſame voice. It is the ſame with an orcheſtra, where all the inſtruments playing in uniſon execute the ſame part.

The Almé aſſiſt at the marriage ceremonies, and march before the bride playing on inſtruments. They make a figure likewiſe at funerals, and accompany the proceſſion, ſinging ſorrowful airs. They break forth into groans and lamentations, and give every ſign of grief and deſpair. Theſe women are paid very high, and ſeldom appear but among the grandees and rich men.

The common people have alſo their Almé. They are girls of the ſecond claſs, who try to imitate the former; but they have neither their elegance, their graces, or their knowledge.

ALMEHRAB, in the Mahometan cuſtoms, a nich in their moſques, pointing towards the kebla, or temple of Mecca, to which they are obliged to bow in praying.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of caſting of lots with arrows, ſtrictly forbid by the law of Mahomet, on account of the frequent quarrels occaſioned by it.

The manner of the game was thus: A young camel being brought and killed, was divided into a number of parts. The adventurers, to the number of ſeven, being met, eleven arrows were provided without heads or feathers; ſeven of which were marked, the firſt with one notch, the ſecond with two, the third with three, &c. the other four had no marks. Theſe arrows were put promiſcuouſly into a bag, and thus drawn by an indifferent perſon. Thoſe to whom the marked arrows fell, won ſhares in proportion to their lot; the reſt to whom the blanks fell were entitled to no part of the camel, but obliged to pay the whole price of it. Even the winners taſted not of the fleſh themſelves more than the loſers, but the whole was diſtributed to the poor.

ALMENE, in commerce, a weight of two pounds uſed to weigh ſaffron in ſeveral parts of the Eaſt Indies.

Almene, a ſynonyme of the African lotus or acanthus.

ALMIGGIM Wood, a name given in the Scriptures to the Indian pine tree, which implies light and white.

ALMIZADIR, in alchemy, implies the ſame as alkaheſt.

ALMOGIZA, the Arabic name of the limb of the aſtrolobe.

AL-MOHARRAM, the name of the firſt or holy moon of the Arabian year.

ALMOND, the fruit of the almond tree, whoſe botanic name comes under the article Amygdalus.

Almond, in commerce, a meaſure by which the Portugueſe ſell their oil; 26 almonds make a pipe.

Almonds, in anatomy, a name ſometimes given to two glands, generally called the tonſils.

Almonds, among lapidaries, ſignify pieces of rock cryſtal, uſed in adorning branch-candleſticks, &c. on account of the reſemblance they bear to the fruit of that name.

Almond-Furnace, among refiners, that in which the ſlags of litharge, left in refining ſilver, are reduced to lead again by the help of charcoal.

ALMONER, in its primitive ſenſe, denotes an officer in religious houſes, to whom belonged the management and diſtribution of the alms of the houſe. By the ancient canons, all monaſteries were to ſpend at leaſt a tenth part of their income in alms to the poor. The almoner of St. Paul's is to diſpoſe of the monies left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to ſinging, for the uſe of the choir. By an antient canon, all biſhops are required to keep almoners.

Lord Almoner, or Lord High Almoner, of England, is an eccleſiaſtical officer, generally a biſhop, who has the forfeiture of all deodands, and the goods of *felos de ſe*, which he is to diſtribute among the poor. He has alſo, by virtue of an ancient cuſtom, the power of giving the firſt diſh from the king's table to whatever poor perſon he pleaſes, or, inſtead of it, an alms in money.

Great Almoner, Grand Aumonier, in France, is the higheſt eccleſiaſtical dignity in that kingdom. To him belongs the ſuperintendency of all hoſpitals and houſes of lepers. The king receives the ſacrament from his hand; and he ſays maſs before the king in all grand ceremonies and ſolemnities.

Almoner is alſo a more faſhionable title given by ſome writers to chaplains. In this ſenſe we meet with almoner of a ſhip, almoner of a regiment, &c.

ALMONRY, or Aumbry, the office or lodgings of the almoner; alſo the place where alms are given.

ALMS, a general term for what is given out of charity to the poor.

In the early ages of chriſtianity, the alms of the charitable were divided into four parts; one of which was allotted to the biſhop, another to the prieſts, and a third to the deacons and ſubdeacons, which made their whole ſubſiſtence; the fourth part was employed in relieving the poor, and in repairing the churches.

No religious ſyſtem is more warm in its exhortations to almsgiving, than the Mahometan. The alcoran repreſents alms as a neceſſary means to make prayer be heard. Hence that ſaying of khalifs: "Prayer carries half way to God, faſting brings us to the door of his palace, and alms introduces him into the preſence chamber."

Alms alſo denotes lands or other effects left to churches or religious houſes, in the catholic perſuaſion, on condition of praying for the ſoul of the donor.

Free Alms was that which is liable to no rent or ſervice.

Reasonable Alms was a certain portion of the eſtates of inteſtate perſons, allotted to the poor.

Alms-Box, or Chest, or ſmall cheſt or coffer, called by the Greeks Κιβώτιον, wherein anciently the alms were collected, both at church and at private houſes.

The alms cheſt in Engliſh churches is a ſtrong box, with a hole in the upper part, having three keys, one to be kept by the parſon or curate, the other two by the churchwardens. The erecting of ſuch alms-cheſt in every church is enjoined by the book of canons, as alſo the manner of diſtributing what is thus collected among the poor of the pariſh.

Alms-House, a kind of hoſpital for the maintenance of a certain number of poor, aged, or diſabled people.

ALMUCANTARS, in aſtronomy, an Arabic word denoting circles of the ſphere paſſing through the centre of the ſun, or a ſtar parallel to the horizon, being the ſame as parallels of altitude.

Almucantars-Staff, is an inſtrument uſually made of pear-tree or box, having an arch of 15 degrees; uſed to take obſervations of the ſun, about the time of its riſing and ſetting; in order to find the amplitude, and conſequently the variation of the compaſs.

ALMUCIUM, denotes a kind of cover for the head, worn chiefly by monks and eccleſiaſtics: it was of a ſquare form, and ſeems to have given riſe to the bonnets of the ſame ſhape ſtill retained in univerſities and cathedrals.

ALMUGEA, in aſtrology, ſignifies the diſtance of five ſigns from each other, in calculating the five planets that are ſaid to preſide over nativity.

ALMUGIM, or Almug-Tree, a certain kind of wood mentioned in the firſt book of Kings, (x. 11.) which the Vulgate tranſlates *ligna thyina*, and the Septuagint *wrought wood*. Scripture tells us the almug-tree was uſed for making muſical inſtruments, ſtair-caſes, &c. The word *thyinum* is a name for the citron-tree, known to the ancients, and very much eſteemed for its ſweet odour and great beauty. It came from Mauritania. The almug-tree, or almugim, algumin, or ſimply gummim, taking *al* for a kind of article, is therefore by the beſt commentators underſtood to be an oily and gummy ſort of wood; and particularly that ſort of tree which produces the gum ammoniac, which is alſo thought to be the ſame with the ſhittim-wood, of which there is ſuch frequent mention made by Moſes.

ALMUTAZAPHUS, a name given to the head magiſtrate of the police of Arragon in Spain.

ALNABATI, in medicine, the ſame as the ſiliqua dulcis or carob-tree.

ALNAGE, or Aulnage, the meaſuring of woollen manufactures by the ell. It was at firſt intended as a proof of the goodneſs of that commodity, and accordingly a ſeal was invented as a mark that the commodity was made according to the ſtatute;

ALNAGER, Alneger, Aulneger, q. d. meaſurer by the ell, ſignifies a ſworn public officer, who, by himſelf or deputy, is to look to the aſſize of woollen cloth throughout the land, i. e. the length, width, and work thereof; and to the ſeals for that purpoſe ordained. The office of king's aulneger ſeems to have been derived from the ſtatute of Richard I. A. D. 1197, which ordained, that there ſhould be only one weight and one meaſure throughout the kingdom. His buſineſs was to meaſure all cloths made for ſale, till the office was aboliſhed by the ſtatute 11 and 12 W. III. cap. 20.

ALNAM, the botanical name of the herb penny-royal.

ALNASI, the muſſulman's notion of adopting a prophane moon for the obſervance of the rites of an holy one.

ALNUS, the alder-tree, a ſpecies of betula.

Alnus, in the ancient theatres, that part which was moſt diſtant from the ſtage.

ALOA, in Grecian antiquity, a feſtival kept in honour of Ceres by the huſbandmen, and ſuppoſed to reſemble our harveſt-home.

ALOE, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 10th order, *coronariæ* For the characters ſee Syſtem of Botany. Of this genus, botanical writers enumerate ten ſpecies; of which the moſt remarkable are,

1. The diſticha, or ſoap aloe. This ſeldom riſes above two feet high. The leaves are very broad at the baſe, where they cloſely embrace the ſtalk, and gradually decreaſe to a point. The edges are ſet with ſharp ſpines, and the under leaves ſpread open horizontally every way. Theſe are of a dark green colour ſpotted with white. The flowers grow in umbels on the tops of the ſtalks, and are of a beautiful red colour, and appear in Auguſt and September.

2. The variegata, or partridge-breaſt aloe, is a low plant, ſeldom riſing above eight inches high. The leaves of this are triangular, and curiouſly veined and ſpotted, ſomewhat like the feathers of a partridge's breaſt. The flowers grow in very looſe ſpikes, and are of a fine red colour tipt with green.

3. The viſcoſa, with funnel-ſhaped flowers, grows near a foot high, with triangular leaves of a dark green colour.

4. The ſpiralis, with oval crenated flowers, grows ſomewhat like the former.

5. The linguisformæ, or tongue-aloe, has its leaves about ſix inches in length, and ſhaped like a tongue.

6. The margaritifera, or pearl aloe, is a very beautiful plant. It is ſmaller than moſt of the aloe kind. The leaves are ſhort, very thick, ſharp-pointed, and turning down, with a large thick end, appear there triangular. The colour of the leaves is a fine green, ſtriped in an elegant manner with white, and frequently tipped with red at the point. This aloe is ſingular in not having the bitter reſinous juice with which the leaves of moſt others abound; when a leaf of this ſpecies is cut, what runs from it is watery, colourleſs, and perfectly inſipid.

7. The perfoliata, or ſocotorine aloe, hath long, narrow, ſucculent leaves, which come out without any order, and form large heads. The ſtalks grow three or four feet high, and have two, three, and ſometimes four, of theſe heads branching out from it.

The proper earth for planting theſe vegetables in, is one half freſh light earth from a common, and the reſt an equal mixture of white ſea-ſand and ſifted lime rubbiſh.

The aloe is a kind of ſymbolic plant to the mahometans, eſpecially in Egypt, and in ſome meaſure dedicated to the offices of religion; for whoever returns from a pilgrimage to Mecca, hangs it over his ſtreet door, as a token of his having performed that holy journey.

Aloes is a ſtimulating ſtomachic purge, which, given in ſmall quantities, operates mildly by ſtool; but in large doſes acts roughly, and often occaſions an irritation about the anus, and ſometimes a diſcharge of blood. It is a good opening medicine to people of a coſtive habit, or who live a ſedentary life; and alſo to thoſe whoſe ſtomach and bowels are loaded with phlegm or mucus, or who are troubled with worms, or are debilitated; becauſe at the ſame time that it carries off thoſe viſcid humours which pall the appetite, and overload the inteſtines, it ſerves as a ſtrengthener and bracer.

It is given in ſubſtance from five grains to a ſcruple. As it is a ſlow-working purge; it is generally taken at bed-time, and operates the next day.

ALOETICS, medicines wherein aloes is the chief ingredient.

ALOEUS, a ſpecies of the firſt order of the beetle kind, enumerated by Linnæus. This inſect is a native of America only. See Syſtem of Entomology.

ALOGIANS, in church hiſtory, a ſect of ancient heretics, who denied that Jeſus Chriſt was the Logos, and conſequently rejected the goſpel of St. John. The word is compounded of the privative *α*, and *λογος*, q. d. without Logos or Word. Some aſcribe the origin of the name, as well as of the ſect of Alogians, to Theodore of Byzantium, by trade a currier; who having apoſtatized under the perſecution of the emperor Severus, to defend himſelf againſt thoſe who reproached him therewith, ſaid, that it was not God he denied, but only man. Whence his followers were called in Greek *αλογοι*, becauſe they rejected the word. They made their appearance toward the cloſe of the ſecond century.

ALOGOTROPHIA, among phyſicians, a term ſignifying the unequal growth or nouriſhment of any part of the body.

ALOIDES, in botany, a name given to the freſh-water aloe, which Linnæus calls ſtratiotes.

Aloides, in mythology, two giants, ſaid to be the ſons of Aloeüs, whoſe names were Otus and Ephialtes; they attempted to heap Oſſa on Olympus, and Pelion on Oſſa, in order to climb up to heaven and dethrone Jupiter; but they were ſhot to death by the arrows of Apollo and Diana.

Virgil makes Æneas relate, that he ſaw theſe two giants in hell.

Hic et Aloidas geminos, immania vidi,
Corpora, qui manibus magnum reſcindere cælum
Aggreſſi.

Here lie th'Atlean twins, (I ſaw them both)
Enormous bodies of gigantic growth,
Who dar'd in fight the thund'rer to defy,
Affect his heaven and force him from the ſky.
Dryden.

Mr. Pope's Homer relates, that Mars, the god of War, was ſhut up in priſon by them for thirteen months, till relieved by Mercury.

The mighty Mars in mortal fetters bound,
And lodg'd in brazen dungeons under ground,
Full thirteen moons impriſon'd, roar'd in vain;
Otus and Ephialtes held the chain:
Perhaps had periſh'd, had not Hermes' care,
Reſtor'd the groaning god to upper air.

ALOOF, has frequently been mentioned as a ſea term; in common diſcourſe to imply *at a diſtance*; and the reſemblance of the phraſes *keep a loof*, and *keep a luff*, or *keep the luff*, in all probability gave riſe to this conjecture. It denotes a lee-ſhore, in which ſituation the pilot might naturally apply it in the ſenſe commonly underſtood, viz. keep *all off*, or quite off.

ALOPECIA, a term uſed among phyſicians to denote a total falling off of the hair from certain parts, occaſioned either by the defect of nutritious juice, or by its vicious quality corroding the roots of it, and leaving the ſkin rough and colourleſs.

The word is formed from *αλωπηξ*, *vulpes*, "a fox;" whoſe urine, it is ſaid, will occaſion baldneſs; or becauſe it is a diſeaſe which is common to that creature.

In caſes where the baldneſs is total, a quantity of burdock roots ſhould be bruiſed in a marble mortar, and then boiled in white wine until there remains only as much as will cover them. This liquor, carefully ſtrained off, is a perfect cure for baldneſs, by waſhing the head every night with ſome of it warm. A freſh cut onion, rubbed on the part until it be red and itch, is likewiſe a cure for baldneſs.

ALOPECURUS, or Fox-tail grass, in botany: a genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, *Gramina.*

ALOPEX, in zoology, a ſpecies of the canis, with a ſtrait tail and black tip. It is commonly called the *field fox*.

ALOSA, or Aloxe, the ſhad, or mother of herrings, a ſpecies of the clupea.

ALPHA, the name of the firſt letter of the Greek alphabet, anſwering to our A. As a numeral, it ſtands for one, or the firſt of any thing. It is particularly uſed, among ancient writers, to denote the chief or firſt man of his claſs or rank. In this ſenſe, the word ſtands contradiſtinguiſhed from *beta*, which denotes the ſecond perſon. Plato was called the *Alpha* of the wits: Eratoſthenes, keeper of the Alexandrian library, whom ſome called a Second Plato, is frequently named *beta*.

Alpha is alſo uſed to denote the beginning of any thing. In which ſenſe it ſtands oppoſed to *omega*, which denotes the end. Theſe two letters were made the ſymbols of Chriſtianity; and accordingly were engraven on the tombs of the ancient Chriſtians, to diſtinguiſh them from thoſe of idolaters.

ALPHABET, the natural or cuſtomary ſeries of the ſeveral letters of a language. The word is formed from *alpha* and *beta*, the firſt and ſecond letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The Engliſh alphabet contains 26 letters; the French 23; the Hebrew, the Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perſian 31; the Turkiſh 33; the Georgian 36; the Coptic 32; the Muſcovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spaniſh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Barameſe 19. The Chineſe have, properly ſpeaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,500.

Among the European nations I find none who can pretend any right to the diſcovery of letters. All of them derived the art from the Romans, excepting only the Turks, who had it from the Arabians. The Romans never laid claim to the diſcovery; but confeſſed that they derived their knowledge from the Greeks, and the latter owned that they had it from the Phœnicians; who, as well as their coloniſts the Carthaginians, ſpoke a dialect of the Hebrew ſcarcely varying from the original.

The Coptic, or Egyptian, reſembles the Greek in moſt of its characters, and is therefore to be referred to the ſame original.

The Chaldee, Syriac, and latter Samaritan, are dialects of the Hebrew, without any conſiderable deviation, or many additional words.

The Ethiopic differs more from the Hebrew, but leſs than the Arabic; yet theſe languages have all iſſued from the ſame ſtock, as the ſimilarity of their formation, and the numberleſs words common to them, ſufficiently evince. The Perſic is very nearly allied to the Arabic.

It appears that all the languages in uſe amongſt men that have been conveyed in alphabetical characters, have been the languages of people connected ultimately or immediately with the Hebrews, who have handed down the earlieſt ſpecimens of writing to poſterity; and we have therefore the greateſt reaſon to believe, that their method of writing, as well as their language, was derived from the ſame ſource.

All the alphabets in the world cannot be derived from one original; becauſe there is a variety of alphabets uſed in different parts of Aſia, which vary in name, number, figure, order and power, from the Phœnician, ancient Hebrew, or Samaritan. In ſeveral of theſe alphabets alſo there are marks for ſounds peculiar to the language of the eaſt, which are not neceſſary to be employed in the notation of the languages of Europe.

None of the alphabets to the eaſt of Perſia have any connection with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conqueſts of the Mahometans.

The foundation of all the Indian characters are thoſe called *ſhanſcrit*, or *ſungſkrit*, which ſignifies ſomething brought to perfection, in contradiſtinction to *prakrit*, which ſignifies vulgar or unpoliſhed. Hence the refined and religious language and characters of India are called *Sungſkrit*, and the more vulgar mode of writing and expreſſion *Prakrit*. From the Shanſcrit are derived the ſacred characters of Thibet, the Caſhmirian, Bengaleſe, Malabaric, and Tamoul; the Singaleſe, Siameſe, Maharattan, Concanee, &c.

From the ſame ſource we may derive the Tangutic or Tartar characters, which are ſimilar, in their great outlines, to the Shanſcrit; though it is not eaſily determined which is derived from the other. The common Tartar is generally read, like the Chineſe, from top to bottom.

There are, however, ſeveral alphabets uſed in different parts of Aſia, entirely different, not only from the Shanſcrit and all thoſe derived from it, but alſo from the Phœnician and thoſe which proceed from it. Some of which are the alphabet of Pegu, the *Batta* characters uſed in the iſland of Sumatra, and the *Barman* or *Boman* characters uſed in ſome parts of Pegu.

The names and powers of the letters of which theſe alphabets are compoſed differ entirely from the Phœnician, or thoſe derived from them. It is impoſſible to aſſimilate their forms, and indeed it is by no means eaſy to conceive how the 50 letters of the Shanſcrit language could be derived from the Phœnician alphabet, which conſiſted originally only of 13; though it is certain, that by far the greater number of alphabets now in uſe are derived from the ancient Hebrew, Phœnician, or Samaritan.

From the ancient Hebrew proceeded the Chaidal, or ſquare Hebrew; the round Hebrew; and what is called the *running hand of Rabbins*.

The Pelaſgian gave birth to the Etruſcan, Eugubian, or Umbrian, Oſcan, Samnite, and Ionic Greek, written from the left.

From the Chaldaic, or ſquare Hebrew, are derived the Syriac, and the antient and modern Arabic.

The Syriac is divided into the Eſtrangelo and Mendæan, and the modern Arabic has given riſe to the Perſian and Turkiſh.

From the ancient Arabic are derived the Kufic or Oriental, the Mauritanic or Occidental; the African or Saracen, and the Mooriſh.

The Ionic Greek gave riſe to the Arcadian, Latin, ancient Gauliſh, ancient Spaniſh, ancient Gothic, Coptic, Ethiopic, Ruſſian, Illynian or Sclavonic, Bulgarian and Armenian.

From the Roman are derived the Lombardic, Viſigothic, Saxon, Gallican, Franco-Gallic or Merovingian, German, Caroline, Capetian, and modern Gothic.

The Punic letters are ſometimes called Tyrian, and were much the ſame with the Carthaginian or Sicilian. The Punic language was at firſt the ſame with the Phœnician; it is nearly allied to the Hebrew, and has an affinity with the Chaldee and Syriac. Some remains of it are to be met with in the Malteſe.

The Pelaſgi were likewiſe of Phœnician original; and, according to Sanconiatho, the Dioſcuri and Cabiri wrote the firſt annals of the Phœnician hiſtory, by order of Taaut the inventor of letters.

They made ſhips of burthen, and being caſt upon the coaſt near mount Caſius, about 40 miles from Peluſium, where they built a temple in the ſecond generation after the deluge related by Moſes, they were called *Pelaſgi* from their paſſing by ſea, and wandering from one country to another.

Herodotus informs us, that the Pelaſgi were deſcendants of the Phœnician Cabiri, and that the Samothracians received and practiſed the Cabiric myſteries from them.

The Pelaſgic alphabet prevailed in Greece till the time of Deucalion, when the Pelaſgi were driven out of Theſſaly or Oenotria by the Hellenes; after which ſome of them ſettled at the mouth of the Po, and others at Croton, now Cartona in Tuſcany.

Their alphabet conſiſted of 16 letters, and the Tyrrhenian alphabet, brought into Italy before the reign of that prince, conſiſted of no more than 13.

Deucalion is ſaid to have reigned about 820 years after the deluge, and 1529 before the Chriſtian æra.

That the Tyrrheni, Tyrſeni, or Hetruſci, ſettled in Italy long before this period, appears from the teſtimony of Herodotus, who informs us, that a colony went by ſea from Lydia into Italy under Tyrrhenus; and Dionyſius of Halicarnaſſus proves that many authors called them Pelaſgi. He then cites Hellanicus Leſbicus, an author ſomewhat more ancient than Herodotus, to prove, that they were firſt called *Pelaſgi Tyrrheni*; and when they paſſed into Italy, they ſettled in that part of it called *Etruria*.

Their emigration took place about the year of the world 2011, or 1993 years before the Chriſtian æra, which is 350 years before the Pelaſgi left Greece. Several Roman authors alſo ſpeak of this Lydian colony; and Horace compliments his patron Mæcenas upon his Lydian deſcent:

Lydorum quicquid Etruſcos
Incoluit fines, nemo generoſior eſt te.

The Etruſcan letters are Pelaſgic, and ſeveral of the Etruſcan inſcriptions are written in the Pelaſgic language.

The Roman letters are Ionic. The Oſcan language was a dialect of the Etruſcan; their characters are nearer the Ionic or Roman than the Etruſcan. There is alſo very little difference between the Pelaſgian, Etruſcan, and moſt antient Greek letters, which are placed from right to left.

The Arcadians were ancient Greeks, and uſed the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uncertain.

The Etruſcan, Oſcan, and Samnite alphabets, are derived from the Pelaſgic; they differ from each other more in name than in form, but a far greater number are derived from the Ionic Greek; viz. the Arcadian, the Latin or Roman, and the others already enumerated. The Runic is derived from the Gothic.

According to Dionyſius of Halicarnaſſus, the firſt Greek colony which came into Italy conſiſted of Arcadians under the conduct of Oenotrus the ſon of Lycaon, and fifth in deſcent from Phoroneus the firſt king of Argos, who reigned about 566 years before the taking of Troy, and 1750 years before the Chriſtian æra.

Theſe Oenotrians were called Aborigines; and after they had been engaged for many years in a war with the Siculi, entered into an alliance with a colony of the Pelaſgi, who came out of Theſſaly into Italy, after having been driven from the former country. About 1476 B. C. another colony of the Pelaſgi, who had been driven out of Theſſaly by the Coretes and Leleges, arrived in Italy, where they aſſiſted the Aborigines to drive out the Siculi; poſſeſſing themſelves of the greateſt part of the country between the Tiber and Liris, and building ſeveral cities.

Solinus and Pliny tell us, that the Pelaſgi firſt carried letters into Italy; and the latter diſtinguiſhes between the Pelaſgi and the Arcades: ſo the letters firſt carried into Italy were not the Ionic Greek, but thoſe more ancient Pelaſgi characters, which the Pelaſgi carried with them before Deucalion and Cadmus are ſaid to have come into Bœotia and Theſſaly.

The ſtory of Cadmus is much involved in fable; but it is agreed by moſt of the ancients, that the children of Agenor, viz. Cadmus, Europa, Phœnix, and Cilix, carried with them a colony, compoſed of Phœnicians and Syrians, into Aſia Minor, Crete, Greece, and Lybia, where they introduced letters, muſic, poetry, and other arts, ſciences, and cuſtoms, of the Phœnicians.

Dionyſius enumerates the following Greek colonies which came into Italy: 1. The Aborigines under Oenotrus from Arcadia. 2. The Pelaſgic colony which came from Hœmonia or Theſſaly. 3. Another Arcadian colony, which came with Evander from Pallantium. 4. Thoſe who came from Peloponneſus with Hercules; and, 5. Thoſe who came with Æneas from Troy.

It is not eaſy to diſcover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not univerſally prevail even in Greece till ſeveral ages after it was found out.

The Athenians did not comply with it till the year of Rome 350; nor was it practiſed by the Samnites even in the ſixth century of that city, or 230 years before Chriſt: for M. Gæbelin, Vol. VI. pl. 2. gives us the Samnite alphabet of that century, wherein the letters are placed from right to left; although the Ionic way of writing prevailed in ſome parts of Italy in the third century of Rome. "In time, ſays Pliny, the tacit conſent of all nations agreed to uſe the Ionic letters. The Romans conſented to this mode about the time of Tarquinius Priſcus their fifth king."

After the Romans had eſtabliſhed the uſe of the Ionic letters, they ſeem not to have acknowledged the Pelaſgian and Etruſcan to have been Greek alphabets: the moſt learned of them knew none older than the Ionic, as appears from the Greek Farneſe inſcriptions of Herodes Atticus.

The ancient Gauliſh letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inſcription of Gordian, meſſenger of the Gauls, who ſuffered martyrdom in the third century with all his family. The Gauliſh characters were generally uſed by that people before the conqueſt of Gaul by Cæſar; but after that time the Roman letters were gradually introduced.

The ancient Spaniards uſed letters nearly Greek before their intercourſe with the Romans.

The ancient Gothic alphabet was very ſimilar to the Greek, and is attributed to Ulphilas, biſhop of the Goths, who lived in Mæſia about 370 years after Chriſt. He tranſlated the bible into the Gothic tongue. This circumſtance might have occaſioned the tradition of his having invented theſe letters; but it is probable that theſe characters were in uſe long before this time.

The Runic alphabet is derived from the ancient Gothic.

The Coptic letters are derived immediately from the Greek. Some have confounded them with the ancient Egyptian; but there is a very material difference between them. The Ethiopic alphabet is derived from the Coptic.

The alphabet proceeding from that of the Scythians, eſtabliſhed in Europe, is the ſame with what St. Cyril calls the *Servien*.

The Ruſſian, Illyrian or Sclavonic, and the Bulgarian, are all derived from the Greek.

The Armenian letters differ very much from the Greek, from which they are derived, as well as from the Latin.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuſcripts of Italy; the Viſigothic to thoſe of Spain; the Saxon to thoſe of England; the Gallican and Franco-Gallic or Merovingian to the manuſcripts of France; the German to thoſe of that country; and the Caroline, Capetian, and Modern Gothic, to all the countries of Europe who read Latin.

The firſt ſix of theſe alphabets are before the age of Charlemagne, the laſt three poſterior to it.

They are more diſtinguiſhed by their names than the forms of their characters, and the former indicate all of them to have been of Roman extractions.

The Viſigoths introduced their form of writing into Spain, after having over-run that country; but it was aboliſhed in a provincial ſynod held at Leon in 1091, when the Latin characters were eſtabliſhed for all public inſtruments, though the Viſigothic were uſed in private writings, for three centuries afterwards.

The Gauls, on being ſubjected by the Romans, adopted their manner of writing; but by ſubſequent additions of their own, their characters were changed into what is called the Gallican or *Roman Gallic* mode. This was changed by the Franks into the *Franco-Gallic* or *Merovingian* mode of writing, being practiſed under the kings of the Merovingian race. It took place towards the cloſe of the ſixth century, and continued till the beginning of the ninth.

The German mode of writing was improved by Charlemagne, and this improvement occaſioned another diſtinction in writing by introducing the alphabet named Caroline, which declined in the 12th century, and was ſucceeded in the 13th by the modern Gothic. In France it had degenerated by the middle of the 10th century, but was reſtored in 987 by Hugh Capet, whence it obtained the name of Capetian. It was uſed in England as well as Germany and France.

The modern Gothic, which ſpread itſelf all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently uſed by the Goths. It is, however, the worſt and moſt barbarous way of writing, and originated among the ſchoolmen in the decline of the arts; being indeed nothing elſe than Latin writing degenerated. It began in the 12th century, and was in general uſe, eſpecially among monks and ſchoolmen, in all parts of Europe, till the reſtoration of arts in the 15th century, and continued longer in Germany and the northern nations. Our ſtatute-books are ſtill printed in Gothic letters.

The idea that all the alphabets now mentioned are derived from the Roman, tends to prove the diſtinction of national writing, and is of great uſe in diſcovering the age of manuſcripts: for though we may not be able exactly to determine the time when a manuſcript was written, we may be able nearly to aſcertain its age.

The learned author of Hermes informs us, that to about 20 plain elementary ſounds, we owe that variety of articulate voices which have been ſufficient to explain the ſentiments of ſuch an innumerable multitude as all the paſt and preſent generations of men. Mr. Sheridan ſays, that the number of ſimple ſounds in our tongue are 28; while Dr. Kenrick aſſerts, that we have only 11 diſtinct ſpecies of articulate ſounds, which, even by contraction, prolongation, and compoſition, are increaſed only to the number of 16; every ſyllable or articulate ſound in our language being one of the number. Biſhop Wilkins, and Dr. William Holder ſpeak of 33 ſounds. But the late ingenious and learned John Herries, M. A. has given an elegant ſcale, wherein he proves, that there are exactly 29 ſounds in the Engliſh language.

After the analyſis or decompoſition of language into the elementary ſounds, the next ſtep towards the notation of it by alphabetical characters, would be the delineation of a ſeparate mark ot letter to repreſent each ſound; which marks, though few in number, would admit of ſuch a variety of arrangements and combinations, as might be capable of producing that infinity of articulate ſounds which compoſe the language.

The very numerous combinations of the twenty-four letters, even without any repetition, amount to no fewer than 620,448,401,733,239,439,360,000; and much more than ſufficient to expreſs all the ſounds that ever were articulated by man.

As there are more ſounds in ſome languages than in others, it follows of courſe, that the number of elementary characters, or letters, muſt vary in the alphabets of different languages.

ALPHÆNIX, white barley-ſugar, to which is given an extraordinary name, to render it more valuable. This ſugar, which is thought good for colds, is made of common ſugar, which is boiled until it becomes eaſy to crack, when they pour it upon a marble table, greaſed with oil of ſweet almonds, and mould it into various figures with a braſs crotchet.

ALPHERATZ, in aſtronomy, a fixed ſtar of the third magnitude in Aquarius.

ALPHESERA, in botany, a ſynonime of the plant bryony.

ALPHESTES, in ichthyology, a name given by Geſner to the cinædus.

ALPHETA, in aſtronomy, a fixed ſtar in the lucida coronæ.

ALPHITIDON, in ſurgery, a ſpecies of fracture, by which the bone is broke into a great number of ſmall parts.

ALPHONSIN, in ſurgery, an inſtrument for extracting bullets from gun-ſhot wounds. This inſtrument derives its name from the inventor, Alphonſus Ferrier, a phyſician of Naples. It conſiſts of three branches, which are cloſed by a ring. When cloſed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball, and then the ring is puſhed from the haft, by which means the branches graſp the ball ſo firmly, as to extract it from the wound.

ALPHOS, in medicine, implies a white or black ſcurf, like ſcales, on the ſkin; which commonly proceeds from a ſcorbutic habit.

ALPINIA, in botany, a genus of the monogynia order, belonging to the monandria claſs of plants; and in the natural method ranking under the ſame order, Scitamineæ. For the characters ſee Syſtem of BOTANY. Of this genus there is but one ſpecies, which is a native of the Weſt Indies, where it grows naturally in moiſt places. The leaves decay every winter, and are puſhed out from the roots in the ſpring, like the ginger and maranta; ſo muſt be managed in the ſame manner as directed for theſe two plants, and may be propagated by parting the roots when the leaves decay.

ALPISTE, or ALPIA, a ſort of ſeed uſed to feed birds with, eſpecially when they are to be nouriſhed for breeding. The Alpiſte ſeed is of an oval figure, of a pale yellow, inclining to an iſabel colour, bright and gloſſy. It is an article of the cornchandlers and ſeedſmens trade.

ALQUIER, a liquid meaſure, uſed in Portugal to meaſure oil, two of which make an almond.

ALQUIFOU, or ARQUIFOU, is a ſort of lead-ore, which, when broken, looks like antimony. It is uſed by the potters to give a green varniſh to their works, and thence is called potter's ore. It is met with in Cornwall, &c. The potters mix a ſmall portion of manganeſe with the alquifou, and then the varniſh or glazing on their ware is of a blackiſh hue.

ALRAMECH, or ARAMECH, a name given to Arcturus by the Arabic aſtronomy.

ALRAUPE, in ichthyology, a ſynonime of the gadus.

ALRUKAK, in the art of medicine, a ſpecies of frankincenſe.

ALRUM, in botany, a name given to the tree which produces the bdellium.

ALSAHARATICA, in botany, a ſynonime of the herb feverfew.

ALSCNEFU, in botany, a ſynonime of the herb wormwood.

ALSEBON, in chemiſtry, ſignifies ſea ſalt.

ALSIMEL, in medicine, a ſynonime of the Indian ſpikenard.

ALSINA, in botany, a ſynonime of the theligonum.

ALSINASTRUM, in botany, the trivial name and alſo a ſynonime of the elatine.

ALSINE, or Chickweed, a genus of the trigynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 22d order, Caryophyllei. For the characters, ſee Syſtem of Botany. Of this genus a great number of ſpecies are enumerated by botanical writers; but none of them poſſeſs any remarkable properties, except the media, or common chickweed, with white bloſſoms, which is ſo well known as to need no particular deſcription.

This ſpecies affords a ſtriking inſtance of what is called the *ſleep of plants:* for, every night, the leaves approach in pairs, ſo as to include within their upper ſurfaces the tender rudiments of the new ſhoots; and the uppermoſt pair but one at the end of the ſtalk are furniſhed with longer leaf-ſtalks than the others; ſo that they can cloſe upon the terminating pair, and protect the end of the branch.

The young ſhoots and leaves, when boiled, can hardly be diſtinguiſhed from ſpring ſpinach. They are deemed refrigerating and nutritive, and an excellent food for perſons of a conſumptive habit of body.

ALSTONIA, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants. For the characters, ſee Syſtem of Botany. There is but one ſpecies, the theaformis, a native of America.

ALSTROEMERIA, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 11th order, Sarmentaceæ. For its characters, ſee Syſtem of Botany. There are five ſpecies, natives of Italy and Peru.

ALT, in muſic, a term applied to the high notes in the ſcale.

ALTAIC Chain, a range of mountains which bounds Aſia on the ſouth.

ALTAR, a place upon which ſacrifices were anciently offered to ſome deity.

The heathens at firſt made their altars only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as that of Apollo in Delos.

Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſenting either the gods to whom they were erected, or their ſymbols.

The height of their altars differed according to the various gods to whom they ſacrificed.

According to Servius, thoſe altars, ſet apart for the honour of the celeſtial gods, were placed on a tall pile of building; and for that reaſon were called *altaria*, from the words *alta* and *ara*, " a high elevated altar."

Thoſe appointed for the terreſtrial gods were laid on the ſurface of the earth, and called *aræ*.

And, on the contrary, they dug into the earth and opened a pit for thoſe of the infernal gods, which they called βοθροι λακκοι, ſcrobiculi. But this diſtinction is not generally obſerved: the beſt authors frequently uſe *ara* as a general word, under which are included the altars of the celeſtial and terreſtrial, as well as thoſe of the infernal gods. Witneſs Virgil, En. 12. v. 201.

> *Tango aras, medioſque ignes, & numina teſtor,*
> *Nulla dies pacem hanc Italis, nec fœdera rumpet.*
>
> " I touch the ſacred altars, touch the flames,
> " And all thoſe powers atteſt, and all their names;
> " Whatever chance befel on either ſide,
> " No term of time this union ſhall divide."

Where *aræ* plainly includes *altaria*; for whatever we make of Daphnis, Phœbus was certainly a celeſtial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus.*

The Greeks alſo diſtinguiſhed two ſorts of altars; that whereon they ſacrificed to the gods was called βωμος, and was a real altar, different from the other whereon they ſacrificed to the heroes, which was ſmaller, and called εσχαρα.

Pollux makes this diſtinction of altars in his Onomaſticon; he adds, however, that ſome poets uſed the word εσχαρα for the altar whereon ſacrifice was offered to the gods.

The Septuagint verſion does ſometimes alſo uſe the word εσχαρα, for a ſort of little low altar, which may be expreſſed in Latin by *craticula*; which implies a hearth rather than an altar.

Before temples were in uſe, altars were erected in groves, highways, and on the tops of mountains; and the name, enſign, or character, of the deity to whom they were conſecrated, engraved on the front or face of them.

In the great temples of ancient Rome there were ordinarily three altars: The firſt was placed in the ſanctuary, at the foot of the ſtatue of the divinity, upon which incenſe was burnt and libations offered; the ſecond was before the gate of the temple, upon which they ſacrificed the victims; and the third was a portable altar, upon which were placed the offering and the ſacred veſſels.

Beſides theſe uſes of altars, the ancients ſwore upon them, and ſwore by them, in making alliances, confirming treaties of peace, and other ſolemn occaſions. Altars alſo ſerved as places of refuge to all thoſe who fled to them, for whatever crime they might have committed.

Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world.

Altars, in the patriarchal times, were very rude. The altar which Jacob ſet up at Beth-el was nothing but a ſtone, which ſerved him inſtead of a bolſter; that of Gideon, a ſtone before his houſe: and the firſt which God commanded Moſes to erect was probably of earth, or unpoliſhed ſtones, without any iron; for if any uſe was made of that metal, the altar was declared impure.

The principal altars of the Jews were, The altar of *incenſe*; that of *burnt-offering*; and the *altar*, or *table, for the ſhew-bread*.

The *altar of incenſe* was a ſmall table of ſhittim-wood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the four corners, were four kinds of horns, and all round a little border or crown over it.

This was the altar hidden by Jeremiah before the captivity; and upon it the officiating prieſt offered, every morning and evening, incenſe of a particular compoſition.

The *altar of burnt offerings* was made of ſhittim-wood, and carried upon the ſhoulder of the prieſts by ſtaves of the ſame wood overlaid with braſs.

In the time of Moſes, this altar was five cubits ſquare and three high; but in Solomon's temple it was much larger, being 20 cubits ſquare and 10 in height. It was covered with braſs; and at each corner was a horn or ſpire, wrought out of the ſame wood with the altar, to which the ſacrifices were tied. Within the hollow was a grate of braſs, on which the fire was made; through it fell the aſhes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the ſmoke of the burnt-offerings might not ſully the inſide of the tabernacle.

The *altar*, or *table*, for the *ſhew-bread*, was likewiſe of ſhittim-wood, covered with plates of gold, having a little border round it, adorned with ſculpture. It was two cubits long, one wide, and one and an half in height. Upon this table, which ſtood in the holy of holies, were put every ſabbath-day, 12 loaves, with ſalt and incenſe.

The Jewiſh altars, after their return from the captivity, and the building of the ſecond temple, were in ſome reſpects different from thoſe deſcribed above. That of burnt-offerings was a large pile, built of unhewn ſtone, 32 cubits ſquare at the bottom, and 24 ſquare at the top. The aſcent was by a gentle riſing, 32 cubits in length, and 16 in breadth.

Altar is alſo uſed among Chriſtians for the communion-table.

In the primitive church, the altars were only of wood; as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar ſhould be built but of ſtone. At firſt there was but one altar in each church; but the number ſoon increaſed; and from the writings of Gregory the Great, who lived in the ſixth century, we learn, that there were ſometimes in the ſame church 12 or 13.

In the cathedral of Magdeburg there are no leſs than 49 altars.

The altar is ſometimes ſuſtained on a ſingle column, as in the ſubterraneous chaples of St. Cecilia, at Rome, &c. and ſometimes by four columns, as the altar of St. Sebaſtian of Crypta Arenaria; but the cuſtomary form is, to be a maſſive of ſtone-work, ſuſtaining the altar-table.

Theſe altars bear a reſemblance to tombs: to this purpoſe, we read in church hiſtory, that the primitive Chriſtians chiefly held their meeting at the tombs of the martyrs, and celebrated the myſteries of religion upon them; for which reaſon, it is a ſtanding rule to this day in the church of Rome never to build an altar, without incloſing the relics of ſome ſaint in it.

ALTAR Thane, or Altariſt, in old law-books, an appellation given to the prieſt or parſon of a pariſh, to whom the the altarage belonged.

ALTARAGE, in law, altars erected in virtue of donations, before the Reformation, within a parochial church, for the purpoſe of ſinging of maſs for deceaſed friends.

Altarage likewiſe ſignifies the profits ariſing to the prieſt on account of the altar.

ALTARIST, in eccleſiaſtical hiſtory, denotes the vicar of a church: figuratively implying, that the altar procured him a livelihood. The word is uſed in modern church hiſtory for a chaplain.

ALTASRIF, in medical hiſtory, denotes the fundamentals of the Arabian principles of the art of healing.

ALTAVELA, in ichthyology, ſignifies a particular ſpecies of the aquila marina kind, common in the markets of the Mediterranean, and very good for food.

ALTERANTS, or ALTERATIVE *Medicines*, ſuch as correct the bad qualities of the blood and other humours, without occaſioning any ſenſible evacuation.

ALTERATION, in phyſics, the act of changing the circumſtances and manner of a thing; its general nature and appearance remaining the ſame. Or, an accidental and partial change in a body; without proceeding ſo far as to make the ſubject quite unknown, or to take a new denomination thereupon. By this *alteration* is diſtinguiſhed from *generation* and *corruption*; thoſe terms expreſſing an acquiſition or loſs of the eſſential qualities of a thing.

ALTERCATION, a debate or conteſt between two friends or acquaintance. The word comes from *altercari*, which anciently ſignified, to converſe, or hold diſcourſe together.

ALTERN-BASE, in trigonometry, a term uſed in contradiſtinction to the true baſe. Thus in oblique triangles, the true baſe is either the ſum of the ſides, and then the *difference* of the ſides is called the *altern-baſe*; or the true baſe is the difference of the ſides, and then the *ſum* of the ſides is called the *altern-baſe*.

ALTERNATE, in a general ſenſe, a term applied to ſuch perſons or things as ſucceed each other by turns.

ALTERNATE, in heraldry, is ſaid in reſpect of the ſituation of the quarters. Thus the firſt and fourth quarters, and the ſecond and third, are uſually of the ſame nature, and are called *alternate quarters*.

ALTERNATE, in botany, ſignifies when the leaves or branches of plants ariſe higher on oppoſite ſides alternately.

ALTERNATION, in its primary ſenſe, denotes a ſucceſſion by turns.

ALTERNATION is ſometimes uſed to expreſs the different changes or alterations of orders in any number of things propoſed; which is alſo called *permutation*, and eaſily found by continual multiplication of all the numbers, beginning at unity.

ALTERNATIVE is particularly uſed for the choice of two things propoſed. In this ſenſe we ſay, to take the *alternative* of two propoſitions.

ALTHÆA, MARSHMALLOW, a genus of the polyandria order, belonging to the monodelphia claſs of plants; and, in the natural method, ranking under the 37th order, *Columniferæ*. For the characters, ſee Syſtem of BOTANY. There are three ſpecies of this plant, viz.

1. The vulgaris, or common marſhmallow, a native of Britain; it is a perennial plant, and has an annual ſtalk, which periſhes every autumn. 2. The hirſuta, or hairy marſhmallow, is a native of Spain and Portugal. 3. The cannabina, or ſhrubby marſhmallow, is a native of Hungary and Iſtria. Though the firſt ſort is found naturally in ſalt marſhes, it will thrive when tranſplanted into any ſoil, or in any ſituation; however, it will always grow larger in moiſt than in dry ſoil. If the ſeeds of the ſecond ſpecies are ſown in April, the plants will flower in July, and carry ripe ſeed in September. The ſeeds of the cannabina ought alſo to be ſown where the plants are to remain, and have a ſheltered ſituation and a dry ſoil, otherwiſe they will not live through the winter.

The hirſuta, or hairy marſhmallow, is the only ſpecies uſed in medicine. The whole plant, eſpecially the root, abounds with a mild mucilage. It has the general virtues of an emollient medicine; and proves ſerviceable in a thin acrimonious ſtate of the juices, and where the natural mucus of the inteſtines is abraded. It is chiefly recommended in ſharp defluxions upon the lungs, hoarſeneſs, dyſenteries; and likewiſe in nephritic and calculous complaints; not, as ſome have ſuppoſed, that this medicine has any peculiar power of diſſolving or expelling the calculous; but as, by lubricating and relaxing the veſſels, it procures a more free and eaſy paſſage. The root is ſometimes employed externally for ſoftning and maturating hard tumours; chewed, it is ſaid to give eaſe in difficult dentition of children.

This root gave name to an officinal ſyrup, decoction, and ointment; and was likewiſe an ingredient in the compound powder of gum tragacanth, and the oil and plaſter of mucilages. But of all theſe formulæ the ſyrup alone is now retained.

ALTIMETRY, the art of meaſuring altitudes or heights, whether acceſſible or inacceſſible.

ALTIN, a money of account in Muſcovy, worth three *copecs*; one hundred of which make a ruble, worth about 4s. 6d. ſterling.

ALTINCAR, among mineraliſts, a ſpecies of factitious ſalt uſed in the fuſion and purification of metals.

It is a ſort of flux powder, and divers ways of preparing it are given by Libavius.

ALTITUDE, in a general ſenſe, implies, height or diſtance from the ground meaſured upward.

The method of taking conſiderable terreſtrial altitudes, of which thoſe of mountains are the greateſt, by means of the barometer, is very eaſy and expeditious. It is done by obſerving, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain.

ALTITUDE *of the Eye*, in perſpective, is a right line let fall from the eye, perpendicular to the geometrical plane.

ALTITUDE, in aſtronomy, is the diſtance of a ſtar, or other point, in the mundane ſphere, from the horizon.

This altitude may be either *true* or *apparent*. If it be taken from the rational or real horizon, the altitude is ſaid to be true or real; if from the apparent or ſenſible horizon, the altitude is apparent. Or rather, the apparent altitude is ſuch as it appears to our obſervation; and the *true* is that from which the refraction has been ſubtracted.

The true altitudes of the ſun, fixed ſtars, and planets, differ but very little from the apparent altitudes; becauſe of their great diſtance from the centre of the earth, and the ſmallneſs of the earth's ſemidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52′.

ALTITUDE *Inſtrument*, or *Equal Altitude Inſtrument*, is that uſed to obſerve a celeſtial object when it has the ſame altitude on the eaſt and weſt ſides of the meridian.

ALTO *et Baſſo*, or *in Alto & in Baſſo*, in law, ſignifies the abſolute reference of all differences, ſmall and great, high and low, to ſome arbitrator or indifferent perſon.

ALTO *Relievo*, ſynonimous with RELIEVO.

ALTO *Ripieno*, in muſic, the tenor of the grand chorus which ſings and plays only now and then in ſome particular places.

ALTOLIZOIM, in chemiſtry, denotes the latum paracelſi, reduced to an oil, ſometimes called fel terræ, or bitter ſalt.

ALTUMAL, in commerce, a low method of phraſeology, to communicate crafty dealings to perſons of the ſame trade.

ALVAH, ſuppoſed by ſome to be the name of the wood wherewith Moſes ſweetened the waters of Marah, Exod. ch. xv. ver. 25. The name of this wood is not found in Scripture; but the Mahometans give it that of *alvah*, and pretend to trace its hiſtory from the patriarchs before the flood. Joſephus, on the contrary, ſays, that Moſes uſed the wood which he found next lying before him.

ALVARID, in antient hiſtory, ſignifies the ſame as of the preſent Spaniſh magiſtracy called Alcaida.

ALVARISTS, in church hiſtory, a ſectuary of religious profeſſors, partly Jeſuits and partly Janſeniſts.

ALUCITÆ, in entomology, a ſubdiviſion in the Linnæan ſyſtem of the genus of phalæna, or nocturnal butterflies, comprizing eight ſpecies.

ALUCO, in ornithology, a ſynonime of the church or white owl.

ALUDELS, in chemiſtry, earthen pots without bottoms, inſerted into each other, and uſed in ſublimations.

ALVEARIUM, in anatomy, the bottom of the concha or hollow of the outer ear.

ALVEARIUM alſo ſignifies a bee-hive. The word is formed of *alveus*, a channel or cavity; in alluſion to the *alveoli*, or cells in bee-hives.

Some of the ancients uſe alſo the word *alvearium* for a bee-houſe, more uſually called among us *apiary*.

ALVEARIUM is ſometimes alſo uſed figuratively, to denote a collection. In which ſenſe, *alvearium* amounts to much the ſame with what we otherwiſe call *theſaurus, cornucopia*, or the like.

ALVEOLI, or ALVEOLUS, in anatomy, the ſockets wherein the teeth are ſet in the jaw. See Syſtem of ANATOMY.

ALVEOLI, in natural hiſtory, implies the holes wherein bees depoſit their honey in the combs.

ALUESEN, in botany, a ſynonime of hogs fennel.

ALVEOLUS, in natural hiſtory, the name of the waxen cells in bee-hives. Alſo the name of a ſea-foſſil of a conic figure, compoſed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

ALVEUS, is a general word for any channel wherein a liquid can flow: and therefore is often met with in the writings of various authors of antiquity, particularly on the ſubjects of Aſtronomy, Anatomy, and Navigation.

In Roman antiquity, we find the legend of Romulus and Remus being expoſed in a ſmall alveus, made of the rind or bark of an elm tree.

ALUM, a clear and tranſparent ſaline matter, uſually ſold in large maſſes, of a very auſtere and aſtringent taſte, uſeful in medicine, and in various arts.

Moſt of the alum to be met with is artificially prepared by chemical operations, though ſometimes a ſmall quantity is produced naturally. This native alum is mixed with heterogeneous matters, or effloreſces in various forms upon the ores during calcination. It rarely occurs in a cryſtallized ſtate, though thus it is ſaid to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in the waters, impregnated with fixed air, but very ſeldom in fountains or hot medicated waters.

There are ſeveral kinds of alum to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kind. That called the Roman alum has been conſidered as preferable to any other. This is uſually met with in ſmall chryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation.

This ſalt is extremely uſeful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwiſe would either not adhere in any degree, or only for a very ſhort time. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation of Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not ſaturated by the colouring matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum likewiſe, according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in making of candles; for being mixed with the tallow, it gives it an hardneſs and conſiſtence which it has not naturally. Wood or even paper ſufficiently ſoaked in a ſolution of alum does not eaſily take fire, the latter of which is for that reaſon very properly employed in preſerving gun-powder, as it alſo excludes the moiſture of the air. Paper impregnated with alum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſion of the ſkins almoſt entirely deſtroyed by the lime.

In medicine it is of conſiderable uſe as an aſtringent and tonic. It is reckoned particularly ſerviceable for reſtraining hemorrhages, and immoderate ſecretions from the blood; but leſs proper in inteſtinal fluxes. In violent hemorrhages, it may be given in doſes of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other caſes ſmaller doſes are more adviſable; large ones being apt to nauſeate the ſtomach, and occaſion violent conſtipations of the bowels.

It is uſed alſo externally, in aſtringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in caſes of colic. In ſuch inſtances, when taken to the extent of a ſcruple for a doſe, it has been ſaid gently to move the belly, and give very great relief from the ſevere pain.

Its officinal preparations are, for internal uſe, *pulvis ſtypticus*, and *aqua ſtyptica* for external applications, the *aqua aluminis*, and *coagulum aluminis* and *alumen uſtum*; which laſt is no other than the alum dried by fire, or freed from the watery moiſture, which, like other ſalts, it always retains in its cryſtalline form.

By the loſs of its water it becomes ſharper, ſo as to act as a ſlight eſcharotic: and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally.

The manufacture of alum was firſt invented in the year 1608, and ſucceſſively practiſed in England, meeting with great encouragement in Yorkſhire, where it was firſt made, from Lord Sheffield, and other gentlemen of that county. King James I. by advice of his miniſtry, aſſumed the monopoly of it to himſelf, and therefore prohibited the importation of foreign alum; and in 1625, the importation of it was further prohibited by the proclamation of Charles I.

Alum *Works*, places where alum is prepared, and manufactured in quantities for ſale. They differ from alum-mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALVIDUCA, in medicine, imply thoſe remedies which are of a laxative or purgative nature.

ALVUS, in anatomy, a term uſed for the belly in general, but more frequently applied to the bowels.

AL-UZZA, in mythology, an ancient Arabian idol, which was demoliſhed by Mahomet in the 8th year of the Hegira.

ALWAIDII, a ſect of Mahometans who believe all great crimes to be unpardonable.

ALYPIAS, or Alypon, among phyſicians, denotes a ſpecies of turbith, uſed as a preſcription for purging the bile.

ALYPUM, a ſynonymous word for dogs-bane, ſpurge and globularia, in botanical deſcriptions of plants.

ALYSSUM, Allyson, or Allysoides, madwort; (from αλυσσω; *to be mad*; becauſe it was believed to have the property of curing madneſs) a genus of the filiculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, *Siliquoſa*. For the characters, ſee Syſtem of Botany.

Of this genus, Linnæus enumerates 19 ſpecies; but none of them are remarkable either for beauty, or any other property, except the halimifolium, or madwort with whole ſpear-ſhaped leaves.

Though theſe plants are natives of the ſouthern parts of Europe; yet, if planted on a dry, lean, or rubbiſhy ſoil, they will endure our ſevereſt winters in the open air. They may alſo be propagated by cuttings, which ought to be planted in April or May, and are very likely to take root, if kept ſhaded in the heat of the day, and gently refreſhed with water.

ALYTARCHA, a prieſt of Antioch in Syria, who, in the games inſtituted in honour of the gods, preſided over the officers who carried rods to clear away the crowd and keep order.

In the Olympic games, the alytarches had the ſame command, and obliged every perſon to preſerve order and decency.

ALZAGIAT, in medical authors, generally imports vitriolic acids.

ALZUM, in botany, implies the tree which produces the bdellium gum; and is a ſynonime of aldum, the proper name of that tree.

AMA, in eccleſiaſtical writers, denotes a veſſel wherein wine, water, or the like, was held, for the ſervice of the euchariſt. In this ſenſe the word is alſo written amula; and frequently hama, and hamula.

Ama is ſometimes alſo uſed for a wine-meaſure, as a caſk, pipe, or the like.

AMABYR, a cuſtom which formerly prevailed in ſeveral parts of England and Wales, being a ſum of money paid to the lord when a maid was married within his lordſhip. The word is old Britiſh, and ſignifies "the price of virginity."

AMADOW, a kind of black-match, tinder, or touch-wood, which comes from Germany. It is made of a ſort of large muſhrooms, or ſpungy excreſcences, which commonly grow on old trees, eſpecially oaks, aſh, and firs. This ſubſtance being boiled in common water, and afterwards dried and well beaten, is then put into a ſtrong lye prepared with ſalt-petre, after which it is again put to dry in an oven. Some give to the amadow the name of *Pyrotechnical Spunge*, becauſe of its aptneſs to take fire.

AMADOWRY, a kind of cotton which comes from Alexandria, by way of Marſeilles.

AMAIN, in the ſea-language, a term importing to lower ſomething at once. Thus to *ſtrike amain*, is to lower, or let fall, the top-ſails; to *wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their top-ſails.

AMALGAM, or Amalga, mercury united with ſome metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal.

For the combination of one metal with another, it is generally ſufficient that one of them be in a ſtate of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; nevertheleſs, heat conſiderably facilitates the operation.

To amalgamate without heat requires nothing more than mixing the two metals together in a mortar; but the metal to be united with the mercury ſhould be previouſly divided into very thin plates or grains. When heat is uſed (which is always moſt effectual, and with ſome metals indeſpenſably neceſſary), the mercury ſhould be heated till it begins to ſmoke, and the grains of metal made red-hot before they are thrown into it. If it be gold or ſilver, it is ſufficient to ſtir the fluid with an iron rod for a little while, and then throw it into a veſſel filled with water. This amalgam is uſed for gilding or ſilvering on copper, which is afterwards expoſed to a degree of heat ſufficient to evaporate the mercury.

Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of theſe metals in a ſtate of fuſion, and ſtiring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMALTHÆA, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman deſtinies, and demanded 300 pieces of gold for them. He derided her; whereupon ſhe threw three of them into the fire; and returning, aſked the ſame price for the other ſix; which being denied, ſhe burnt three more; and returned, ſtill demanding the ſame price. Upon which Tarquin conſulting the pontifs, was adviſed to buy them. Theſe books were in ſuch eſteem, that two magiſtrates were created to conſult them upon extraordinary occaſions.

Amalthæa, in pagan mythology, the daughter of Meliſſus, king of Crete, and the nurſe of Jupiter, whom ſhe fed with goat's milk and honey. According to others, Amalthæa was a goat which Jupiter tranſlated into the ſky, with her two kids, and gave one of her horns to the daughter of Meliſſus, as a reward for the pains they had taken in attending him. This horn is ſaid to have had the peculiar property of furniſhing them with whatever they wiſhed for; and was thence called the *cornucopia*, or horn of plenty.

The following is a tranſlation of the deſcription given by Ovid of this fiction:

> On Ida's ſummit, in a ſhady grove,
> The Naid Amalthæa foſter'd Jove.
> A goat ſhe had, the faireſt of the ſort;
> Two friſking kids about their mother ſport.
> With lofty wreath'd horns, her temples nod;
> Her dugs were worthy to ſuſtain a God!
> Great Jove ſhe ſuckl'd, of old Rhea born,
> And in the pious office broke her horn;
> As playful in a rifled oak ſhe toſt
> Her heedleſs head, and half its honor's loſt!
> Fair Amalthæa took it off the ground,
> With apples fill'd it, and with garlands bound,

Which to the ſmiling infant ſhe convey'd:
He, when the ſcepter of the gods he ſway'd,
When bold he ſeiz'd his father's vacant throne,
And reign'd the tyrant of the ſkies alone;
Bid his rough nurſe the ſtarry heavens adorn,
And gratefully in the zodiac, fix'd her horn.

AMARANTE, or **Amaranth**, an order of knighthood, inſtituted in Sweden by queen Chriſtina, in 1645, at the cloſe of an annual feaſt, celebrated in that country, called *Wirtſchaft*. This feaſt was ſolemnized with entertainments, balls, maſquerades, and the like diverſions, and continued from evening till the next morning. That princeſs, thinking the name too vulgar, changed it into that of the *feaſt of the gods*, in regard each perſon here repreſented ſome deity as it fell to his lot. The queen aſſumed the name of *Amarante*; that is, unfading, or immortal. The young nobility, dreſſed in the habit of nymphs and ſhepherds, ſerved the gods at the table. At the end of the feaſt, the queen threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the maſques; and, in memory of ſo gallant a feaſt, founded a military order, called in Swediſh *geſcilchafft*, into which all that had been preſent at the feaſt were admitted, including 16 lords and as many ladies, beſides the queen. Their device was the cypher of *Amarante*, compoſed of two A's, the one erect, the other inverted, and interwoven together; the whole incloſed by a laurel crown, with this motto, *Dolce nella memoria.*

AMARANTHOIDES, in botany, the trivial name of a ſpecies of illecebrum.

AMARANTHUS, (of α privative, and μαραινω, *to wither*, becauſe the flower of this plant when cropped does not ſoon wither) **Amaranth**, or **Flower-Gentle**, a genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 54th order, *Miſcelaneæ*. For the charácters, ſee Syſtem of **Botany**.

Of this genus Linnæus enumerates 19 ſpecies; the moſt remarkable of which are. 1. The tricolor, or three-coloured amaranthus. This has been long cultivated in gardens, on account of the beauty of its variegated leaves, which are of three colours, green, yellow, and red; and very elegantly mixed. When the plants are in full vigour, the leaves are large, and cloſely ſet from the bottom to the top of the ſtalks, and the branches form a ſort of pyramid; ſo that there is not a more beautiful plant than this when it is in full luſtre. 2. The melancholicus, bicolor, or two-coloured amaranthus. 3. The caudata, with very long hanging cylindrical ſpikes, a native of America. 4. The maximus, or tree-like amaranthus. 5. The ſanguineus, a native of the Bahama iſlands. It is an eſculent plant, and bears fine flowers. 6. The oleraceus, with obtuſe indented leaves. This has no beauty; but it is uſed by the Indians as a ſubſtitute to cabbage.

The two firſt of theſe ſpecies being tender, require ſome art and care to bring them to perfection in Britain, by a ſucceſſion of hot-beds, with proper waterings, airings, and ſhadings.

AMARYLLIS, **Lily-asphodel**, a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 9th order, *Spathaceæ*. For the characters, ſee Syſtem of **Botany**.

The principal ſpecies are, 1. The lutea, or autumnal narciſſus. This is uſually ſold by gardeners, along with colchicums, for autumnal ornaments to gardens. Although there is but one flower in each cover, yet there is a ſucceſſion of flowers from the ſame root, eſpecially when they are ſuffered to remain three or four years unremoved. The roots are bulbous, and ſhaped like thoſe of the narciſſus; ſo are proper ornaments for ſuch borders as are planted with cyclamens, ſaffron, autumnal crocus, colchicums, and ſuch low autumnal flowers. 2. The formoſiſſima, or jacobæa lily, produces its flowers two or three times in a year, without being regular to any ſeaſon. 3. The farnienſis, or Guernſey lily, is ſuppoſed to have come originally from Japan, but has been many years cultivated in the gardens of Guernſey and Jerſey; in both which places they ſeem to thrive as well as if it was their native country, and from theſe iſlands their roots are ſent annually to the curious in moſt parts of Europe. 4. The regina, or belladonna lily, is a native of Portugal. This kind, if properly managed, will ſometimes put out two or three ſtems, growing near three feet high, and produce many flowers in each umbel, which make a fine appearance during the month of October. 5. The zeylanica, or Ceylon lily, is a native of the Weſt Indies, and uſually flowers in June. 6. The Orientalis, or lily daffodil, with leaves ſhaped like a tongue. This is a native of the Cape of Good Hope.

The firſt ſort is very hardy, and will thrive in almoſt any ſoil or ſituation; but will ſucceed beſt in a freſh light dry ſoil, and not too near the dripping of trees, or too near walls. Theſe roots may be tranſplanted any time from May to the end of July; after which it will be too late to remove them. The jacobæa ought to be kept in a moderate ſtove all winter; in which caſe it will ſend forth plenty of offsets, that will produce vigorous plants. The roots of the Guernſey lily are generally brought over in June and July; but the ſooner they are taken out of the ground after the leaves decay, the better: for although the roots which are taken up when their flower-ſtems begin to appear, will flower; yet their flowers will not be ſo large, nor will their roots be near ſo good after, as thoſe which were removed before they ſent forth fibres. The other ſpecies of the amaryllis may eaſily be raiſed by taking care to ſhelter them in a ſtove from the winter's cold.

AMASONIA, in botany, a genus of the angio-ſpermia order, belonging to the didynamia claſs of plants; for the characters ſee Syſtem of **Botany**. The ſeed is an ovate unilocular nut, the length of the calyx.

AMATORII **Musculii**, in anatomy, a term ſometimes uſed for the obliquus ſuperior and obliquus inferior muſcles of the eye, as theſe muſcles aſſiſt in ogling or drawing the eye ſideways.

AMAUROSIS, in medicine, a deprivation of ſight, the eye remaining fair and ſeemingly unaffected. A perfect amauroſis is when the blindneſs is total; when there is ſtill a power of diſtinguiſhing light from darkneſs, the diſeaſe is called by M. de St. Ives an *imperfect amauroſis*. There is a periodical ſort which comes on inſtantaneouſly, continues for hours, or days, and then diſappears. Mr. Hey, ſurgeon at Leeds, mentions ſeveral caſes of patients afflicted with the amauroſis who were relieved by being electrified.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Aſia Minor, upon the river Thermodoon, along the coaſts of the Black Sea. They are ſaid to have formed a ſtate out of which men were excluded. What commerce they had with that ſex, was only with ſtrangers; they killed all their male children; and cut off the right breaſts of their females, to make them more fit for the combat. But Dr. Bryant, in his Analyſis of Ancient Mythology, explodes this account as fabulous; and obſerves, that they were in general Cuthite colonies from Egypt and Syria, who formed ſettlements in different countries, and that they derived their name from *zon*, the ſun, which was the national object of worſhip. Vol. iii. p. 463. It has indeed been controverted even among ancient writers, whether ever there really were ſuch a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pauſanius, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

M. Petit, a French phyſician, publiſhed a Latin diſſertation in 1685, to prove that there was really a nation of Amazons; it contains abundance of curious inquiries, relating to their habit, their arms, the cities built by them, &c. Others of the moderns alſo maintain, that their exiſtence is ſufficiently proved by the teſtimony of ſuch of the hiſtorians of antiquity as are moſt worthy of credit; by the monuments which many of them have mentioned; and by medals, ſome of which are ſtill remaining.

We read of Scythian Amazons in Herodotus; of Lybian Amazons, in Diodorus Siculous; and of German Amazons, in Lucius Florus. Later geographers and travellers alſo ſpeak of Mingrelian and Georgian Amazons; Amazons in South America, in Monomotopa, in the Philippine iſlands, in Denmark, &c.

The Amazons of South America lived on the banks of the great river which bears their name, and made the greateſt figure in hiſtory. They are repreſented as having been governed and led to war only by their queen. No men were permitted to live among them; though thoſe of ſome neighbouring nations were ſuffered to viſit them, at a certain ſeaſon, for the ſake of procreation. The females iſſuing from this commerce were bred up with care, and inſtructed in what related to war and government; but the males were ſent away into the country of their fathers.

Some modern geographers and travellers mention Amazons ſtill in being. John de los Sanctos, a Portugueſe Capuchin, in his deſcription of Æthiopia, ſpeaks of a race of Amazons in Africa; Æneas Silvius gives us a very preciſe account of a republic of real Amazons, in Bohemia, which laſted nine years; founded by the courage of a maid named Valaſca.

Amazon is alſo applied, in a figurative ſenſe, to bees, becauſe among thoſe inſects the females alone are commonly ſuppoſed to bear ſway.

M. Warder has publiſhed a work under the title of the True Amazons, or the Commonwealth of **Bees**.

Amazonian *Habit*, in antiquity, denotes a dreſs formed in imitation of the Amazons.

AMAZONIUS, in medicine, ſignifies remedies taken againſt vomiting.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a rock. The Abyſſinians give names to each of their rocks, as *amba-dorho*, the rock of a hen, &c. The moſt remarkableof theſe ocks is called *amba-geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of free-ſtone, and almoſt impregnable. Its ſummit is about half a Portugueſe league in breadth, and the circumference at the bottom about half a day's journey. The aſcent at firſt is eaſy; but grows afterwards ſo ſteep, that the Abaſſine oxen, which will otherwiſe clamber like goats, muſt be craned up, and let down with ropes. Here the princes of the blood were formerly confined, in low cottages, amongſt ſhrubs and wild cedars, with an allowance barely ſufficient to keep them alive.

Amba, in a botanical ſenſe, implies a ſynonyme of the mango tree.

AMBACHT, in topography, denotes a kind of juriſdiction or territory, the poſſeſſor whereof has the adminiſtration of juſtice, both in *alto* and *baſſo*; or of what is called in the Scots law, a power of pit and gallows; i. e. a power of drowning and hanging. In ſome ancient writers, ambacht is particularly uſed for the chief magiſtracy of a city.

AMBIABA, the name of a tree in Brazil, called by the Indians tipioca.

AMBARVALIA, in antiquity, a ceremony among the Romans, when, in order to procure from the gods an happy harveſt, they conducted the victims thrice round the corn-fields in proceſſion, before ſacrificing them. Ambervalia were either of a private or public nature: the private were performed by the maſter of a family; and the public by the prieſts, who officiated at the ſolemnity, called *fratres ovales*. The prayer preferred on this occaſion, the formula of which we have in Cato, *de Re Ruſtica*, cap. cxlii. was called *carmen ambervale*. At theſe feaſts they ſacrificed to Ceres a ſow, a ſheep, and a bull or heifer, whence they took the name of *ſuovetaurilia*. The method of celebrating them was, to lead a victim round the fields, while the peaſants accompanied it, and one of their number, crowned with oak, hymned forth the praiſes of Ceres, in verſes compoſed on purpoſe. This feſtival was celebrated twice a-year; at the end of January, according to ſome, or in April, according to others; and for the ſecond time, in the month July.

AMBARVALIS Flos, a botanical term for milkwort.

AMBASSADOR, or Embassador, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon, to another.

Ambaſſadors are either ordinary or extraordinary. Ambaſſador in ordinary, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about 200 years ago, ambaſſadors in ordinary were not heard of: all, till then, were ambaſſadors extraordinary; that is, ſuch as are ſent on ſome particular occaſion, and who retire as ſoon as the buſineſs is diſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to the fathers.

Ambaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, &c. unleſs their maſter have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſon of the prince.

By the civil law, the moveable goods of an ambaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, or for payment of a debt, nor by order or execution of judgment, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if, therefore, he hath contracted any debt, he is to be called upon kindly; and if he refuſes, then letters of requeſt are to go to his maſter. Neither can any of the ambaſſador's domeſtic ſervants, that are regiſtered in the ſecretaries of ſtate's office, be arreſted in perſon or goods; if they are, the proceſs ſhall be void. and the parties ſuing out and executing it, ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor, or either of the chief juſtices, ſhall think fit to inflict. Yet, ambaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and, if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBE, in ſurgery, the name of an inſtrument for reducing diſlocated bones. In anatomy it implies ſuperficial jutting out of a bone.

AMBER Succinum, or Karabe, in natural hiſtory, a ſolid, hard, ſemipellucid, bituminous ſubſtance, of a particular nature, of uſe in medicine, and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks.

Amber has been of great repute in the world from the earlieſt times. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. In the times of the Romans it became in high eſteem as a gem; and, in the luxurious reign of Nero, immenſe quantities of it were brought to Rome, and uſed for ornamenting works of various kinds.

The moſt remarkable property of this ſubſtance is, that when rubbed, it draws or attracts other bodies to it; and this, it is obſerved, it does, even to thoſe ſubſtances which the ancients thought it had an antipathy to; as oily bodies, drops of water, human ſweat, &c. Add to this, that, by the friction, it is brought to yield light pretty copiouſly in the dark; whence it is reckoned among the native phoſphori.

Amber aſſumes various figures in the ground, as that of a pear, an almond, a pea, &c.

In amber there have been ſaid to be letters found very well formed; and even Hebrew and Arabic characters. Within ſome pieces, leaves, inſects, &c. have likewiſe been found included; which ſeems to indicate, either that the amber was originally in a fluid ſtate, or that having been expoſed to the ſun, it was once ſoftened, and rendered pliable to leaves, inſects, &c. which came in its way.

It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, aerial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, are viewed with admiration by all the world; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit; the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners, into ſeemingly whole pieces of amber, that it is not eaſy to detect the fraud.

Of thoſe inſects which have been originally incloſed in amber, ſome are plainly ſeen to have ſtruggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unuſual thing to ſee, in a maſs of amber that contains a ſtout beetle, the animal wanting one, or perhaps two of its legs; and thoſe legs left in different places, nearer that part of the maſs from which it has travelled.

This may, in ſome meaſure, account for the common accident of finding legs, or wings of flies, without the reſt of their bodies, in pieces of amber; the inſects having, when entangled in the yet ſoft and viſcid matter, eſcaped, at the expence of leaving thoſe limbs behind them.

Gold and ſilver, as well as iron, are found in various ſhapes immerſed in amber; and the latter is often ſeen eroded, and, ſometimes, in the ſtate of vitriol; it is not impoſſible but that copper, and the other metals, may be alſo ſometimes immerſed in it in the ſame ſtate: hence the bluiſh and greeniſh colours frequently found in pieces of amber.

Naturaliſts have been greatly divided as to the origin of this ſubſtance, and what claſs of bodies it belongs to; ſome referring it to the vegetable, others to the mineral, and ſome even to the animal kingdom. Pliny deſcribes it as "a reſinous juice, oozing from aged pines and firs, (others ſay from poplars, whereof there are whole foreſts on the coaſt of Sweden) and diſcharged thence into the ſea, where, undergoing ſome alteration, it is thrown, in this form, upon the ſhores of Pruſſia, which lie very low. He adds, that it was hence the ancients gave it the denomination *ſuccinum*; from *ſuccus*, juice."

It is certain that all amber is of the ſame origin, and probably that which is found in the ſea has been waſhed thither out of the cliffs. The ſea-amber is uſually finer to the eye than the foſſile; but the reaſon is, that it is diveſted of that coarſe coat with which the other is covered while in the earth.

There are ſeveral indications which diſcover where amber is to be found. The ſurface of the earth is covered with a ſoft ſcaly ſtone; and vitriol in particular always abounds there, which is ſometimes found white, ſometimes reduced into a matter, like melted glaſs, and ſometimes figured like petrified wood.

Amber of the fineſt kind has been found in England. It is frequently thrown on the ſhores of Yorkſhire, and many other places, and found even in our clay-pits: the pits dug for tile-clay, between Tyburn and Kenſington gravel-pits, and that behind St. George's Hoſpital at Hyde-park-corner, have afforded fine ſpecimens.

Poland, Sileſia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of amber, as well dug up from the bowels of the earth, as toſſed about on the ſhores of the ſea and rivers there. Saxony, Miſnia, and Sweden, and many other places in this track of Europe, abound with it. Denmark has afforded, at different times, ſeveral quantities of foſſile amber; and the ſhores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greateſt abundance of all; and of theſe the moſt plentiful country is Pruſſia, and the next Pomerania. Pruſſia was, as early as the times of Theodoric the Goth, famous for amber. This article alone brings his Pruſſian majeſty a very conſiderable revenue annually. The amber of Pruſſia is not only found on the ſea-coaſts, but in digging; and though that of Pomerania is generally brought from the ſhores, yet people who dig, on different occaſions, in the very heart of the country, at times find amber.

Amber has a ſubacrid reſinous taſte, and fragrant aromatic ſmell, eſpecially when diſſolved. It differs from the other bituminous ſubſtances in this, that it yields by diſtillation a volatile acid ſalt, which none of the others do; otherwiſe it affords the ſame ſort of principles as them, viz. an acid phlegm, an oil that gradually becomes thicker as the diſtillation is continued; and when the operation is finiſhed, there remains a black caput mortuum in the retort. When boiled in water, it neither ſoftens or undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs very like a bitumen: it is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but it is with difficulty that the expreſſed ones are brought to act upon it; the ſtrongeſt ſorts of fixed alkaline lixivia almoſt totally diſſolve it.

This ſubſtance is principally of two colours, white and yellow. The white is the moſt eſteemed for medicinal purpoſes, as being not only more odoriferous, but containing the greateſt quantity of volatile ſalt; though the yellow is moſt valued by thoſe who manufacture beads and other toys with it, by reaſon of its tranſparency. When once amber has been melted, it irrecoverably loſes its beauty and hardneſs.

Amber in ſubſtance has been much recommended in medicine. The forms in which it is prepared are, a tincture, a ſalt, and an oil, for the preparation and uſes of which ſee Syſtem of PHARMACY.

Amber Tree, the Engliſh name of a ſpecies of ANTHOSPERMUM.

AMBERGREASE, **Ambergris**, or **Grey Amber**, in natural hiſtory, is a ſolid, opake, aſh-coloured, inflammable ſubſtance, variegated like marble, remarkably light, rugged and uneven in its ſurface, and has a fragrant odour when heated. It does not efferveſce with acids; it melts freely over the fire, into a kind of yellow roſin; and is hardly ſoluble in ſpirit of wine.

It is found ſwimming on the ſea, or the ſea-coaſt, or in the ſand near the ſea-coaſt; eſpecially in the Atlantic Ocean, on the ſea-coaſt of Braſil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt Indies, China, Japan, and the Molucca Iſlands; but moſt of the ambergris which is brought to England comes from the Bahama Iſlands, from Providence, &c. where it is found on the coaſt.

It is alſo ſometimes found in the abdomen of whales, in lumps of various ſhapes and ſizes, weighing from half an ounce to an hundred and more pounds. An American fiſherman from Antigua found, ſome years ago, about 52 leagues ſouth-eaſt from the Windward Iſlands, a piece of ambergris in a whale, which weighed about 130 pounds, and ſold for 500l. ſterling.

There have been many different opinions concerning the origin of this ſubſtance.

It has been ſuppoſed to be a foſſile bitumen or naphtha, exuding out of the bowels of the earth in a fluid form, and diſtilling into the ſea, where it hardens and floats on the ſurface. But having been frequently found in the belly of whales, it has by others been conſidered as entirely an animal production.

That ambergris is found either upon the ſea and ſea-coaſt, or in the bowels of whales, is a matter of fact univerſally credited. But it has never been examined into and determined, whether the ambergris found upon the ſea and ſea-coaſt is the ſame as that found in the whale, or whether they are different from one another? Whether that found on the ſea or ſea-coaſt has ſome properties, or conſtituent parts, which that found in the whale has not? And laſtly, Whether that found in the whale is ſuperior or inferior in its qualities and value to the former?

The uſe of ambergris in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by ſeveral eminent phyſicians. Hence the Eſſentia Ambræ Hoffmanni, Tinctura Regia Cod. Pariſini, Trochiſci de Ambra Ph. Wurtemberg, &c.

In Aſia and part of Africa ambergris is not only uſed as a medicine and a perfume, but likewiſe in cookery, by adding it to ſeveral diſhes as a ſpice. A great quantity of it is alſo conſtantly bought by the pilgrims who travel to Mecca; probably to offer it there, and make uſe of it in fumigations, in the ſame manner as frankincenſe is uſed in Catholic countries.

The Turks make uſe of it as an aphrodiſiac. Our perfumers add it to ſcented pillars, candles, balls or bottles, gloves and hair-powder; and its eſſence is mixed with pomatums for the face and hands, either alone or mixed with muſk, &c. though its ſcent to ſome perſons is very offenſive.

Ambergris may be known to be genuine by its fragrant ſcent when a hot needle or pin is thruſt into it, and its melting like fat of an uniform conſiſtence; whereas the counterfeit will not yield ſuch a ſcent, nor prove of ſuch a fat texture.

AMBERING, in perfumery, denotes the ſcenting of any ſubſtance with amber.

AMBETTUWAY, in botany, the name of a tree, the leaves of which, when boiled in wine, are ſaid to create an appetite, and is uſed by the people in Guinea with that intention.

AMBIDEXTER, a perſon who can uſe both hands with the ſame facility, and for the ſame purpoſes, that the generality of people do their right hand only. As to the natural cauſe of this faculty, ſome, as Hœfer, attribute it to an extraordinary ſupply of blood and ſpirits from the heart and brain, which furniſh both hands with the neceſſary ſtrength and agility: others, as Nicholas Maſſa, to an erect ſituation of the heart, inclining neither to the right hand or left; and others to the right and left ſubclavian arteries being of the ſame height and the ſame diſtance from the heart, by which the blood is propelled with equal force to both hands.

Many think, that, were it not for education and habit, all mankind would be ambidexters; and in fact, we frequently find nurſes obliged to be at a good deal of pains before they can bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, where it would be better, could it be acquired, to have an equal uſe of both hands.

Various inſtances occur in hiſtory, where the left hand has been exerciſed in preference to the right. But by the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic.

Ambidexter, as a law phraſe, ſignifies a juror, who accepts money of both parties, on a promiſe of giving his verdict for each; an offence for which he is liable to be impriſoned, for ever excluded from a jury, and to pay ten times the ſum he accepted.

AMBIENT, a term uſed for ſuch bodies, eſpecially fluids, as encompaſs others on all ſides: thus, the air is frequently called an ambient fluid, becauſe it is diffuſed round the earth.

AMBIGENÆ Oves, in the heathen ſacrifices, an appellation given to ſuch ewes as, having brought forth twins, were ſacrificed with their two lambs, one on each ſide. We find them mentioned among other ſacrifices to Juno.

AMBIGENAL Hyperbola, a name given by Sir Iſaac Newton to one of the triple hyperbolas of the ſecond order, having one of its infinite legs falling within an angle formed by the aſſymptotes, and the other without.

AMBIGU denotes an irregular or promiſcuous manner of laying out a table, that indicates no regular meal.

AMBIGUITY, a defect of language, whereby words are rendered ambiguous.

AMBIGUOUS, a term applied to a word or expreſſion which may be taken in different ſenſes. The reſponſes of the ancient oracles were always ambiguous.

AMBIT, in geometry, is the ſame with what is otherwiſe called the perimeter of a figure.

Ambit was particularly uſed, in antiquity, to denote a ſpace of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houſes were not to be built contiguous, but an ambit or ſpace of 2½ feet was to be left between each, for fear of fire.

The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the ſame, within which the ſanctity aſſigned to it was limited. The whole ground wherein a tomb was erected, was not to be ſecreted from the common uſes; for this reaſon, it was frequent to inſcribe the ambit on it, that it might be known how far its ſanctity extended.

AMBITION, *ambitio*, is generally uſed for an immoderate or illegal purſuit of power.

In the ſtrict meaning, however, of the word, it ſignifies the ſame with the *ambitus* of the Romans.

Ambition, in the former, and more uſual ſenſe, is one of thoſe paſſions that is never to be ſatiſfied. It ſwells gradually with ſucceſs, and every acquiſition ſerves but as a ſpur to further attempts.

"If a man, (ſays a celebrated writer) could at once accompliſh all his deſires, he would be a miſerable creature; for the chief pleaſure of this life is to wiſh and deſire. Upon this account, every prince, who aſpires to be deſpotic, aſpires to die of wearineſs. Searching every kingdom for the man who has the leaſt comfort in life, Where is he to be found? In the royal palace. What! his majeſty? Yes; eſpecially if he be deſpotic."

AMBITUS, in Roman antiquity, the ſetting up for ſome magiſtracy or office, and formally going round the city to ſolicit the intereſt and votes of the people.

Ambitus differed from ambition, as the former lies in the act, the latter in the mind.

Ambitus was of two kinds; one lawful, the other infamous. The firſt, called alſo *ambitus popularis*, was when a perſon offered his ſervice to the republic frankly, leaving it to every body to judge of his pretenſions as they found reaſonable.

The means and inſtruments here made uſe of were various. 1. *Amici*, or friends, under different relations, including *cognati, affines, neceſſarii, familiares, vicini, tribules, clientes, municipes, ſodales, collegæ*. 2. *Nomenclatura*, or the calling and ſaluting every perſon by his name; to which purpoſe, the candidates were attended with an officer, under the denomination of *interpres*, or *nomenclator*. 3. *Blanditia*; or obliging perſons, by ſerving them, or their friends, patrons, or the like, with their vote and intereſt on other occaſions. 4. *Prenſatio*; the ſhaking every perſon by the hand, offering him his ſervice, friendſhip, &c. The ſecond kind was that wherein force, cajoling, money, or other extraordinary influence, was made uſe of. This was held infamous, and ſeverely puniſhed, as a ſource of corruption and other miſchiefs.

Ambitus, in muſic, denotes the modification of each tone, whether ſharp, flat, or natural; or, in other words, is the extent from flat to ſharp.

In the plain chant this word is again uſed; but the ambitus of perfect modes is only of one octave therein; thoſe that exceed it, are called ſuperfluous modes; and thoſe that do not reach it, are called diminiſhed, or leſſened modes.

AMBIX is a ſynonymous term for alembic.

AMBLE, or **Ambling**, in horſemanſhip, a peculiar pace by which a horſe's two legs of the ſame ſide move at the ſame time.

AMBLYGON, in geometry, denotes an obtuſe-angled triangle, or a triangle, one of whoſe angles conſiſts of more than 90 degrees.

AMBLYOPY, among phyſicians, ſignifies an obſcuration of the ſight, ſo that objects at a diſtance cannot be clearly diſtinguiſhed.

AMBO, or Ambon, a kind of pulpit or deſk, in the ancient churches, where the prieſts and deacons ſtood to read or ſing part of the ſervice, and preach to the people; called alſo *analogium.* The ambo was aſcended by ſteps; which occaſioned that part of the office performed there to be called the *gradual.*

Beſides the goſpel, which was read at the top of the ambo, and the epiſtle, which was read a ſtep lower, they likewiſe publiſhed from this place the acts of the martyrs, the commemoration of departed ſaints, and the letters of peace and communion ſent by one church to another: here, too, converts made a public profeſſion of their faith; and biſhops, their defence, when accuſed: treaties alſo were ſometimes concluded, and the coronations of emperors and kings performed, in the ſame place.

The modern reading-deſks and pulpits have been generally ſubſtituted to the ancient ambos; though, in ſome churches, remains of the ambos are ſtill ſeen.

AMBONUM, in natural hiſtory, denotes the prominent tubercles on many ſtones expoſed to the open air.

AMBREADA, thus they call the falſe amber, which the Europeans uſe in their trade with the negroes on the coaſt of Africa, and particularly on the river Senegal.

AMBRONES, a Gauliſh people, who lived near the foot of the Alps, between Switzerland and Provence. They invaded the Roman territories in conjunction with the Cimbri and Tentones; but were defeated with great ſlaughter by Marius, about 101 years before Chriſt.

AMBROSE, or St. Ambroſe in the Wood, an order of religious, who uſe the Ambroſian office, and wear an image of that ſaint engraven on a little plate: in other reſpects they conform to the rule of the Auguſtins.

AMBROSIA, in heathen antiquity, denotes the ſolid food of the gods, in contradiſtinction from the drink, which was called nectar. It had the appellation ambroſia, (compounded of the particle *α*, and βροτος, immortal) as being ſuppoſed to render thoſe immortal who fed on it.

Ovid tells us the horſes of the ſun feed upon ambroſia inſtead of graſs.

> *Ambroſiam per gramine habent.*
> Met. lib. ii. v. 214.

And, deſcribing the deification of Æneas, he ſays;

> *Luſtratum genitrix divino corpus odore*
> *Unxit, et ambroſia cum dulci nectare miſta*
> *Contigit os, fecitque decum.*
> Id. lib. xiv. v. 605.

> His better part by luſtral waves refin'd,
> Wore pure, and nearer to the ætherial mind,
> With gums of fragrant ſcent the goddeſs ſtrews,
> And on his features breathes ambroſial dews:
> Thus deified——

Ambrosia is alſo a ſplendid kind of title, given by ſome phyſicians to certain alexipharmic compoſitions, of extraordinary virtue. The name was particularly given to a famous antidote of Philip of Macedon, againſt all poiſons, bites, and ſtings of venomous creatures, as well as many internal diſeaſes.

Ambrosia, a genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 49th order, *compoſitæ-nucamentaceæ.* Of this genus five ſpecies are enumerated; but neither have any properties worthy of notice. For the characters ſee Syſtem of Botany.

AMBROSIAN Office, or Rite, in church hiſtory, a particular formula of worſhip in the church of Milan, which takes its name from St. Ambroſe, who inſtituted that office in the fourth century. Each church originally had its particular office; and when the pope, in after-times, took upon him to impoſe the Roman office upon all the weſtern churches, that of Milan ſheltered itſelf under the name and authority of St. Ambroſe; from which the ambroſial ritual has prevailed.

AMBROSIN, in middle-age writers, denotes a coin ſtruck by the lords or dukes of Milan, whereon was repreſented St. Ambroſe on horſeback, with a whip in his right hand. The occaſion of this coinage is ſaid to have been a viſion of that ſaint, who appeared to the Milaneſe general in 1339, during the time of battle; but this viſion muſt be conſidered as fabulous.

AMBROSINIA, in botany, a genus of the polyandria order belonging to the gynandria claſs of plants.

AMBRY, a place in which were formerly depoſited all utenſils neceſſary for houſe-keeping. In the ancient abbeys and priories, there was an office under this denomination, in which all charities were laid up and diſtributed to the poor.

AMBUBAJÆ, in Roman antiquity, were immodeſt women, who came from Syria to Rome, where they lived by proſtitution, and by playing on the flute: the word is derived from the Syriac *abub,* which ſignifies a flute; although others make it to come from *am* and *Baiæ,* becauſe theſe proſtitutes often retired to *Baiæ.* According to Cruquius, theſe women uſed likewiſe to ſell paint for ornamenting the face, &c.

AMBUBEIA, in botany, a trivial name of the wild ſuccory.

AMBULANT, or Ambulatory. They give in France the name of *ambulant commiſſioners* to thoſe commiſſioners, or clerks of the king's farms, who have no ſettled office; but viſit all the offices within a certain diſtrict, to ſee that nothing be done in them againſt the king's right and the intereſt of the farm.

Ambulant is alſo uſed to denote thoſe brokers at Amſterdam, or exchange agents, who have not been ſworn before the magiſtrates. They tranſact brokerage buſineſs, but their teſtimony is not received in the courts of juſtice.

AMBULATION, a ſynonymous term for exerciſe, by walking on foot a conſiderable time.

Ambulation, among ſurgeons, ſignifies the firſt ſymptom of a mortification.

AMBULATORY, a term anciently applied to ſuch courts, &c. as were not fixed to any certain place; but held ſometimes in one place, and ſometimes in another. In oppoſition to ſtationary courts. The court of parliament was anciently ambulatory; ſo alſo were the courts of king's bench, &c.

AMBURBIUM, in Roman antiquity, a proceſſion, made by the Romans round the city and pomœrium, in which they led a victim, and afterwards ſacrificed it, in order to avert ſome calamity that threatened them.

AMBURY, or Anbury, a term among farriers, ſignifying a tumor, wart, or ſwelling, which is ſoft to the touch, and full of blood.

This diſorder of horſes is cured by tying a horſe-hair very hard about its root; and, when it has fallen off, which commonly happens in about eight days, ſtrewing ſome powder of verdigris upon the part, to prevent the return of the complaint. If the tumor be ſo low that nothing can be tied about it, they cut it out with a knife, or elſe burn it off with a ſharp hot iron; and, in ſinew parts, where a hot iron is improper, they eat it away with oil of vitriol, or white ſublimate.

Many farriers boaſt of a ſecret which infallibly cures all kinds of protuberances of this kind; the receipt for which is this:

Take three ounces of green vitriol and one ounce of white arſenic; beat them to a coarſe powder, and put them into a crucible; place the crucible in the midſt of a charcoal fire, ſtirring the ſubſtance, but carefully avoiding the poiſonous ſteams; when the whole grows reddiſh, take the crucible out of the fire; and, when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of album rhoſis; make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will by this means fall off gently and eaſily, without leaving any ſwellings. It is beſt to keep the horſe quiet, and without working, during the cure. What ſores remain on the parts which the ſwellings fall off from, may be cured with the common application called the *counteſs's ointment.*

AMBUSCADE, or Ambush, in military affairs, properly denotes a place where ſoldiers may lie concealed till they find an opportunity to ſurpriſe the enemy.

AMEA, in botany, a medicinal plant not enumerated by Linnæus. It is found in ſeveral parts of Africa, particularly the coaſt of Guinea, where the negroes uſe it with ſucceſs to ſtop bleeding at the noſe.

AMEDIANS, or Amedei, in church hiſtory, a congregation of religious in Italy, ſo called from their profeſſing themſelves *amantes Deum,* lovers of God; or rather *amati Deo,* beloved of God. They wore a grey habit and wooden ſhoes, had no breeches, and girt themſelves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Ciſtercian order, and and partly with that of the Soccolanti, or wooden-ſhoe wearers.

AMELLUS, Starwart, a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-oppoſitifoliæ.* Of this there are two ſpecies. 1. The lynchitis, with one flower on each footſtalk. This is a native of the Cape of Good Hope. It is a perennial plant, riſing about three feet high, ſpear-ſhaped leaves placed oppoſite, by ſingle naked flower-ſtalks, each ſupporting one violet-coloured flower, having a yellow diſk, which is ſucceeded by oblong ſeeds. 2. The umbellatus, with flowers growing in umbels, is a native of Jamaica. The firſt is eaſily propagated, either by cuttings planted in the ſummer-months, or by ſeeds ſown on a moderate hot-bed in the ſpring, but the plants require a ſlight ſhelter in winter. The ſecond is much more tender, and therefore requires to be preſerved in a ſtove during the winter ſeaſon.

AMEN, ſignifies *true, faithful, certain.* It is made uſe of likewiſe to affirm any thing, and was a ſort of affirmation uſed often by our Saviour: Αμην, Αμην, λεγω υμιν, i. e. *Verily, Verily, I ſay unto you.* Laſtly, it is underſtood as expreſſing a wiſh; as

Amen, So be it, Numb. v. 22. or an affirmation, *Amen, yes I believe it,* 1 Cor. xiv. 16. The Hebrews and the five books of Pſalms, according to their way of diſtributing them, with the words *amen, amen*; which the Septuagint have tranſlated, *γενοιτο, γενοιτο*; and the Latins *fiat, fiat.*

The Greek and Latin churches have preſerved this word in their prayers, as well as *alleluiah* and *hoſanna*; becauſe they obſerved more energy in them than in any terms which they could uſe in their own languages. At the concluſion of the public prayers, the people anſwered with a loud voice, Amen; and St. Jerom ſays, that at Rome when the people anſwered Amen, the ſound of their voices was like a clap of thunder: *In ſimilitudinem cæleſtis tonitrui Amen reboat.* The Jews aſſert that the gates of heaven are open to him who anſwers *Amen* with all his might.

AMENABLE, in law, implies a right to bring a perſon that has offended, to abide by the juriſdiction of the court; or in other words, to be dealt with according to law.

In many caſes, a married woman is freed from the puniſhment due to felonious tranſactions, wherein her huſband was a principal, merely becauſe ſhe is ſuppoſed to be amenable, or under the government of her huſband.

AMEND, or AMENDE, in the French cuſtoms, a pecuniary puniſhment impoſed by a judge for any crime, falſe proſecution, or groundleſs appeal.

AMENDE *Honourable,* an infamous kind of puniſhment inflicted in France upon traitors, parricides, or ſacrilegious perſons, in the following manner: the offender being delivered into the hands of the hangman, his ſhirt is ſtripped off, a rope put about his neck, and a taper in his hand; then he is led into court, where he muſt beg pardon of God, the king, the court, and his country. Sometimes the puniſhment ends here; but at others it is only a prelude to death, or baniſhment to the galleys.

AMENDE *Honourable,* is a term alſo uſed for making recantation in open court, or in preſence of the perſon injured.

AMENDMENT, in a general ſenſe, denotes ſome alteration or change made either in a perſon, or thing, for the better.

AMENDMENT, in law, the correction of an error committed in a proceſs, which may be amended after judgment, unleſs the error lies in giving judgment; which in caſe it is not amendable, yet the party is at liberty to bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without a motion for leave of the court.

AMENDMENT *of a Bill,* in parliament, is ſome alteration made in the firſt draught of it.

AMENTUM, in botany, the name of a ſpecies of calyx, conſiſting of valves, and hanging down in different directions from the caulis. Common oats afford a good example of the amentum. This word imports the ſame as Amentaceous.

AMENTUM, in Roman antiquity, a thong tied about the middle of a javelin or dart, and faſtened to the fore-finger, in order to recover the weapon as ſoon as it was diſcharged. The ancients made great uſe of the amentum, thinking it helped to enforce the blow. It alſo denotes a latchet for their ſandals.

AMERADE, a kind of officers among the Saracens, anſwering to the governors of provinces among the Europeans. The name is originally the ſame with that of emir.

AMERCEMENT, or AMERCIAMENT, in law, a pecuniary puniſhment impoſed on offenders at the diſcretion of the court.

AMERICAN NIGHT-SHADE, a ſynonyme of Phytolacca.

AMERICAN GROUND-NUT, a ſynonyme of Arrachis.

AMETHYST, in natural hiſtory, a tranſparent gem of a purple colour, which ſeems compoſed of a ſtrong blue and a deep red; and, according as either of thoſe prevails, affording different tinges of purple, ſometimes approaching to violet, and ſometimes even fading to a pale-roſe colour.

Though the amethyſt is generally of a purple colour, it is nevertheleſs ſometimes found naturally colourleſs, and may at any time be eaſily made ſo by putting it into the fire; in which pelucid or colourleſs ſtate, it ſo reſembles the diamond that the want of hardneſs ſeems the only way of diſtinguiſhing it.

Some derive the name amethyſt from its colour, which reſembles wine mixed with water; whilſt others, with more probability, think it got its name from its ſuppoſed virtue of preventing drunkenneſs; an opinion which, however imaginary, prevailed to that degree among the ancients, that it was uſual for great drinkers to wear it about their necks. The amethyſt is ſcarce inferior to any gem in the beauty of its colour; and in its pureſt ſtate is of the ſame hardneſs, and at leaſt of equal value, with the ruby and ſapphire.

It is found of various ſizes, from the bigneſs of a ſmall vetch, to an inch and an half in diameter, and often to much more than that in length. Its ſhape is extremely various, ſometimes roundiſh, ſometimes oblong, and at others flatted, at leaſt on one ſide; but its moſt common appearance is in a cryſtalliform figure, conſiſting of a thick column, compoſed of four plants, and terminated by a flat and ſhort pyramid, of the ſame number of ſides; or elſe, of a thinner and longer hexangular column; and ſometimes of a long pyramid, without any column. It makes the gayeſt figure in the laſt of theſe ſtates, but is hardeſt and moſt valuable in the roundiſh and pebble-like form.

The amethyſt is found in the Eaſt and Weſt Indies, and in ſeveral parts of Europe; the oriental ones, at leaſt ſome of the finer ſpecimens, being ſo hard and bright as to equal any of the coloured gems in value. However, by far the greater number of amethyſts fall infinitely ſhort of theſe; as all the European ones, and not a few of thoſe brought from the Eaſt and Weſt Indies, are very little harder than common cryſtal.

Counterfeit or Fictitious AMETHYST. Spars and cryſtals tinged red and yellow, &c. are ſold for amethiſts. The falſe ones come from Germany, are tinged by vapours in the mines, and contain ſome lead.

AMETHYST, in heraldry, a term for the purple colour in the coat of a nobleman, in uſe with thoſe who blazon with precious ſtones, inſtead of metals and colours. This, in a gentleman's eſcutcheon, is called *Purpure*; and in thoſe of ſovereign princes, *Mercury.*

AMETHYSTEA, or AMETHYST, in botany, a genus of the monogynia order, belonging to the diandria claſs of plants; and, in the natural method, ranking under the 42d order, *Verticillatæ.* There is only one known ſpecies.

This plant is a native of Siberia. It is an annual plant, with an upright ſtalk, which riſes about a foot high. Towards the top it puts forth two or three lateral branches, garniſhed with ſmall trifid leaves, ſawed on their edges, of a very dark green colour. It flowers in June or July, and produces in ſmall umbels at the extremities of the branches. The colour is a fine blue, and the leaves immediately under the umbel, make a fine appearance. The ſeeds ſhould be ſown in autumn, where they are to remain, as they do not thrive when tranſplanted.

AMETHYSTINE, is applied, in antiquity, to a kind of purple garment dyed of the hue of amethyſt. In this ſenſe amethyſtine differed from *Tyrian* as well as from *hyacinthine* purple, being a kind of medium between both.

AMGAILAM, or AMGAILA, in medicine, implies a ſynonyme of the Acanthian root, uſed in cardiac and ſtomachic compoſitions.

AMIA, in ichthyology, the name of a very large ſea fiſh, the ſame as the glaucus or leccia; it is of the ſalmon ſpecies and common to the Mediterranean. It is the ſcomber of Linnæus. The thunny is ſometimes called by this name.

AMIANTHUS, or EARTH-FLAX, in natural hiſtory, a fibrous, flexile, elaſtic, mineral ſubſtance, conſiſting of ſhort, abrupt, and interwoven filaments. It is found in Germany, in the ſtrata of iron ore, ſometimes forming veins of an inch in diameter. Its fibres are ſo flexible that cloth has been made of them, and the ſhorter filaments that ſeparate in the waſhing of the ſtone may be made into paper in the common manner.

Amianthus is claſſed by Mr. Kirwan in the muriatic genus of earths, becauſe it contains about a fifth part of magneſia. Its other conſtituents are, flint, mild calcareous earth, barytes, clay, and a very ſmall proportion of iron. It is fuſible *per ſe* in a ſtrong heat, and alſo with the common fluxes. It differs from aſbeſtos in containing ſome ponderous earth.

AMICABLE, in a general ſenſe, denotes any thing done in a friendly manner, or to promote peace.

AMICABLE *Benches,* in Roman antiquity, were, according to Pitiſcus, lower and leſs honourable ſeats allotted for the *judices pedanei,* or inferior judges, who, upon being admitted of the emperor's council, were dignified by him with the title *amici.*

AMICABLE *Numbers,* ſuch as are mutually equal to the ſum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers: for the aliquot parts 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other numbers 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICITIA, in law, denotes a holding of lands rent-free during the pleaſure of the donor.

AMICTUS, in Roman antiquity, was any upper garment worn over the tunica.

AMICTUS, among eccleſiaſtical writers, the uppermoſt garment anciently worn by the clergy; the other five being the alba, ſingulum, ſtola, manipulus, and planeta. The amictus was a linen garment, of a ſquare figure, covering the head, neck, and ſhoulders, and buckled or claſped before the breaſt. It is ſtill worn by the religious abroad.

AMICULUM, in Roman antiquity, a woman's upper garment, which differed from the palla. It was worn both by matrons and courtezans.

AMICUS CURIÆ, a law term, to denote a byſtander who informs the court of a matter in law that is doubtful or miſtaken.

AMIDA, or AMIDAS, an idol of the Japaneſe, who has many temples erected to it in the iſland of Japan, of which the principal is at Jedo. The Japaneſe have ſuch a confidence in it, that they hope to attain eternal felicity by the frequent invocation of its name. One of the figures of this idol is repreſented at Rome.

AMIDSHIPS, a nautical expreſſion, implies the middle of a ſhip, either with regard to length or breadth. Thus, "the enemy boarded us amidſhips," that is to ſay, midway between ſtem and ſtern. Or, "Put the helm amidſhips," i. e. in the middle between the two ſides.

AMIESTES, in commerce, ſignifies the cottons (wrought) imported from the Eaſt Indies.

AMILICTI, in the Chaldaic theology, denote a kind of intellectual powers, or perſons in the divine hierarchy. The amilicti are repreſented as three in number; and conſtitute one of the tryads, in the third order of the hierarchy.

AMINEUM Acetum, in medical preſcriptions, denotes white wine vinegar.

AMIRANTE, in the Spaniſh polity, a great officer of ſtate, anſwering to our lord high-admiral.

AMITTERE Legem Terræ, among lawyers, a phraſe importing the loſs of liberty of ſwearing in any court: the puniſhment of a champion overcome or yielding in battle, of jurors found guilty in a writ of attaint, and of a perſon outlawed.

AM-KAS, in hiſtory, a name given to a ſpacious ſaloon in the palace of the Great Mogul, where he gives audience to his ſubjects, and where he appears on ſolemn feſtivals with extraordinary magnificence. His throne is ſupported by ſix large ſteps of maſſy gold, ſet with rubies, emeralds, and diamonds, eſtimated at 60,000,000 l.

AMMA, or Hamma, among eccleſiaſtical writers, a term uſed to denote an abbeſs or ſpiritual mother.

AMMAN, or Ammant, in the German and Belgic policy, a judge who has the cognizance of civil cauſes. It is alſo uſed among the French for a public notary, or officer, who draws up inſtruments and deeds.

AMMANIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 17th order, Calycanthemæ. For the characters ſee Syſtem of Botany. Of this genus there are three ſpecies, all natives of warm climate; but they have neither beauty or any remarkable property.

AMMI, Biſhop's-weed: a genus of the digynia order, belonging to the pentandria claſs of plants; and ranking, in the natural method, under the 45th order, *Umbellatæ*.

There are three ſpecies. 1. The majus, or common biſhop's-weed, the ſeeds of which are uſed in medicine. 2. The glaucifolium, or ſpear biſhop's-weed. 3. The copticum, or Egyptian biſhop's-weed.

The firſt is an annual plant; and propagated by ſeeds ſown in autumn, where the plants are to remain. They flower in June, and ripen in Auguſt. The ſecond ſort is perennial, and very hardy.

The ſeeds of the ammi copticum are ſmall, ſtriated, of a reddiſh brown colour, and have a warm pungent taſte, and a pleaſant ſmell approaching to that of origanum. They are recommended as ſtomachic, carminative, and diuretic; but have long been ſtrangers to the ſhops. The ſeeds of the ammi majus, which are uſed in their place, are much weaker both in taſte and ſmell, and without the origanum flavour of the other.

AMMINEA Uva, in botany, a trivial name for the wild or hedge vine found in Italy.

AMMITES, or Ammonites, in mineralogy, ſignifies a rough free ſtone found in Germany, compoſed of ſeveral globular ſhaped petrefactions of ſand.

AMMOCHRYSOS, from *αμμος*, *ſand*, and *χρυσος*, *gold*, a name given to a ſtone very common in Germany, and ſeeming to be compoſed of a golden ſand. It is of a gold colour, and its particles are very gloſſy. It is generally ſo ſoft that it may be rubbed to a powder in the hand. It is uſed only as ſand to ſtrew over writing.

There is another kind of it leſs common, but much more beautiful, conſiſting of the ſame ſort of gloſſy ſpangles, but of a bright red, like vermillion.

AMMODYTES, or Sand-eel, in ichthyology, a genus of fiſhes belonging to the order of apodes. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head of the ammodytes is compreſſed, and narrower than the body; the upper jaw is larger than the under; the body is cylindrical, with ſcales hardly perceptible. There is but one ſpecies, the tobianus, or launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre.

Ammodytes, in zoology, a ſerpent, of a ſand colour, of the viper kind.

AMMON, or Hammon, in heathen mythology, the name of the Egyptian Jupiter, worſhipped under the figure of a ram.

Bacchus having ſubdued Aſia, and paſſing with his army through the deſarts of Africa, was in great want of water: but Jupiter, his father, aſſuming the ſhape of a ram, led him to a fountain, where he refreſhed himſelf and his army; in gratitude for which favour, Bacchus built there a temple to Jupiter, under the title of *Ammon*, from the Greek *αμμος*, which ſignifies *ſand*, alluding to the ſandy deſart where it was built. In this temple was an oracle of great note, which Alexander the Great conſulted, and which laſted till the time of Theodoſius.

Hammon, the god of the Egyptians, was the ſame with the Jupiter of the Greeks; for which reaſon theſe latter denominate the city which the Egyptians call No-Hammon, or the habitation of Ammon, Dioſpolis, or the city of Jupiter. He is thought to be the ſame with Ham, who peopled Africa, and was the father of Mizraim, the founder of the Egyptians.

The temple of Jupiter Ammon was famous for its oracle. Lucan brings his hero, the great Cato, to conſult the oracle of Jupiter Ammon, whoſe temple he thus deſcribes:

Ventum erat ad templum, Lybicis quod gentibus unum
Inculti garamantes habent: ſtat corniger illic
Jupiter, ut memorant, ſed non aut fulmina vibrans,
Aut ſimilis noſtro, ſed tatis, cornibus Ammon.

— — — — — — —

Pauper ad huc deus eſt, nullis violata per ævum
Divinitiis delubra tenens; morumque priorum
Numen Romano templum defendit ab auro.

Luc. lib. 9. v. 514.

Now to the ſacred temple they draw near,
Whoſe only altars Lybian lands revere:
There, but unlike the Jove by Rome ador'd,
A form uncouth ſtands Heaven's Almighty Lord.
No regal enſigns grace his potent hand,
Nor ſhakes he there the lightning's flaming brand;
But, ruder to behold, a horned ram,
Belies the God, and Ammon is his name.

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There plain and poor, and unprofan'd, he ſtood,
Such as, to whom, our great forefathers bow'd:
A god of pious times, and days of old,
That keeps his temple free from Roman gold.

AMMONIAC, a concrete gummy reſinous juice, brought from the Eaſt Indies, uſually in large maſſes, compoſed of little lumps or tears, of a milky colour, but ſoon changing, upon being expoſed to the air, of a yellowiſh hue.

There is no certain account of the plant which affords this juice; the ſeeds uſually found among the tears reſemble thoſe of the umbelliferous claſs.

It has been alleged, that it is an exudation from a ſpecies of the Ferula, another ſpecies of which produces the aſſafœtida.

Ammoniac has a nauſeous ſweet taſte, followed by a bitter one; and a peculiar ſcent ſomewhat like galbanum: it ſoftens in the mouth, and grows of a whiter colour when chewed. It will burn away in flame: and is in ſome meaſure ſoluble in water or vinegar, with the latter of which it aſſumes the appearance of milk; but the reſinous part, amounting to about one half, ſubſides on ſtanding.

Ammoniac is an uſeful deobſtruent, and frequently preſcribed for opening obſtructions of the abdominal viſcera, and in hyſterical diſorders occaſioned by a deficiency of the menſtrual evacuations. It is likewiſe ſuppoſed to deterge the pulmonary veſſels; and proves of conſiderable ſervice in ſome kinds of aſthmas, where the lungs are oppreſſed by viſcid phlegm: in this inſtance, a ſolution of gum ammoniac in vinegar of ſquills proves a medicine of great efficacy, though very unpleaſant. In obſtinate cholics proceeding from viſcid matter lodged in the inteſtines, this gummy reſin has produced happy effects, after the purges and the common carminatives had been uſed in vain. Ammoniac is moſt commodiouſly taken in the form of pills; about a ſcruple may be given every night, or oftener. Externally, it ſoftens and ripens hard tumours: a ſolution of it in vinegar ſtands recommended by ſome for reſolving even ſchirrhous ſwellings. A plaſter made of it and ſquill-vinegar is recommended in white ſwellings. A dilute mixture of the ſame is likewiſe rubbed on the parts, which are alſo fumigated with the ſmoak of juniper-berries. It is prepared with a ſolution of it in pennyroyal water, and called from its milky colour, *lac ammoniaci*.

Sal Ammoniac, a volatile ſalt, of which there are two kinds, ancient and modern. The ancient ſort, deſcribed by Pliny and Dioſcorides, was a native ſalt, generated in thoſe large inns or caravanſeras where the crowd of pilgrims, coming from the temple of Jupiter Ammon, uſed to lodge; who, in thoſe parts, travelling upon camels, and thoſe creatures when in Cyrene, a province of Egypt, where that celebrated temple ſtood, urining in the ſtables, or (ſay ſome) in the parched ſands, out of this urine, which is remarkably ſtrong, aroſe a kind of ſalt, denominated Ammoniac.

Since the ceſſation of theſe pilgrimages, no more of this ſalt has been produced there.

The characters of the ancient ſal ammoniac are, that it cools water, turns aqua fortis into aqua regia, and conſequently diſſolves gold.

The modern ſal ammoniac is entirely factitious.

AMMONITÆ, or Ammonis-cornu, in natural hiſtory, is the ſame as Cornu Ammonis.

AMMONITES, a people dſcended from Ammon the ſon of Lot. The Ammonites deſtroyed thoſe giants which they called Zamzummins (Deut. ii. 19—21.), and ſeized upon their country. God forbad Moſes, and, by him the children of Iſrael, to attack the Ammonites; becauſe he did not intend to give their lands unto the Hebrews. Before the Iſraelites entered the land of Canaan, the Amorites had by conqueſt got great part of the countries belonging to the Ammonites and Moabites. This Moſes retook from the Amorites, and divided between the tribes of Gad and Reuben.

In the time of Jephtha, the Ammonites declared war againſt the Iſraelites (Judges xi.), under pretence that they detained a great part of the country which had formerly been theirs before the Amorites poſſeſſed it.

Jephtha declared, that as this was an acquiſition which the Iſraelites had made in a juſt war, and what they had taken from the Amorites, who had long enjoyed it by right of conqueſt, he was under no obligation to reſtore it. The Ammonites were not ſatisfied with this reaſon; wherefore Jephtha gave them battle and defeated them.

The Ammonites and Moabites generally united whenever there was any deſign ſet on foot of attacking the Iſraelites.

After the death of Othniel, the Ammonites and Amalekites joined with Eglon king of Moab to oppreſs the Hebrews; whom they ſubdued, and governed for the ſpace of 18 years, till they were delivered by Ehud the ſon of Gera, who ſlew Eglon king of Moab. Some time after this, the Ammonites made war againſt the Iſraelites, and greatly diſtreſſed them. But theſe were at laſt delivered by the hands of Jephtha; who having attacked the Ammonites, made a very great ſlaughter among them. In the beginning of Saul's reign, (1 Sam. xi.) Naaſh king of the Ammonites having ſat down before Jabeſh-gilead, reduced the inhabitants to the extremity of demanding a capitulation. Naaſh anſwered, that he would capitulate with them upon no other conditions than their ſubmitting to have every one his right eye plucked out, that ſo they might be made a reproach to Iſrael: but Saul coming ſeaſonably to the relief of Jabeſh, delivered the city and people from the barbarity of the king of the Ammonites.

David had been the king of Ammon's friend; and after the death of this prince, he ſent embaſſadors to make his compliments of condolence to Hanun his ſon and ſucceſſor; who, imagining that David's ambaſſadors were come as ſpies to obſerve his ſtrength, and the condition of his kingdom, treated them in a very injurious manner (2 Sam. x. 4.) David revenged this indignity thrown upon his ambaſſadors, by ſubduing the Ammonites, the Moabites, and the Syrians their allies.

Ammon and Moab continued under the obedience of the kings David and Solomon; and, after the ſeparation of the ten tribes, were ſubject to the kings of Iſrael till the death of Ahab in the year of the world 3107. Two years after the death of Ahab, Jehoram his ſon, and ſucceſſor of Ahaziah, defeated the Moabites (2 Kings iii.) but it does not appear that this victory was ſo complete as to reduce them to his obedience. At the ſame time, the Ammonites, and other people, made an irruption upon the lands belonging to Judah; but were forced back and routed by Jehoſhaphat (2 Chr. xx. 1, 2.). After the tribes of Reuben, Gad, and the half-tribe of Manaſſeh, were carried into captivity by Tiglath-pileſer in the year 3264, the Ammonites and Moabites took poſſeſſion of the cities belonging to theſe tribes. Jeremiah (xlix. 1.) reproaches them for it. The ambaſſadors of the Ammonites were ſome of thoſe to whom this prophet preſented the cup of the Lord's fury, and directed to make bonds and yokes for themſelves; exhorting them to ſubmit themſelves to Nebuchadnezzar, and threatening them, if they did not, with captivity and ſlavery. Ezekiel (xxv. 4. 10) denounces their entire deſtruction; and tells them God would give them up to the people of the eaſt, who ſhould ſet their palaces in their country, ſo that there ſhould be no more mention of the Ammonites among the nations. It is believed that theſe misfortunes happened to the Ammonites in the fifth year after the taking of Jeruſalem, when Nebuchadnezzar made war againſt all the people that dwelt upon the confines of Judea, in the year of the world 3420.

AMMUNITION, a general name for all warlike proviſions; but more particularly powder and ball.

Ammunition and arms, untenſils of war, gun-powder, &c. if imported without licence from his Majeſty, are, by the laws of England, forfeited, in triple the value. And again, ſuch licence obtained, except for furniſhing his Majeſty's public ſtores, is to be void, and the offender to incur a premunire, and to be diſabled to hold any office from the crown.

AMMUNITION *Bread, Shoes, &c.* ſuch as are ſerved out to the ſoldiers of an army or garriſon.

AMNESTY, in matters of policy, denotes a pardon granted by a prince to his rebellious ſubjects, uſually with ſome exceptions: ſuch was that granted by Charles II. at his reſtoration. The word is formed from the Greek *αμνεστια*, the name of an edict of this kind, publiſhed by Thraſibulus, on his expelling the tyrants out of Athens.

AMNIOS, in anatomy, a thin pellucid membrane, which ſurrounds the fœtus in the womb.

AMNÆ, AMNA, or AMNIS, in medical diſtinctions, imports, a kind of ſpring water, which is ſo much impregnated with limy acid, or tinged with white, as to reſemble milk and water. From this kind of mineral ſpring, greater virtues are derived.

AMNIMODAR, in aſtrology, implies the planet, which ruled the hour of nativity in caſting up the events that are feigned to be deduced by the impoſters who pretend to that ſcience.

AMNITES, in mineralogy, ſignifies the Hammites or ſpawn ſtone. It was formerly conjectured, that this ſtone was produced from fiſh ſpawn; but the idea is now deſervedly exploded, as it is found to be a dropping or ſand petrefaction.

AMOEBÆUM, in ancient poetry, a kind of poem repreſenting a diſpute between two perſons, who are made to anſwer each other alternately: ſuch are the third and ſeventh of Virgil's eclogues.

AMOGLOSSUS, in ichthyology, is the ſame as the ſpecies of the ſoal fiſh, called the lantern, which is reckoned a delicious taſted fiſh.

AMOMI, in commerce, is a Dutch term, for what we call the Jamaica, or long pepper.

AMOMUM, GINGER, a genus of the monogynia order, belonging to the monandria claſs of plants. For the characters ſee Syſtem of BOTANY. Of this genus there are four ſpecies:

1. The zingiber, or common ginger, is a native of the Eaſt, and alſo of ſome parts of the Weſt Indies; where it grows naturally without culture. The roots are jointed, and ſpread in the ground: they put out many green reed-like ſtalks in the ſpring, which ariſe to the height of two feet and an half, with narrow leaves. The flower-ſtems ariſe by the ſide of theſe, immediately from the root; theſe are naked; ending with an oblong ſcaly ſpike. From each of theſe ſcales is produced a ſingle blue flower, whoſe petals are but little lower than the ſquamous covering.

2. The zerumbet, or wild ginger, is a native of India. The roots are larger than thoſe of the firſt, but are jointed in the ſame manner.

3. The cardamomum, or cardamom, is likewiſe a native of India; but little known in this country, except by its ſeeds, which are uſed in medicine.

4. The grana paradiſi ſpecies is likewiſe a native of the Eaſt Indies. It is more grateful, and conſiderably more pungent, than cardamoms.

The dried roots of the firſt ſpecies are of great uſe in the kitchen, as well as in medicine, and furniſh a conſiderable export from ſome of the American iſlands. The green roots, preſerved as a ſweetmeat, are preferable to every other kind.

Ginger is a very uſeful ſpice, in cold flatulent cholics, and in laxity and debility of the inteſtines; it does not heat ſo much as thoſe of the pepper kind, but its effects are much more durable. The cardamoms and grains of paradiſe have the ſame medicinal qualities with ginger. In Jamaica, the common people employ it in baths and fomentations with good ſucceſs, in complaints of the viſcera, in pleuriſies, and in obſtinate and continued fevers.

AMOMUM *Verum*, or *True Amomum*, is a round fruit, about the ſize of a middling grape; containing, under a membranous cover, a number of ſmall rough angular ſeeds, of a blackiſh brown colour on the outſide, and whitiſh within; the ſeeds are lodged in three diſtinct cells; thoſe in each cell are joined cloſely together, ſo as that the fruit, upon being opened, appears to contain only three ſeeds. Ten or twelve grow together in a cluſter; and adhere without any pedicle, to a woody ſtalk about an inch long; each fruit is ſurrounded by ſix leaves, in form of a cup; and the part of the ſtalk void of fruit is clothed with leafy ſcales. The huſks, leaves, and ſtems, have a light grateful ſmell, and a moderately warm aromatic taſte; the ſeeds, freed from the huſks, are in both reſpects much ſtronger; their ſmell is quick and penetrating, their taſte pungent, approaching to that of camphor.

AMOMUM *Vulgare*, the ſame as SISON.

AMORÆANS, a ſect or order of gemaric doctors, or commentators on the Jeruſalem Talmud. The Amoræans ſucceeded the Miſchnic doctors. They ſubſiſted 250 years; and were ſucceeded by the Seburæans.

AMORCE, in military matters, implies a fine clear-grained powder of rapid inflammation.

AMORE, in ichthyology, are of three kinds, all natives of Weſt Indian ſeas. 1. Amore pixuma. 2. Amore guaca. 3. Amore tinga. They are all eaten, but the firſt is the beſt.

AMORITES, a people deſcended from Amorrhæus, according to the Septuagint and Vulgate; Emoræus, according to other expoſitors; Hæmori, according to the Hebrew; or Emorite, according to our verſion of the bible; who was the fourth ſon of Canaan. Gen. x. 16.

The Amorites firſt of all peopled the mountains lying to the weſt of the Dead Sea. They had likewiſe eſtabliſhments to the Eaſt of the ſame ſea, between the brooks of Jabbock and Arnon, from whence they forced the Ammonites and Moabites. Numb. xiii. 30. xxi. 29. Joſh. v. 1. and Judges xi. 19, 20. Moſes made a conqueſt of this country from their kings Sihon and Og, in the year of the world 2553.

The prophet Amos, (ii. 9) ſpeaking of the gigantic ſtature and valour of the Amorites, compares their height with that of cedars, and their ſtrength with that of an oak. The name Amorite is often taken in Scripture for all Canaanites in general. The lands which the Amorites poſſeſſed on this ſide Jordan were given to the tribe of Judah, and thoſe which they enjoyed beyond this river, were diſtributed between the tribes of Reuben and Gad.

AMORPHA, False Indigo, a genus of the decandria order, belonging to the diadelphia claſs of plants; and, in the natural method, ranking under the 32d order, Papilionaceæ. For the characters ſee Syſtem of Botany.

Of this there is only one known ſpecies, a native of Carolina, where the inhabitants formerly made from it a coarſe kind of indigo, whence the plant took its name. It riſes, with many irregular ſtems, to the height of 12 or 14 feet. The leaves are late in the ſpring before the foliage is fully diſplayed. The ends of their branches are generally deſtroyed by the froſt; or, if they recover it, they have the appearance of being dead. They ſhew their leaves about the middle of May, which are of a pleaſant green colour, very large, beautifully pinnated, the ſolioles being arranged along the ſtalk by pairs, and terminate by an odd one. The flowers are of a purple colour, and ſhow themſelves in perfection the beginning of July. They grow in ſpikes, ſeven or eight inches long, at the ends of the branches, and are of a ſingular ſtructure. The ſeeds of this plant were firſt ſent to England by Mr. Mark Cateſby in 1724, from which many plants were raiſed in the gardens near London.

The amorpha is moſt readily propagated by ſeeds, which ought to be procured annually from America. It may alſo be propagated by laying down the young branches, which in one year will make good roots; and may then be taken off, and planted in the places where they are deſigned to remain.

AMORTIZATION, in law, the alienation of lands or tenements to a corporation or fraternity and their ſucceſſors.

AMOS, a canonical book of the Holy Scriptures; the prophecy is recorded as the work of one of the minor prophets, who was a herdſman at Tekoa, a ſmall town about twelve miles from Jeruſalem. The prophet remonſtrates with the Iſraelites firſt, and then the Samaritans, concerning the evils of their ways; and laſtly, pronounces God's judgment againſt each nation: and cloſes his works with the glad tidings of the kingdom of Chriſt.

AMOVING, in law, implies the removal of an unſociable inhabitant from one part of the realm to another, at the diſcretion of the court, or the pleaſure of the king.

By the ſtat. 1 W. and M. c. 9, papiſts were amoved (removed) out of London and Weſtminſter, and a circuit of ten miles round each.

AMPANA, in botany, a trivial name given to the boraſſus of Linnæus.

AMPER, or Ampor, a dialect term, which vulgarly implies a tumor or ſwelling.

AMPELIS, the vine, in botany, the ſame as Vitis.

Ampelis, the chatterer, in ornithology, a genus of birds belonging to the order of paſſeres; the diſtinguiſhing characters of which are, that the tongue is furniſhed with a rim or margin all round, and the bill is conical and ſtrait.

There are ſeven ſpecies, all natives of foreign countries, except the garrulus, which is a native both of Europe and the Weſt Indies. In the former, the native country of theſe birds is Bohemia; from whence they wander over the reſt of Europe, and were once ſuperſtitiouſly conſidered as preſages of a peſtilence.

They appear annually, in the northern parts of this kingdom, in February; and feed on the berries of the mountain-aſh. They are gregarious; feed on grapes, where vineyards are cultivated; are eaſily tamed; and eſteemed delicious food.

This ſpecies is about the ſize of the black-bird: the bill is ſhort, thick, and black; on the head is a ſharp-pointed creſt reclining backwards: the lower part of the tail is black; the end of a rich yellow: the quill feathers are black, the three firſt tipt with white; the ſix next have half an inch of their exterior margin edged with fine yellow, the interior with white.

They have horny appendages from the tips of ſeven of the ſecondary feathers, of the colour and gloſs of the beſt red wax.

AMPELITES, Canal, Cannel-coal, Candle-coal, or Black Silk Coal, a hard, opaque, foſſile, inflammable ſubſtance, of a black colour. It does not effervеſce with acids. The ampelites, though much inferior to jet in many reſpects, is yet a very beautiful foſſil; and, for a body of ſo compact a ſtructure, remarkably light. Examined by the microſcope, it appears compoſed of innumerable very ſmall and thin plates, laid cloſely and firmly on one another; and full of very ſmall ſpecks of a blacker and more ſhining matter than the reſt, which is evidently a purer bitumen than the general maſs. Theſe ſpecks are equally diffuſed over the different parts of the maſſes.

It is dug in many parts of England, and France. It makes a very briſk fire, flaming violently for a ſhort time, and after that continuing red and glowing hot a long time; and finally is reduced into a ſmall proportion of grey aſhes, the greater part of its ſubſtance having flown off in the burning. It is capable of a very high and elegant poliſh; and, in the countries where it is produced, is turned into a vaſt number of toys, which bear all the nicety of turning, and paſs for jet.

AMPHERES, in antiquity, a kind of veſſels wherein the rowers plied two oars at the ſame time, one with the right hand and the other with the left.

AMPHIATHROSIS, in anatomy, a term for ſuch junctures of bones as have an evident motion, but different from the diarthroſis, &c.

AMPHIARAUS, in pagan mythology, a celebrated prophet, who poſſeſſed part of the kingdom of Argos. He was believed to excel in divining by dreams, and is ſaid to be the firſt who divined by fire.

Amphiaraus knowing, by the ſpirit of prophecy, that he ſhould loſe his life in the war againſt Thebes, hid himſelf in order to avoid engaging in that expedition: but his wife Eriphyle, being prevailed upon by a preſent, diſcovered the place in which he had concealed himſelf; ſo that he was obliged to accompany the other princes who marched againſt Thebes. This proved fatal to him; for the earth being ſplit aſunder by a thunder-bolt, both he and his chariot were ſwallowed up in the opening.

Amphiaraus, after his death, was ranked among the gods; temples were dedicated to him; and his oracle, as well as the ſports inſtituted to his honour, were very famous.

AMPHIBIA, in zoology, the name of Linnæus's third claſs of animals; including all thoſe which live partly in water and partly on land. The characters of this claſs are: that they have either a naked, or elſe a ſcaly body, with no grinders, or dentes molares, their teeth all ſharp and pointed, and without radiated fins: their heart has but one ventricle, and they reſpire through their lungs.

This claſs is divided into three orders, namely; 1. Reptiles. 2. Serpents. 3. Swimming Amphibia. It comprehends 24 genera and 289 ſpecies.

It is not certain whether the animals commonly called *amphibious*, live moſt in the water or on land. If we conſider the words *αμφι* (*utrinque*, both ways), and *βιος* (*vita*, life), from which the term *amphibious* is derived; we ſhould underſtand, that animals having this title, ſhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conſtantly at will: but it will be difficult to find any animal that can fulfil this definition, as being equally qualified for either. An ingenious naturaliſt, divides them into two orders, viz. 1. Such as enjoy their chief functions by land, but occaſionally go into the water. 2. Such as chiefly inhabit the water, but occaſionally go aſhore. That this diviſion is judicious will appear from the following obſervation:

Otters, beavers, and ſome kinds of rats, go occaſionally into the water for their prey, but cannot remain very long under water.

Frogs, how capable ſoever of remaining in the water, yet cannot avoid living on land; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can.

The lizard kind, ſuch as may be called water-lizards, are all obliged to come to land, in order to depoſit their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering, he is capable of remaining in the water longer by far than moſt other amphibious animals.

The hippopotamus, who wades into the lakes or rivers, is a quadruped, and remains under the water a conſiderable time; yet its chief reſidence is upon land, and he muſt come on ſhore for reſpiration.

The teſtudo, or ſea-tortoiſe, though it goes out to ſea, and is often found far from land, yet being a reſpiring animal, cannot remain long under water.

Among the amphibious animals which chiefly inhabit the waters, but occaſionally go on ſhore, are, eels and water ſerpents, or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtaltic motion, by which they can go forward at a pretty good rate: whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie montionleſs, and ſoon die.

All land animals have lungs, and can live no longer than while theſe are inflated by the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and exſpiration of air.

In like manner, the fiſh in general have, inſtead of lungs, gills or branchiæ; and as in land animals the lungs have a large portion of the maſs of blood circulating through them, which muſt be ſtopped if the air has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the branchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the branchiæ are not perpetually wet with water. So that, as the air is to the lungs in land animals a conſtant aſſiſtant to the circulation; ſo is the water to the branchiæ of thoſe of the rivers and ſeas: for when theſe are out of the water, the branchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo, when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes, and the animal dies.

Again, as land animals would be deſtroyed by too much maceration in water, ſo fiſhes would, on the other hand, be ruined by too much exſiccation; the latter being, from their general ſtructure and conſtitution, made fit to bear, and live in, the water; the former, by their conſtitution and form, to breath and dwell in the air.

AMPHIBIOUS, in natural hiſtory, imports much the ſame meaning as Amphibia; but may be defined generally to imply a term applied to a ſort of animals which live both upon land and in the water, i. e. which breathe the air, but paſs part of their time in the water, as affording them their chief food.

AMPHIBLESTROIDES, in anatomy, denotes a tunic, or coat of the eye, more uſually called the retina.

AMPHIBOLOGY, in grammar and rhetoric, a term uſed to denote a phraſe that admits of two different interpretations.

AMPHIBRACHYS, in ancient poetry, the name of a foot conſiſting of three ſyllables, whereof that in the middle is long, and the other two ſhort; ſuch is the word ăbīrĕ.

AMPHICOME, in natural hiſtory, a kind of figured ſtone, of a round ſhape, but rugged, and beſet with eminences, celebrated on account of its uſe in divination. The word is originally Greek, αμφικομη, *q. d. utrinque comata*, or "hairy on all ſides." This ſtone is alſo called *Erotylos*, Ερωτυλος, *Amatoria*, probably on account of its ſuppoſed power of creating love. The amphicome is mentioned by Democritus and Pliny, though little known among the moderns. Mercatus takes it for the ſame with the *lapis lumbricatus*, of which he gives a figure.

AMPHICTYONS, in Grecian antiquity, an aſſembly compoſed of deputies from the different ſtates of Greece; and reſembling, in ſome meaſure, the diet of the German empire.

The ſtated terms terms of their meeting was in ſpring and autumn; the ſpring meeting was called Εαρινη Πυλαια, that in autumn Μετοπωρινη. On extraordinary occaſions, however, they met at any time of the year, or even continued ſitting all the year round.

Philip of Macedon uſurped the right of preſiding in the aſſembly of the Amphictyons, and of firſt conſulting the oracle which was called Προμαντεια.

AMPHIDROMIA, a feaſt celebrated by the ancients on the fifth day after the birth of a child.

AMPHIDRYON, in eccleſiaſtical writers, denotes the veil or curtain which was drawn before the door of the bema in ancient churches.

AMPHIMACER, in ancient poetry, a foot conſiſting of three ſyllables, whereof the firſt and laſt are long, and that in the middle ſhort; ſuch is the word cāſtĭtās.

AMPHION, in mythology, the ſon of Jupiter and Antiope; who, according to the poets, made the rocks follow his muſic; and at his harp the ſtones of Thebes danced into walls and a regular city.

AMPHIMALLUM, in church hiſtory, denotes the wool-fleece, or coat of the biſhops; figuratively alluding to the garment of innocence, neceſſary for the ſhepherd of the flock.

AMPHIBNEUMA, in medicine, ſignifies the difficulty of reſpiration in pleuretic fevers, and other diſeaſes of the lungs.

AMPHIPOLES, in antiquity, the principal magiſtrates of Syracuſe. They were eſtabliſhed by Timoleon in the 109th Olympiad, after the expulſion of the tyrant Dyoniſius. They governed Syracuſe for the ſpace of 300 years: and Diodorus Siculus aſſures us they ſubſiſted in his time.

AMPHIPII, in Grecian antiquity, ſoldiers who, in war, uſed two horſes without ſaddles, and were dextrous enough to leap from one to the other.

AMPHIPORÆ, in the naval affairs of the ancients, were veſſels with a prow at each end. They were uſed chiefly in rapid rivers and narrow channels, where it was not eaſy to tack about.

AMPHIPROSTYLE, in the architecture of the ancients, a temple which had four columns in the front, and as many in the aſpect behind.

AMPHISBÆNA, in zoology, a genus of ſerpents belonging to the order of amphibia ſerpentes, ſo called from the falſe notion of its having two heads, becauſe it moves with either end foremoſt.

The head of the amphiſbæna is ſmall, ſmooth, and blunt; the noſtrils are very ſmall; the eyes are minute and blackiſh; and the mouth is furniſhed with a great number of ſmall teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex ſegments, like thoſe of a worm; and it has about 40 longitudinal ſtreaks, of which 12 on each ſide are in the form of ſmall croſſes like the Roman X; the anus is a tranſverſe ſlit; and the laſt ring, or ſegment of the belly, has eight ſmall papillæ, forming a tranſverſe line before the anus; the tail, i. e. all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white; but the black prevails moſt on the back, and the white on the belly. It has a great reſemblance to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies:

1. The fuliginoſa, which anſwers exactly to the above deſcription, and is found in Libya, and in different parts of America.

2. The alba, which is totally white, is a native of both the Indies, and is generally found in ant-hillocks. The bite of the amphiſbæna is reckoned to be mortal by many authors; but as it is not furniſhed with dog-fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earth-worms, but particularly the latter.

Amphisbæna Aquatica, a name given by Bertrutius, Albertus, and ſeveral other authors, to that long and ſlender inſect, called by others the ſeta aquatica, and vermis ſetarius. It has the name amphiſbæna, from its going backwards or forwards with equal eaſe and celerity. The uſual ſize is four or five inches long, and about the thickneſs of a large hair.

AMPHISCII, among geographers, a name applied to the people who inhabit the torrid zone. The Amphiſcii, as the word imports, have their ſhadows one part of the year towards the north, and the other towards the ſouth, according to the ſun's place in the ecliptic. They are alſo called Aſcii.

AMPHISMILA, or Amphismela, in ſurgery, a two-edged knife.

AMPHITAPAA, in antiquity, a cloth with a rug or knap on each ſide.

AMPHITANE, in natural hiſtory, a ſtone ſaid to attract gold as the loadſtone does iron. Pliny ſays it was found in that part of the Indies where the native gold lay ſo near the ſurface of the earth, as to be turned up in ſmall maſſes among the earth of ant-hills; and deſcribes it to have been of a ſquare figure, and of the colour and brightneſs of gold. The deſcription plainly points out a well-known foſſil, called, by Dr. Hill, *pyricubium*: this is common in the mines of moſt parts of the world; but neither this, nor any other ſtone, was ever ſuppoſed, in our times, to have the power of attracting gold.

AMPHITHEATRE, in antiquity, a ſpacious edifice, built either round or oval, with a number of riſing ſeats, upon which the people uſed to behold the combats of gladiators, of wild beaſts, and other ſports.

Amphitheatres were at firſt only of wood; and it was not till the reign of Auguſtus, that Statilius Taurus built one, for the firſt time, of ſtone. The loweſt part was of an oval figure, and called *arena*, becauſe, for the convenience of the combatants, it was uſually ſtrewed with ſand; and round the arena were vaults, ſtyled *caveæ*, in which were confined the wild beaſts appointed for the ſhows.

Above the caveæ was erected a large circular periſtyle, or podium, adorned with columns. This was the place of the emperors, ſenators, and other perſons of diſtinction.

The rows of benches were above the podium. Their figure was circular; and they were entered by avenues, at the end of which were gates called *vomitoriæ*.

The Theatre was built in orm of a ſemicircle, only exceeding a juſt ſemicircle by one fourth part of the diameter; and the amphitheatre was nothing elſe but a double theatre, or two theatres joined together: ſo that the longeſt diameter of the amphitheatre was to the ſhorteſt as 1½ to 1.

There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *coliſeum*, and that at Verona, in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators.

Amphitheatre, in gardening, certain diſpoſitions of trees and ſhrubs on the ſides of hilly places, which, if the hill or riſing be naturally of a circular figure, always have the beſt effect. They are formed of ever-greens, ſuch as hollies, phillereys, laureſtines, bays, and ſuch plants, obſerving to plant the ſhorteſt growing trees in the front, and thoſe which will be the talleſt behind, ſuch as pines, firs, cedars, &c.

Amphitheatres are alſo ſometimes formed of ſlopes on the ſides of hills, covered only with turf; and, when well kept, they are a great ornament to large gardens.

AMPHITHURA, in antiquity, ſignified the veil which divided the chancel from the reſt of the church.

AMPHITRITE, αμφιτριτη, from *circumferendo*, in the heathen mythology, the wife of Neptune, and goddeſs of the ſea, ſometimes taken for the ſea: alſo the name of a ſmall naked ſea inſect, ſomewhat reſembling a quill.

AMPHITRYON, in mythology, ſon of Alcæus, leſs known by his own exploits than from his wife Alcmena's adventure.

AMPHODONTA, in zoology, a deſignation given to animals which have teeth in both jaws, i. e. upper and under.

AMPHORA, in antiquity, a liquid meaſure among the Greeks and Romans. The Roman amphora contained 48 ſextaries, equal to about ſeven gallons one pint Engliſh wine-meaſure; and the Grecian or Attic amphora contained one-third more.

Amphora was alſo a dry meaſure uſed by the Romans, and contained about three buſhels.

Amphora, among the Venetians, is the largeſt meaſure uſed for liquids, containing about 16 quarts.

AMPHORARIUM Vinum, in antiquity, denotes that which is drawn or poured into *amphoræ* or pitchers; by way of diſtinction from *vinum doliare*, or caſk wine. The Romans had a method of keeping wine in *amphoræ*, for many years, to ripen, by faſtening the lids tight down with pitch or gypſum, and placing them either in a ſituation where the ſmoke came, or under ground.

AMPHOTEROPLON, in civil law, denotes a naval inſurance on ſhipping, in outward bound, and returning voyages, generally diſtinguiſhed from Heteroplon, or voyages only inſured for the outfit, or export deſtination.

AMPHOTIDES, in antiquity, a kind of armour or covering for the ears, worn by the ancient pugiles, to prevent their adverſaries from laying hold of thoſe parts.

AMPLEXATIO, in alchemy, denotes the connexion or union of the philoſophical mercury, as male and female; the former red, the latter white.

AMPLIATION, in a general ſenſe, denotes the act of enlarging or extending the compaſs of a thing.

On a medal of the emperor Antoninus Pius, we find the title *ampliator civium* given him, on account of his having extended the *jus civitatis*, or rights of citizens, to many ſtates and people before excluded that privilege.

Ampliation, in Roman antiquity, was the deferring to paſs ſentence in certain cauſes. This the judge did by pronouncing the word *amplius*; or by writing the letters N. L. for *non liquet*; thereby ſignifying, that, as the cauſe was not clear, it would be neceſſary to bring further evidence.

AMPLIFICATION, in rhetoric, part of a diſcourſe or ſpeech, wherein a crime is aggravated, a praiſe or commendation heightened, or a narration enlarged, by an enumeration of circumſtances; ſo as to excite the proper emotions in the ſouls of the auditors. Such is the paſſage in Virgil, where, inſtead of ſaying merely that Turnus died, he amplifies the circumſtances of his death.

> *—Aſt illi ſolvuntur frigore membra,*
> *Vitaque cum gemitu fugit indignata ſub umbras.*

Elegant ſpeakers make amplification to be the ſoul of diſcourſe.

AMPLITUDE, in aſtronomy, an arch of the horizon, intercepted between the eaſt or weſt point and the centre of the ſun, or a planet, at its riſing or ſetting; and ſo is either north and ſouth, or ortive and occaſive.

Magnetical Amplitude, the different riſing or ſetting of the ſun, from the eaſt or weſt points of the compaſs. It is found by obſerving the ſun at his riſing and ſetting, by an amplitude-compaſs.

AMPOTIS, in natural hiſtory, ſignifies the receſs or ebb of the tide. Hence phyſicians, from the great Hippocrates, call an abatement of any diſorder, an ampotis or receſs.

AMPULLA, in antiquity, a round big-bellied veſſel, which the ancients uſed in their baths, to contain oil for anointing their bodies. Alſo the name of a cup for drinking out of at table.

Ampulla, among eccleſiaſtical writers, denotes one of the ſacred veſſels uſed at the altars. Ampullæ were alſo uſed for holding the oil uſed in chriſmation, conſecration, coronation, &c.

Knights of St. Ampulla, belong to an order inſtituted by Clovis I. king of France; at the coronation they bear up the canopy, under which the ampulla is carried in proceſſion.

AMPUTATION, in ſurgery, the cutting off a limb, or any part from the body. For the method ſee Syſtem of Surgery.

AMSEGETES, in ancient law books, denoted thoſe whoſe lands abutted on the king's highway.

AMTRUSTIO, in ancient charters, denotes a ſworn fidelity from the tenant to his lord.

AMULET, a charm, or pretended preſervative againſt miſchief, witchcraft, or diſeaſes.

Amulets were made of ſtone, metal, ſimples, animals, and in a word of every thing that imagination ſuggeſted.

Sometimes they conſiſted of words, characters, and ſentences, ranged in a particular order, and engraved upon wood, &c. and worn about the neck, or ſome other part of the body.

At other times they were neither written or engraved; but prepared with many ſuperſtitious ceremonies, great regard being uſually paid to the influence of the ſtars. The Arabians have given to this ſpecies of amulet the name of Talisman.

All nations have been fond of amulets: the Jews were extremely ſuperſtitious in the uſe of them, to drive away diſeaſes; and the Miſna forbids them, unleſs received from an approved man who had cured at leaſt three perſons before by the ſame means.

Among the Chriſtians of the early times, amulets were made of wood, or ribbands with a text of Scripture written on them, as preſervatives againſt diſeaſes. They are now very properly exploded, and looked upon fictions to impoſe upon mankind, which in truth they certainly were.

AMULETIC *Medicines*, implies medical ſuperſtition.

AMUND, in antiquity, denotes a perſon of age, and fully inſtructed.

AMURCA, in pharmacy, denotes a drying medicine.

AMYGDALUS, the Almond and Peach, a genus of the monogynia order, belonging to the icoſandria claſs of plants; and, in the natural method, ranking under the 36th order, Pomaceæ. For the characters, ſee Syſtem of Botany.

There are enumerated ſeveral ſpecies, 1. The Communis, or Common Almond, a native of Africa, will grow to near 20 feet high; and whether planted ſingly in an open place, or mixed with others in clumps, ſhrubbery-quarters, &c. ſhews itſelf one of the fineſt flowering trees in nature. The white flowering almond, well known in our nurſeries, is a variety of this ſpecies, and is cultivated for the ſake of the flowers and the fruit.

2. The Nana, Dwarf Almond, is a native of Aſia Minor. Of this ſhrub there are two ſorts, the ſingle and the double. Both grow to about four or five feet high, and are in the firſt eſteem as flowering ſhrubs.

3. The Perſica, or Peach, is ſaid to be a native of Europe; but of what place is not known. Cultivation has produced many varieties of this fruit; of which the following are the moſt eſteemed.

1. The White Nutmeg.
2. The Red Nutmeg.
3. The Early Purple.
4. The Small Mignon.
5. The White Magdalen.
6. The Yellow Alberge.
7. The Large French Mignon.
8. The Beautiful Chevreuſe.
9. The Red Magdalen.
10. The Chancellor.
11. Smith's Newington.
12. The Montauban.
13. The Malta.
14. The Vineuſe.
15. The Bellegarde.
16. The Bourdine.
17. The Roſſanna.
18. The Admirable.
19. The Old Newington.
20. The Royal.
21. The Rambouillet.
22. The Portugal.
23. The Late Admirable.
24. The Nivette.
25. Venus's Nipple.
26. The late Purple.
27. The Perſique.
28. The Catharine.
29. The Monſtrous Pavy.
30. The Bloody Peach.

The White Nutmeg is the firſt peach in ſeaſon, it being often in perfection by the end of July. The leaves are doubly ſerrated, the flower large, and of a pale colour; the fruit is white, ſmall, and round; the fleſh too is white, parts from the ſtone, and has a ſugary, muſky flavour.

The Red Nutmeg hath yellowiſh green leaves, with ſerpentine edges, which are ſlightly ſerrated. The flowers are large, open, and of a deep bluiſh-colour. The fruit is larger and rounder than the former, and is of a bright vermilion next the ſun, but more yellow on the other ſide. The fleſh is white, except next the ſtone, from which it ſeparates, and has a rich muſky flavour. It ripens juſt after the white nutmeg.

The Early Purple hath ſmooth leaves, terminated in a ſharp point. The flowers are large, open, and of a lively red. The fruit is large, round, and covered with a fine deep red coloured down. The fleſh is white, red next the ſtone, and full of a rich vinous juice. Ripens about the middle of Auguſt.

The Small Mignon hath leaves ſlightly ſerrated, and the flowers ſmall and contracted. The peach is round, of a middling ſize, tinged with darkiſh red on the ſunſide, and is of a pale yellowiſh colour on the other. The fleſh is white, parts from the ſtone, where it is red, and contains plenty of a vinous, ſugary juice. Ripens rather before the former.

The White Magdalen hath long, ſhining, pale-green leaves, deeply ſerrated on the edges, and the wood is moſt black at the pith. The fruit is round, large, of a yellowiſh-white colour, except on the ſunny ſide, where it is ſlightly ſtreaked with red. The fleſh is white to the ſtone, from which it ſeparates, and the juice is pretty well flavoured. Ripe at the end of Auguſt.

The Yellow Alberge hath deep red, middle-ſized flowers: the peach is ſmaller than the former, of a yellow colour on the ſhady ſide, and of a deep red on the other. The fleſh is yellow, red at the ſtone, and the juice is ſugary and vinous.

The Great French Mignon hath large, finely ſerrated leaves, and beautiful red flowers. The fruit is large, quite round, covered with a fine ſattiny down, of a browniſh red colour on the ſunny ſide, and of a greeniſh yellow on the other. The fleſh is white, eaſily parts from the ſkin, and is copiouſly ſtored with a ſugary high-flavoured juice. Ripe near the middle of Auguſt.

The Beautiful Chevreuſe hath plain leaves, and ſmall contracted flowers. The fruit is rather oblong, of a middling ſize, of a fine red colour next the ſun, but yellow on the other ſide. The fleſh is yellowiſh, parts from the ſtone, and is full of a rich ſugary juice. ripens a little after the former.

The Red Magdalen hath deeply ſerrated leaves, and large open flowers. The fruit is large, round, and of a fine red next the ſun. The fleſh is firm, white, ſeparates from the ſtone, where it is very red: the juice is ſugary, and of an exquiſite rich flavour. Ripe at the end of Auguſt.

The Chancellor hath large, ſlightly ſerrated leaves. The peach is about the ſize of the Beautiful Chevreuſe, but rather rounder. The ſkin is very thin, of a fine red on the ſunny ſide; the fleſh is white and melting, parts from the ſtone, and the juice is very rich and ſugary. It ripens with the former.

The leaves of Smith's Newington are ſerrated, and the flowers are large and open. The fruit is of a middle ſize, of a fine red on the ſunny ſide; the fleſh white and firm, but very red at the ſtone, to which it ſticks cloſely, and the juice has a pretty good flavour. Ripens with the former.

The Montauban hath ſerrated leaves, and large open flowers.
The

The fruit is about the ſize of the former, of a purpliſh red next the ſun, but of a pale one on the ſhady ſide. The fleſh is melting and white even to the ſtone, from which it ſeparates. The juice is rich, and well flavoured. It ripens a little before the former.

The Malta hath deeply ſerrated leaves, and the flowers are large and open. The fruit is almoſt round, of a fine red next the ſun, marbled with a deeper red, but the ſhady ſide is of a deep green. The fleſh is fine, white, except at the ſtone, from which it parts, where it is of a deep red; the juice is a little muſky, and agreeable. It ripens at the end of Auguſt, or beginning of September.

The Vineuſe hath large deep green leaves, and full bright red flowers. The fruit is round, of a middle ſize; the ſkin is thin, all over red; the fleſh fine and white, except at the ſtone, where it is very red, and the juice is copious and vinous. Ripe in the middle of September.

The Bellegarde hath ſmooth leaves, and ſmall contracted flowers. The fruit is very large, round, and of a deep purple colour next the ſun. The fleſh is white, parts from the ſtone, where it is of a deep red, and the juice is rich and excellent. It ripens early in September.

The Bourdine hath large, fine green, plain leaves, and ſmall fleſh-coloured contracted flowers. The fruit is round, of a dark red next the ſun; the fleſh white, except at the ſtone, where it is of a deep red, and the juice is rich and vinous. Ripens with the former.

The Roſſanna hath plain leaves, and ſmall contracted flowers. The fruit is rather longer than the alberge, and ſome count it only a variety of the latter. The fleſh is yellow, and parts from the ſtone, where it is red; the juice is rich and vinous. Ripe early in September.

The Admirable hath plain leaves, and ſmall contracted flowers, which are of a pale red. The fruit is very large and round; the fleſh is firm, melting, and white, parts from the ſtone, and is there red; and the juice has a ſweet, ſugary, high vinous flavour. Ripe early in September.

The Old Newington hath ſerrated leaves, and large open flowers. The fruit is large, of a fine red next the ſun; the fleſh is white, ſticks cloſe to the ſtone, where it is of a deep red, and the juice has an excellent flavour. It ripens juſt after the former.

The Royal has plain leaves, and ſmall contracted flowers. The fruit is about the ſize of the admirable, and reſembles it, except that it has ſometimes a few knobs or warts. The fleſh is white, melting, and full of a rich juice; it parts from the ſtone, and is there of a deep red. Ripe about the middle of September.

The Rambouillet hath leaves and flowers like the royal. The fruit is rather round than long, of a middling ſize, and deeply divided by a furrow. It is of a bright yellow on the ſhady ſide, but of a fine red on the other. The fleſh is melting, yellow, parts from the ſtone, where it is of a deep red, and the juice is rich and vinous. Ripe with the former.

The Portugal hath plain leaves, and large open flowers. The fruit is large, ſpotted, and of a beautiful red on the ſunny ſide. The fleſh is firm, white, ſticks to the ſtone, and is there red. The ſtone is ſmall, deeply furrowed, and the juice is rich and ſugary. Ripe towards the end of September.

The Late Admirable hath ſerrated leaves, and browniſh red ſmall contracted flowers. The fruit is rather large and round, of a bright red next the ſun, marbled with a deeper. The fleſh is of a greeniſh white, and ſticks to the ſtone, where it hath ſeveral red veins; the juice is rich and vinous. Ripe about the middle of September.

The Nivette hath ſerrated leaves, and ſmall contracted flowers. The fruit is large and roundiſh, of a bright red colour next the ſun, but of a pale yellow on the ſhady-ſide. The fleſh is of a greeniſh-yellow, parts from the ſtone, where it is very red, and is copiouſly ſtored with a rich juice. It ripens about the middle of September.

Venus's Nipple hath fine ſerrated leaves, and roſe-coloured, ſmall contracted flowers, edged with carmine. The fruit is of a middling ſize, and has a riſing like a breaſt. It is of a faint red on the ſun-ſide, and on the ſhady one of a ſtraw-colour. The fleſh is melting, white, ſeparates from the ſtone, where it is red, and the juice is rich and ſugary. Ripens late in September.

The Late Purple hath large, ſerrated leaves, which are variouſly contorted, and the flowers are ſmall and contracted. The fruit is round, large, of a dark red on the ſunny-ſide, and yellowiſh on the other. The fleſh is melting, white, parts from the ſtone, where it is red, and the juice is ſweet and high-flavoured. Ripens with the former.

The Perſique hath large, very long indented leaves, and ſmall contracted flowers. The fruit is large, oblong, of a fine red next the ſun; the fleſh firm, white but red at the ſtone, juicy, and of a high pleaſant flavour. The ſtalk has frequently a ſmall knot upon it. Ripe late in September.

The Catharine hath plain leaves, and ſmall flowers. The fruit is large, round, of a very dark red next the ſun. The fleſh white, firm, ſticks cloſe to the ſtone, and is there of a deep red. The juice is rich and pleaſant. It ripens early in October.

The Monſtrous Pavy hath large, very ſlightly ſerrated leaves, and large, but rather contracted flowers. The fruit is round, and very large, whence its name. It is of a fine red on the ſunny ſide, and of a greeniſh-white on the other. The fleſh is white, melting, ſticks cloſe to the ſtone, and is there of a deep red. It is pretty full of juice, which in dry ſeaſons is ſugary, vinous, and agreeable. Ripe towards the end of October.

The peach-tree has hitherto been planted againſt a wall; and if they are well managed, by this advantage, they are ſucceeded by very good fruit.

The Bloody Peach hath rather large, ſerrated leaves, which turn red in autumn. The fruit is of a middling ſize, the ſkin all over of a dull red, and the fleſh is red down to the ſtone. The fruit is but dry, and the juice rather ſharp and bitteriſh. It ſeldom ripens well in England, but is well worth cultivating notwithſtanding, for the fruit bake and preſerve excellent well.

The Nectarine, according to Linnæus, is only a variety of the peach, its having a ſmooth coat being only an accident originally. Of this alſo many varieties are now cultivated; and the following are ſome of the moſt eſteemed: 1. The Elruge. 2. The Newington. 3. The Scarlet. 4. The Roman. 5. The Murrey. 6. The Italian. 7. The Golden. 8. The Temple's.

The Elruge hath large ſerrated leaves, and ſmall flowers. The fruit is of a middling ſize, of a dark purple colour next the ſun, and of a greeniſh yellow on the ſhady ſide. The fleſh parts from the ſtone, and has a ſoft, melting, good flavoured juice. Ripe early in Auguſt.

The Newington hath ſerrated leaves, and large open flowers. The fruit is pretty large, of a beautiful red on the ſunny ſide, but of a bright yellow on the other. The fleſh ſticks to the ſtone, is there of a deep red colour, and the juice has an excellent rich flavour. Ripe towards the end of Auguſt.

The Scarlet is rather leſs than the former, of a fine ſcarlet colour next the ſun, but fades to a pale red on the ſhady ſide. It ripens near the time of the former.

The Roman, or cluſter red Nectarine, hath plain leaves, and large flowers. The fruit is large, of a deep red towards the ſun, but yellowiſh on the ſhady ſide. The fleſh is firm, ſticks to the ſtone, and is there red; the juice is rich, and has an excellent flavour. Ripe about the end of Auguſt.

The Murrey is a middling-ſized fruit, of a dirty red colour on the ſunny ſide, and yellowiſh on the ſhady one. The fleſh is firm, and tolerably well flavoured. It ripens early in September.

The Italian Nectarine hath ſmooth leaves and ſmall flowers; the fruit is red next the ſun, but yellowiſh on the other ſide; fleſh firm, adheres to the ſtone, where it is red, and when ripe, which is early in September, has an excellent flavour.

The Golden Nectarine has an agreeable red colour next the ſun, bright yellow on the oppoſite ſide; fleſh very yellow, ſticks to the ſtone, where it is of a pale red, has a rich flavour, and ripens in September.

Temple's Nectarine is of a middling ſize, of a fair red next the ſun, of a yellowiſh green on the other ſide; fleſh white near the ſtone, from which it ſeparates; ripens in September, and has a high poignant flavour.

All the above ſpecies are propagated by inoculating them into plum-ſtocks in Auguſt.

There are general rules given for the pruning of peach and nectarine trees; viz. 1. Always to have enough of bearing wood; and, 2. Not to lay in the branches too cloſe to one another.

Sweet almonds are reckoned to afford little nouriſhment; and, when eaten in ſubſtance, are not eaſy of digeſtion, unleſs thoroughly comminuted: Peeled, and eaten ſix or eight at a time, they ſometimes give preſent relief in the heart-burn. But in medicine they are moſtly uſed for making emulſions; and they abound not only with an oil, but likewiſe with a mucilage fit for incorporating oil and water together.

The bitter almonds are not now ſo much uſed as formerly, being found to be very unwholeſome.

As to the peach and nectarine, they are known to be delicious fruits.

Peach-flowers have an agreeable ſmell, and a bitteriſh taſte; diſtilled, without any addition, by the heat of a water-bath, they yield one-ſixth their weight, or more, of a whitiſh liquor, which communicates, to a large quantity of other liquids, a flavour like that of the kernels of fruits. An infuſion, in water, of half an ounce of the freſh-gathered flowers, or a drachm of them when dried, ſweetened with ſugar, proves for children an uſeful laxative and anthelmintic: the leaves of the tree are, with this intention, ſomewhat more efficacious, though leſs agreeable.

The fruit has the ſame quality with the other ſweet fruits, that of abating heat, quenching thirſt, and gently looſening the body.

AMYGDALATE, implies, in medicine, the milk or emulſion extracted from almonds.

AMYGDALOIDES Lapis, in mineralogy, denotes a kind of ſtone, produced from the petrefaction of the ſpine of the echinus marininus, or ſea urchin.

AMYLUM, in commercial manufacture, ſignifies ſtarch.

AMYNTICA Emplastra, in medical preſcriptions, denotes ſtrengthening plaſters.

AMYLACEOUS, from *amylum*, ſtarch; a term applied to the fine flour of farinaceous ſeeds, in which conſiſts their nutritive part.

AMYNTA, in literary hiſtory, a beautiful paſtoral comedy, compoſed by Taſſo; the model of all dramatic pieces wherein ſhepherds are actors.

AMYNTOR, *αμυντωρ*, formed of the verb *αμυνω*, *I defend*, or *avenge*, properly denotes a perſon who defends or vindicates a cauſe.

AMYRALDISM, a name given, by ſome writers, to the doctrine of univerſal grace, as explained and aſſerted by Amyraldus, or Moſes Amyrault, and his followers, among the reformed in France, towards the middle of the 17th century.

The principles of his doctrine were, that God deſires the happineſs of all men, and none are excluded by a divine decree; that none can obtain ſalvation without faith in Chriſt; that God refuſes to none the power of believing, though he does not grant to all his aſſiſtance, that they may improve this power to ſaving purpoſes; and that many periſh through their own fault. Thoſe who embraced this doctrine were called Univerſaliſts.

AMYRIS, in botany, a genus of the monogynia order, belonging to the decandria claſs of plants. For the characters ſee Syſtem of BOTANY. The moſt remarkable ſpecies are:

1. The elemifera, or ſhrub which bears the gum emeli, a native of South America. It grows to the height of about ſix feet, producing trifoliated ſtiff ſhining leaves, growing oppoſite to one another, on footſtalks two inches long. At the ends of the branches grow four or five ſlender ſtalks ſet with many very ſmall white flowers.

2. The gileadenſis, or opobalſamum, is an evergreen ſhrub, growing ſpontaneouſly in Arabia Felix, from whence the opobalſam, or balm of gilead, is procured.

3. Toxifera, or poiſon-wood, is a ſmall tree, with a ſmooth light-coloured bark. Its leaves are winged; the middle rib is ſeven or eight inches long, with pairs of pinnæ one againſt another, on inch-long footſtalks. The fruit hangs in bunches, is ſhaped like a pear, and is of a purple colour, covering an oblong hard ſtone. It grows uſually on rocks, in Providence, Ilathera, and others of the Bahama iſlands.

4. The balſamifera, or roſe-wood, is found on gravelly hills in Jamaica, and others of the Weſt-India iſlands.

From the firſt ſpecies, which is called by the natives of the Braſils, icicariba, is obtained the reſin improperly called gum elemi, or gum lemon. This drug is brought to us from the Spaniſh Weſt Indies, and ſometimes from the Eaſt Indies, in long roundiſh cakes, generally wrapped up in flag leaves. It almoſt totally diſſolves in pure ſpirit, and ſends over ſome part of its fragrance along with this menſtruum in diſtillation.

The ſecond ſpecies yields the balſam of Mecca, of Syria, or of Gilead, which is the moſt fragrant and pleaſant of any of the balſams.

ANA, among phyſicians, denotes a quantity equal to that of the preceding ingredient. It is abbreviated thus, āā, or ā.

ANA, in matters of literature, a Latin termination, adopted into the titles of ſeveral books in other languages. Anas, or books in ana, are collections of the memorable ſayings of perſons of wit and learning.

ANABAPTISM, in the doctrine of modern reformation in religion, imports the whole of the conſtitutional principles of the proteſtant ſectary, uſually denominated anabaptiſts.

ANABAPTISTON, the ſame with ABAPTISTON.

ANABAPTISTS, a name which has been indiſcriminately applied to Chriſtians of very different principles and practices; though many of them object to the denomination, and hold nothing in common, beſides the opinion that baptiſm ought always to be performed by immerſion, and not adminiſtered before the age of diſcretion.

The word Anabaptiſt is compounded of *ανα*, new, and *βαπτιςης*, a baptiſt; and in this ſenſe the Novatians, the Cataphrygians, and the Donatiſts, may be conſidered as a kind of Anabaptiſts in the earlier ages, though not then denoted by this name.

The Engliſh and Dutch Baptiſts do not conſider the denomination as at all applicable to their ſect: by whom the baptiſm appointed by Chriſt is held to be "nothing ſhort of *immerſion, upon a perſonal profeſſion of faith*;" of which profeſſion infants being incapable, and ſprinkling being no adequate ſymbol of the thing intended, the baptizing of proſelytes to their communion, who in their infancy had undergone the ceremony of ſprinkling, cannot, it is urged, be interpreted a repetition of the baptiſmal ordinance.

Anabaptiſts, in a ſtrict and proper ſenſe, appear to be thoſe who not only re-baptize, when they arrive at an adult age, perſons that were baptiſed in their infancy, but alſo, as often as any perſon comes from one of their ſects to another, or as often as any one is excluded from their communion and again received into the boſom of their church, they baptize him. But the opinion common to all the ſects to which the name of Anabaptiſts has been indiſcriminately applied, is that of the invalidity of infant baptiſm, in whatever way adminiſtered: and hence the general denomination of Antipædobaptiſts; which includes Anabaptiſts, Baptiſts, Mennonites, Waterlandians, &c. as diſtinguiſhed by their reſpective peculiarities; though Anabaptiſts ſeem to have been adopted by moſt writers as the general term.

The Anabaptiſts appear to have been little noticed before the time of reformation in Germany. The moſt prudent and rational part of them conſidered it poſſible, by human wiſdom, induſtry, and vigilance, to purify the church from the contagion of the wicked, provided the manners and ſpirit of the primitive Chriſtians could but recover their loſt dignity and luſtre; and ſeeing the attempts of Luther, ſeconded by ſeveral perſons of eminent piety, prove ſo ſucceſsful, they hoped that the happy period was arrived, in which the reſtoration of the church to purity was to be accompliſhed, under the divine protection, by the labours and counſels of pious and eminent men.

Others, far from being ſatisfied with the plan of reformation propoſed by Luther, looked upon it as much beneath the ſublimity of their views; and, conſequently, undertook a more perfect reformation, to found a new church, entirely ſpiritual, and truly divine.

This ſect was ſoon joined by great numbers, whoſe characters and capacities were very different, though their views ſeemed to turn upon the ſame object. Their progreſs was rapid; for, in a very ſhort ſpace of time, their diſcourſes, viſions, and predictions, excited commotions in a great part of Europe, and drew into their communion a prodigious multitude, whoſe ignorance rendered them eaſy victims to the illuſions of enthuſiaſm.

The moſt pernicious faction of all thoſe which compoſed this multitude, was that which pretended that the founders of the new and perfect church, already mentioned, were under the direction of a divine impulſe, and armed againſt all oppoſition, by the power of working miracles. This faction, in the year 1521, began their fanatical work, under the guidance of Munzer, Stubner, and Storck, who were diſciples of Luther; but well knowing that their opinions were ſuch as would receive no ſanction from him, they availed themſelves of his abſence to diſſeminate them in Wittemburgh, and had the addreſs to over-reach the piety of Melancthon. Their principal purpoſe was to gain over the populace, and to form a conſiderable party.

Storck, wanting knowledge, boaſted of inſpiration; and Stubner, who had both genius and erudition, laboured at commodious explications of Scripture. Not content with diſcrediting the court of Rome, and decrying the authority of conſiſtories, they taught, That among Chriſtians, who had the precepts of the goſpel to direct, and the ſpirit of God to guide them, the office of magiſtracy was not only unneceſſary, but an unlawful encroachment on their ſpiritual liberty; that the diſtinctions occaſioned by birth, or rank, or wealth, being contrary to the ſpirit of the goſpel, which conſiders all men as equal, ſhould be entirely aboliſhed; that all Chriſtians, throwing their poſſeſſions into one common ſtock, ſhould live together in that ſtate of equality which becomes members of the ſame family; that, as neither the laws of nature, nor the precepts of the New Teſtament, had placed any reſtraint upon men with regard to the number of wives which they might marry, they ſhould uſe that liberty which God himſelf had granted to the patriarchs.

At firſt they preached, exhorted, admoniſhed, and reaſoned, in a manner that ſeemed proper to impreſs the multitude; and related a great number of viſions and revelations, with which they pretended to have been favoured from above. But when they ſaw that theſe methods of making proſelytes were not attended with ſuch a rapid ſucceſs as they fondly expected, and that the miniſtry of Luther, and other eminent reformers, were detrimental to their cauſe, they then had recourſe to more expeditious meaſures, and madly attempted to propagate their fanatical doctrine by force of arms.

Munzer and his aſſociates, in the year 1525, put themſelves at the head of a numerous army, compoſed, for the moſt part, of the peaſants of Suabia, Thuringia, Franconia, and Saxony, and declared war againſt all laws, government, and magiſtrates of every kind, under the chimerical pretext that Chriſt was now to take the reins of civil and eccleſiaſtical government into his own hands, and to rule alone over the nations. But this ſeditious crowd was routed and diſperſed without much difficulty, by the Elector of Saxony and other princes; and Munzer, their ringleader, ignominiouſly put to death, and his factious counſellors ſcattered abroad in different places.

Many of his followers, however, ſurvived, and propagated their opinions through Germany, Switzerland, and Holland. In the year 1533, a party of them ſettled at Munſter under the direction of two Anabaptiſt prophets, John Matthias, a baker of Haerlem, and John Bockholdt, a journeyman taylor of Leyden.

Having made themſelves maſters of the city, they depoſed the magiſtrates, confiſcated the eſtates of ſuch as had eſcaped, and depoſited the wealth they amaſſed together in a public treaſury, for common uſe. They made preparations of every kind for the defence of the city; and ſent out emiſſaries to the Anabaptiſts in the Low Countries, inviting them to aſſemble at Munſter, which was now dignified with the name of Mount Sion, that from hence they might be deputed to reduce all the nations of the earth under their dominion.

Matthias, who was the firſt in command, was ſoon cut off, in act of frenzy, by the biſhop of Munſter's army; and was ſucceeded by Bockholdt, who was proclaimed by a ſpecial deſignation of Heaven, as he pretended, king of Sion, and inveſted with legiſlative powers, like thoſe of Moſes.

The extravagancies of Bockholdt were too numerous to be recited: it will be ſufficient to add, that the city of Munſter was taken after a long ſiege, and an obſtinate reſiſtance; and Bockholdt, the mock monarch, was puniſhed with a moſt painful and ignominious death.

It muſt be acknowledged, that the true riſe of the numerous inſurrections of this period, ought not to be attributed to religious opinions. The firſt inſurgents groaned under the moſt grievous oppreſſions: they took up arms principally in defence of their civil liberties; and of the commotions that took place. The Anabaptiſt leaders above mentioned ſeem rather to avail themſelves, than to have been the prime movers.

That a great part of the main body, indeed, conſiſted of Anabaptiſts, ſeems indiſputable; and whatever fanaticiſm exiſted among them would naturally be called forth, or be inflamed by the ſituations that occurred, and run riot in its wildeſt ſhapes. At the ſame time it appears from hiſtory, that vaſt numbers were concerned in thoſe inſurrections, of whom it is reported 100,000 fell by the ſword; it is, therefore, reaſonable to conclude, that a great majority of them were not Anabaptiſts.

It is to be remarked, that the Baptiſts or Mennonites in England and Holland are to be conſidered in a very different light from the enthuſiaſts we have been deſcribing: and it appears equally uncandid and invidious, to trace up their diſtinguiſhing ſentiment, as ſome of their adverſaries have done, to thoſe obnoxious characters, and there to ſtop, in order, as it were, to aſſociate with it the ideas of turbulence and fanaticiſm, with which it certainly has no natural connection. Their coincidence with ſome of thoſe oppreſſed and infatuated people, in denying baptiſm to infants, is acknowledged by the Baptiſts: but they diſavow the practice which the appellation of Anabaptiſts implies; and their doctrines ſeem referable to a more ancient and reſpectable origin. They appear ſupported by hiſtory, in conſidering themſelves as the deſcendants of the Waldenſes, who were ſo grievouſly oppreſſed and perſecuted by the deſpotic heads of the Roman hierarchy; and they profeſs an equal averſion to all principles of rebellion on one hand, and to all ſuggeſtions of fanaticiſm on the other.

The denomination of Mennonites, by which they are diſtinguiſhed in Holland, they derive from Menno, the famous man who latterly gave conſiſtence and ſtability to their ſect.

ANABASII, in antiquity, were couriers who were ſent on horſeback, or in chariots, with diſpatches of importance.

ANABASIS, in medicine, implies the riſe and progreſs of a diſorder, from its loweſt to its higheſt pitch. In grammar it denotes to aſcend higher.

ANABASIUS, in botany, ſignifies the uſnea, or hairy moſs-tree, for which it is a trivial name.

ANABATA, in eccleſiaſtical hiſtory, denotes the ſhoulder covering of the ſacerdotal habit; uſually put on when an extraordinary occurrence required the prieſt to notify any thing in the ſuperlative degree, whether good or evil.

ANABATHRA, in ancient writers, denote a kind of ſteps or ladder, whereby to aſcend ſome eminence. In this ſenſe we read of the anabathra of theatres, pulpits, &c. Anabathra appears to have been ſometimes alſo applied to ranges of ſeats riſing gradually over each other.

Anabathra is more particularly applied to a kind of ſtone blocks raiſed by the highway ſides, to aſſiſt travellers in mounting or alighting, before the uſe of ſtirrups was invented.

ANABIBAZON, in aſtronomy, ſignifies the dragon's tail.

ANABLATUM, in botany, a ſynonyme of the dentaria, or tooth-wort.

ANABLEPS, in ichthyology, the trivial name of a ſpecies of cobitis.

ANABOLÆUM, or **Anabole**, in antiquity, a kind of great or upper coat, worn over the tunica.

ANABOLEUS, in antiquity, an appellation given to grooms of the ſtable, or equerries, who aſſiſted their maſters in mounting or diſmounting their horſes. As the ancients had no ſtirrups, they either jumped upon his back, or were aided in mounting by anabolei.

ANABROSIS, in ſurgery, denotes the iſſuing of blood through a hole in a vein worn by corroſion. In modern practice it is termed diabroſis.

ANACA, in ornithology, a name given by the natives of South America, to the Brazilian parroquet.

ANACANDAIA, in amphibiology, ſignifies a Ceylonic term for the bubalinus, or cattle ſerpent, well known to the Dutch in the iſland of Ceylon.

ANACALYPTERIA, according to Suidas, were preſents made to the bride by her huſband's relations and friends when ſhe firſt uncovered her face and ſhowed herſelf to men.

Theſe preſents were alſo called επαυλια: for, among the Greeks, virgins before marriage were under ſtrict confinement, being rarely permitted to appear in public, or converſe with the other ſex; and when allowed that liberty, wore a veil over their faces, termed Καλυπτρον, or Καλυπτρα, which was not left off in the preſence of men till the third day after marriage; whence, according to Heſychius, this day was alſo called anacalypterion.

ANACAMPSEROS, in botany, a ſynonyme of the portulaca and ſeveral other plants.

ANACAMPTERIA, in eccleſiaſtical antiquity, a kind of little edifices, adjacent to churches, deſigned for the entertainment of ſtrangers and poor perſons.

ANACAMPTIC, a name applied by the ancients to that part of optics which treats of reflection, being the ſame with what is now called **Catoptrics**.

ANACARDIUM, or **Cashew-nut Tree**, a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 12th order, Holoraceæ. For the characters ſee Syſtem of **Botany**.

Only one ſpecies is as yet known to the botaniſts, viz. the occidentale. It grows naturally in the Weſt Indies, and arrives at the height of 20 feet in thoſe places of which it is a native, but cannot be preſerved in Britain without the greateſt difficulty. The fruit of this tree is as large as an orange; and is full of an acid juice, which is frequently made uſe of in making punch. To the apex of this fruit grows a nut, of the ſize and ſhape of a hare's kidney, but much larger at the end which is next the fruit than at the other. The ſhell is very hard; and the kernel, which is ſweet and pleaſant, is covered with a thin film. Between this and the ſhell is lodged a thick, blackiſh, inflammable liquor, of ſuch a cauſtic nature in the freſh nuts, that if the lips chance to touch it, bliſters will immediately follow. The kernels are eaten raw, roaſted, or pickled. The milky juice of this tree will ſtain linen of a good black, which cannot be waſhed out.

ANACATHARSIS, among phyſicians, denotes a purgation by ſpitting, in contradiſtinction to catharſis, a purging downwards.

In divinity this term denotes, a ſatisfactory explication of ſome dark ſentence of Scripture by analogy only.

ANACATHARTIC, in pharmacy, ſignifies a vomit.

ANACEPHALÆOSIS, in rhetoric, the ſame with recapitulation.

ANACHARSIS, in mythology, a famous Scythian philoſopher, converſed with Solon, and lived an auſtere life. Upon his return from his travels through Greece, he attempted to change the ancient cuſtoms of Scythia, and to eſtabliſh thoſe of Greece; which proved fatal to him. The king ſhot him dead in a wood with an arrow. A great many ſtatues were erected to him after his death. He is ſaid to have invented tinder, the anchor, and the potter's wheel; but the latter is mentioned by Homer, who lived long before him.

ANACHIS, in mythology, the name given by the ancient Egyptians to one of the deities that were ſuppoſed to take upon them the care of every mortal at his birth. 1. Anachis, or Neceſſity; 2. Dynamis, or Power; 3. Tyche, or Fortune; 4. Eros, or Charity.

ANACHORET, in church hiſtory, denotes a hermit, or ſolitary monk, who retires from the ſociety of mankind into ſome deſart, with a view to avoid the temptations of the world, and to be more at leiſure for meditation and prayer. Such were Paul, Anthony, and Hilarion, the firſt founders of monaſtic life in Egypt and Paleſtine.

Anachorets, among the Greeks, conſiſt principally of monks, who retire to caves or cells, with the leave of the abbot, and an allowance from the monaſtery; never appearing again in the monaſtery, unleſs on ſolemn occaſions.

ANACHRONISM, in matters of literature, an error with reſpect to chronology, whereby an event is placed earlier than it really happened. The word is compounded of *ανα*, *higher*, and *χρονος*, *time*. Such is that of Virgil, who placed Dido in Africa at the time of Æneas, though in reality ſhe did not come there till 300 years after the taking of Troy. An error on the other ſide, whereby a fact is placed later and lower than it ſhould be, is called a *parachroniſm*.

ANACLASTIC **Glasses**, a kind of ſonorous phials, or glaſſes, chiefly made in Germany, which have the property of being flexible; and emitting a vehement noiſe by the human breath. They are alſo called *vexing glaſſes* by the Germans, *vexier glaſer*, on account of the fright and diſturbance they occaſion by their reſilition.

The anaclaſtic glaſſes are a low kind of phials with flat bellies, reſembling inverted funnels, whoſe bottoms are very thin, ſcarce ſurpaſſing the thickneſs of an onion peel: this bottom is not quite flat, but a little convex. But upon applying the mouth to the orifice, and gently inſpiring, or as it were ſucking out the air, the bottom gives way with a prodigious crack, and of convex becomes concave. On the contrary, upon exſpiring or breathing gently into the orifice of the ſame glaſs, the bottom with no leſs noiſe bounds back to its former place, and becomes gibbous as before.

The anaclaſtic glaſſes firſt taken notice of were in the caſtle of Goldbach; where one of the academiſts *Naturæ Curioſorum*, having ſeen and made experiments on them, publiſhed a piece expreſs on their hiſtory and phenomena. They are all made of a fine white glaſs. It is to be obſerved in theſe, 1. That if the bottom be concave at the time of inſpiration, it will burſt; and the like will happen if it be convex at the time of exſpiration.

2. A ſtrong breath will have the ſame effect even under the contrary circumſtances.

ANACLASTICS, that part of optics which conſiders the refraction of light, and is commonly called *Dioptrics*.

ANACLATICS, or ANACLASTICS, that part of optics which treats of refracted light. It is a very obſolete term.

ANACLETERIA, in antiquity, a ſolemn feſtival celebrated by the ancients, when their kings or princes came of age, and aſſumed the reins of government. It is ſo called, becauſe proclamation being made of this event to the people, they went to ſalute their prince during the anacleteria, and to congratulate him on his new dignity.

ANACLETICUM, in the ancient art of war, was a particular blaſt of the trumpet, by which the fearful and flying ſoldiers were rallied, and re-called to the combat.

ANACLINOPALE, Ανακλινοπαλη, in antiquity, a kind of wreſtling, wherein the champions threw themſelves voluntarily on the ground, and continued the combat by pinching, ſcratching, biting, and other methods of offence. The *Anaclinopale* was contradiſtinguiſhed from the *Orthopale*, wherein the champions ſtood erect. In the *Anaclinopale*, the weaker combatants ſometimes gained the victory.

ANACLINTERIA, in antiquity, a kind of pillows on the dining bed, whereon the gueſts uſed to lean. The ancient tricliniary beds had four pillows, one at the head, another at the feet, a third at the back, and a fourth at the breaſt. That on which the head lay was properly called by the Greeks *ανακλιντηριον*, or *ανακλιντρον*; by the Romans *fulcrum*, ſometimes *pluteus*.

ANACLYPHA, in antiquity, denotes thoſe veſſels adorned with raiſed ſculpture, or baſſo relievo.

ANACOLLEMA, a compoſition of aſtringent powders, applied by the ancients to the head, to prevent defluctions on the eyes.

ANACONDO, in natural hiſtory, is a name given in the Iſle of Ceylon to a very large and terrible rattle-ſnake, which often devours the unfortunate traveller alive; yet, what is moſt extraordinary, it is accounted excellent and delicious food.

ANACREONTIC VERSE, in ancient poetry, a kind of verſe ſo called from its being much uſed by the poet Anacreon. It conſiſts of three feet and an half, uſually ſpondees and iambuſes, and ſometimes anapeſts: ſuch is that of Horace,

Lydia, dic per omnes.

No one has given a juſter character of the writings of Anacreon than the God of Love, as taught to ſpeak by Mr. Cowley:

All thy verſe is ſofter far
Than the downy feathers are,
Of my wings, or of my arrows,
Of my mother's doves and ſparrows:
Graceful, cleanly, ſmooth, or round,
All with Venus' girdle bound.

ANACRISIS, among the ancient Greeks, was uſed for a kind of trial or examination, which the archons, or chief magiſtrates, of Athens, were to undergo before their admiſſion into that office. The *anacriſis* ſtands diſtinguiſhed from the *docimaſia*, which was a ſecond examination, in the forum. The anacriſis was performed in the ſenate-houſe.

ANACRISIS, among civilians, an inveſtigation of truth, interrogation of witneſſes, and inquiry made into any fact.

ANACROSIS, in antiquity, denotes a part of the Pythian ſong, wherein the combat of Apollo and Python are deſcribed. The anacroſis was the firſt part, and contained the preparation to the fight.

ANACYCLUS, in botany, a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and, in the natural method, ranking under the 49th order, compoſitæ-diſcoides. The characters are: The calyx is hemiſpheric and imbricated. The carolla is radiated. The ſtamina conſiſt of five very ſhort capillary filaments, the anthera cylindric and tubular. The piſtillum has an oval germen; a filiform ſtylus; a bifid ſtigma in the hermaphrodites, two ſlender reflected ſtigmata in the females: there is no pericarpium, but the calyx unchanged. The ſeeds are ſolitary, with membranous wings, the receptaculum is chaffy.

ANADAVADÆA, in ornithology, a barbarous name of a ſpecies of alauda.

ANADEMA, among the ancients, denotes an ornament of the head, wherewith victors at the ſacred games had their temples bound.

ANADIPLOSIS, in rhetoric and poetry, ſignifies a repitition of the laſt word of a line, or clauſe of a ſentence, in the beginning of the next: Thus,

Pierides, vos hæc facietis maxima Gallo:
Gallo cujus amor, &c.
Et matutinis accredula vocibus inſtat,
Vocibus inſtat, & aſſiduas jacit ore querelas.

ANADIPLOSIS, in medicine, denotes a return of the paroxiſm,

ANADROMOUS, among ichthyologiſts, a name given to ſuch fiſhes as go from the ſea to the freſh waters at ſtated ſeaſons, and return back again; ſuch as the ſalmon, &c.

ANADUOMENE VENUS, in the Grecian mythology, anſwered to the Sea-Venus in the Roman, and was the appellation given to one of the chief deities of the ſea. The moſt celebrated picture in all antiquity was that of this goddeſs by Apelles; and the famous Venus of Medici is a Sea-Venus.

ANADYSIS, in ancient divinity, denotes the emerſion, or riſing up in baptiſm, contradiſtinguiſhed from immerſion, a going down.

ANÆDEIA, in antiquity, a denomination given to a ſilver ſtool placed in the Areopagus, on which the defendant, or perſon accuſed, was ſeated for examination. The word is Greek, *Αν-εδεια*, which imports, imprudence. The plaintiff, or accuſer, was placed on an oppoſite ſtool called *hybris*, or injury; here he propoſed three queſtions to the party accuſed, to which poſitive anſwers were to be given. The firſt, Are you guilty of this act? The ſecond, How did you commit it? The third, Who were your accomplices?

ANÆSTHESIA, ſignifies a privation of the ſenſes.

ANAGALLIS, PIMPERNEL, a genus of the monogynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 20th order, Rotaceæ. For the characters, ſee Syſtem of BOTANY. There are four ſpecies of this plant, viz. 1. The arvenſis, or common pimpernel, with a red flower. 2. The fæmina, with a blue flower. 3. The monelli, or narrow-leaved pimpernel. 4. The latifolia, or Spaniſh pimpernel. The firſt ſort is very common in corn fields, and other cultivated places in Britain. The ſecond is ſometimes found wild in the fields, but is not ſo common as the firſt. The third is a beautiful ſmall perennial plant, and produces numbers of fine blue flowers. The fourth is a native of Spain, and likewiſe produces blue flowers.

ANAGALLIS AQUATICA, in botany, a trivial name for the well-known water herb, brook-lime.

ANAGNOSTA, or ANAGNOSTES, in antiquity, a kind of literary ſervant, retained in the families of perſons of diſtinction, whoſe chief buſineſs was to read to them during meals, or at any other time when they were at leiſure. Cornelius Nepos relates of Atticus, that he had always an agnoſtes at his meals. He never ſupped without reading; ſo that the minds of his gueſts were no leſs agreeably entertained than their appetites. The ſame cuſtom, Eginhard obſerves, was kept up by Charlemagne, who at table had the hiſtories and acts of ancient kings read to him. This cuſtom ſeems to have been a relic of that of the ancient Greeks, who had the praiſes of great men and heroes ſung to them while at table. The ancient monks and clergy kept up the like uſage, as we are informed by St. Auguſtin.

ANAGOGIA, in mythology, were ſacrifices to Venus; the ritual of which was obſerved at Eryx in Sicily.

ANAGOGICAL, ſignifies myſterious, tranſporting; and is uſed to expreſs whatever elevates the mind, not only to the knowledge of divine things here, but in the next life. This word is ſeldom uſed, but with regard to the different ſenſes of Scripture. The anagogical ſenſe is, when the ſacred text is explained with a regard to eternal life, the point which Chriſtians ſhould have in view: for example, the reſt of the ſabbath, in the anagogical ſenſe, ſignifies the repoſe of everlaſting happineſs.

ANAGOGY, or ANAGOGE, among eccleſiaſtical writers, the elevation of the mind to things celeſtial and eternal. It is particularly uſed, where words, in their natural or primary meaning, denote ſomething ſenſible, but have a further view to ſomething ſpiritual or inviſible.

ANANOGY, in a more particular ſenſe, denotes the application of the types and allegories of the Old Teſtament to ſubjects of the New; thus called, becauſe, the veil being here drawn, what before was hidden, is expoſed to open ſight.

ANAGRAM (from the Greek *ανα*, *backwards*, and *γραμμα*, *letter*) in matters of literature, a tranſpoſition of the letters of ſome name, whereby a new word is formed, either to the advantage or diſadvantage of the perſon or thing to which the name belongs. Thus, the anagram of Galenus is *angelus*; that of Logica, *caligo*; that of Alſtedius, *ſedulitas*; that of Loraine is *alerion*, on which account it was that the family of Loraine took *alerions* for their armoury.

Calvin, in the title of his *Inſtitutions*, printed at Straſburg in 1539, calls himſelf *Alcuinus*, which is the anagram of Calvinus, and the name of an eminently learned perſon in the time of Charlemagne, who contributed greatly to the reſtoration of learning in that age.

Thoſe who adhere ſtrictly to the definition of an anagram, take no other liberty than that of omitting or retaining the letter H, at pleaſure; whereas others make no ſcruple to uſe E for Æ, V for W, S for Z, and C for K; and *vice verſa*.

Anagrams are ſometimes made out of ſeveral words: ſuch is that on the queſtion put by Pilate to Our Saviour, *Quid eſt veritas?* whereof we have this admirable anagram, viz. *Eſt vir qui adeſt.*

The Cabbaliſts among the Jews are profeſſed anagrammatiſts; the third part of their art, which they call *themuru*, i. e. "changing," being nothing but the art of making anagrams, or of finding hidden and myſtical meanings in names; which they do by changing, tranſpoſing, and differently combining, the letters of thoſe names.

ANAGRAMMATIST, a maker or compoſer of anagrams.

ANAGROS, in commerce, a meaſure for grain uſed in ſome cities of Spain, particularly at Seville; 46 anagros make about 10½ quarters of London.

ANAGYRIS, STINKING BEAN-TREFOIL, a genus of the monogynia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, papilionaceæ. For the characters, ſee Syſtem of BOTANY.

There is but one ſpecies of this plant, namely, the fetida, which grows naturally in the ſouthern parts of Europe. It is a ſhrub which uſually riſes to the height of eight or ten feet, and produces its flowers in April or May. Theſe are of a bright yellow colour, growing in ſpikes, ſomewhat like the laburnum.

ANAGYRIS, or **ANAGYRUS**, the name of a place in Attica, of the tribe Erechtheis, where a fetid plant, called anagyris, probably the ſame with the foregoing, grew in great plenty, (Dioſcorides, Pliny, Stephanus;) and the more it was handled, the ſtronger it ſmelled: hence *commovere anagyrin* (or *anagyrum*) is to bring a misfortune on one's ſelf, (Ariſtophanes.)

ANAITIS, in mythology, a goddeſs of the Armenians: at the rites of the ſacrifice to this infernal deity, the virgins of all ranks proſtituted themſelves by the ſtrict injunction of their parents! no rank or claſs were exempt from the obſervance of this diabolical cuſtom.

ANAK, in Scripture, the father of the Anakims, was the ſon of Arba, who gave his name to Kirjath-arba, or Hebron, Joſh. xiv. 15. Anak had three ſons, Sheſhai, Ahiman, and Talmai, (chap. xv. 14. and Numb. xiii. 22.) who, as well as their father, were giants, and who with their poſterity, all terrible for their fierceneſs and extraordinary ſtature, were called the Anakims; in compariſon of whom the Hebrews, who were ſent to view the land of Canaan, reported that they were but as graſshoppers. Numb. xiii. *ult.* Caleb, aſſiſted by the tribe of Judah, took Kirjath-arba, and deſtroyed the Anakims, (Judges i. 20. and Joſh. xv. 14.) in the year of the world 2559.

ANALECTA, or **ANALECTES**, in antiquity, a ſervant whoſe employment it was to gather up the off-falls of tables.

ANALECTA, *Analects*, in a literary ſenſe, is uſed to denote a collection of ſmall pieces; as eſſays, remarks, &c.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt or weſt points of the horizon.

ANALEMMA, denotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn, with an horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye will be ellipſes; and all circles whoſe planes paſs through the eye will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPSIS, the augmentation or nutrition of an emaciated body.

ANALEPTICS, reſtorative or nouriſhing medicines.

ANALOGY, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different.

There is always an analogy between beings that have ſome conformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between two different ſpecies of certain animals.

Analogy enters much into all our reaſoning, and ſerves to explain and illuſtrate. A great part of our philoſophy has no other foundation than analogy.

It is natural to mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them and things more familiar or better known. And if the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a conſiderable degree of probability in concluſions drawn from anology.

Thus we may obſerve a ſimilitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the ſun, as the earth does, although at different diſtances, and at different periods. They borrow all their light from the ſun, as the earth does. Several of them are known to revolve round their axis like the earth, and, by that means, muſt have a like ſucceſſion of day and night. Some of them have moons, that ſerve to give them light in the abſence of the ſun, as our moon does to us. They are all, in their motions, ſubject to the ſame law of gravitation, as the earth is. From all this ſimilitude, it is not unreaſonable to think, that thoſe planets may, like our earth, be the habitation of various orders of living creatures. There is ſome probability in this concluſion from analogy.

But it ought to be obſerved, that, as this kind of reaſoning can afford only probable evidence at beſt; ſo unleſs great caution be uſed, we are apt to be led into error by it. To give an inſtance of this: anatomiſts, in ancient ages, ſeldom diſſected human bodies; but very often the bodies of thoſe quadrupeds whoſe internal ſtructure was thought to approach neareſt to that of the human body. Modern anatomiſts have diſcovered many miſtakes the ancients were led into, by their conceiving a greater ſimilitude between the ſtructure of men and of ſome beaſts than there is in reality.

Analogical reaſoning may be of excellent uſe in anſwering objections againſt truths which have other evidence. It may alſo give a greater or leſs degree of probability in caſes where we can find no other evidence. But in all arguments drawn from analogy the greater the diſparity between the things compared, the leſs convincive are the concluſions deduced from them.

There is no ſubject in which men have always been ſo prone to form their notions by analogies of this kind, as in what relates to the mind. We form an early acquaintance with material things by means of our ſenſes, and are bred up in a conſtant familiarity with them. Hence we are apt to meaſure all things by them; and to aſcribe to things moſt remote from matter the qualities that belong to material things.

To illuſtrate more fully that analogical reaſoning from a ſuppoſed ſimilitude of mind to body, which appears to be the moſt fruitful ſource of error with regard to the operations of our minds, the following inſtance may be given. When a man is urged by contrary motives, thoſe on one hand inciting him to do ſome action, thoſe on the other to forbear it; he deliberates about it, and at laſt reſolves to do it, or not to do it. The contrary motives are here compared to the weights in the oppoſite ſcales of a balance; and there is not perhaps any inſtance that can be named of a more ſtriking analogy between body and mind. Hence the phraſes of weighing motives, of deliberating upon actions, are common to all languages.

From this analogy, ſome philoſophers draw very important concluſions. They ſay, that, as the balance cannot incline to one ſide more than the other, when the oppoſite weights are equal; ſo a man cannot poſſibly determine himſelf if the motives on both hands are equal; and as the balance muſt neceſſarily turn to that ſide which has moſt weight, ſo the man muſt neceſſarily be determined to that hand where the motive is ſtrongeſt. And on this foundation ſome of the ſchoolmen maintained, that if a hungry aſs were placed between two bundles of hay equally inviting, the beaſt muſt ſtand ſtill and ſtarve to death, being unable to turn to either, becauſe there are equal motives to both. This is an inſtance of that anological reaſoning, which, it is conceived, ought never to be truſted; for the analogy between a balance and a man deliberating, though one of the ſtrongeſt that can be found between matter and mind, is too weak to ſupport any argument.

The derivation of the word Analogy indicates, as profeſſor Caſtillon of Berlin obſerves, a reſemblance diſcernable by reaſon. This is confirmed by the ſenſe in which the term is uſed in geometry, where it ſignifies an equality of ratios. In explaining this ſubject, it is obſerved, there may be a reſemblance between ſenſations and a reſemblance between perceptions: the former is called *phyſical reſemblance*, becauſe it acts upon the phyſical or ſenſitive faculty; the latter *moral reſemblance*, becauſe it affects the moral or rational faculty of man.

Every reſemblance may be reduced to an equality in ſenſations or perceptions; but this ſuppoſes ſome equality in their cauſes: we ſay *ſome equality*, becauſe the diſpoſition of the organs, or of the ſoul, muſt neceſſarily affect the ſenſations or perceptions; but this can influence only their degree, and not their nature.

The character of one perſon reſembles that of another only when they both ſpeak and act ſo as to excite equal perceptions, or to ſpeak more ſtrictly, the ſame perception; when they both diſplay vivacity or indifference, anger or meekneſs, on the ſame occaſions, and both excite in the ſoul of the obſerver identical perceptions, or rather the ſame perception of vivacity or indifference, of anger or meekneſs.

Theſe identical perceptions, the degree of which will depend much on the diſpoſition of the obſerver's mind, muſt have identical cauſes, or, in other words, the ſame cauſe; which is the vivacity or indifference, the anger or meekneſs, diſplayed by each of theſe characters.

Every phyſical reſemblance may therefore be reduced to one or more equalities; and every moral reſemblance to one or more identities. Wherever there is moral reſemblance there is analogy. Analogy may therefore be reduced to identity, and always ſuppoſes compariſon.

Two objects are ſaid to have an analogy to each other, or are *analogous*, when ſome identity is diſcovered upon comparing them. An *analogical concluſion*, is a concluſion deduced from ſome identity.

The principles of analogy are a compariſon of two objects; and one or more identities reſulting from their being thus compared. The characters of analogy are; that two objects be compared; that there be one or more identities between theſe objects; and that this is diſcernible only be reaſon or intellect.

Phyſical reſemblance is to the ſenſes what analogy is to the underſtanding. The former, when perfect, becomes equality; but the latter, identity. Reſemblance and analogy are the foundations both of probability and of certainty. When we are ſatisfied that the reſemblance or the analogy is complete, we ſtop at probability; which becomes certainty when we are, or think we are, aſſured that the reſemblance or the analogy is perfect.

In reaſoning by analogy, we ſhould be careful not to confound it with reſemblance; and alſo not to deduce from the identity or identities, on which the analogy is founded, a concluſion, which has either no relation, or only a partial relation, to theſe identities.

The principal uſe of analogy in the inveſtigation of phyſical and moral truth, may be reduced to the four following maxims: 1. By means of our ſenſes to improve, firſt our own judgment, and afterwards that of others, with reſpect to intellectual ſubjects. 2. To deduce a general from a particular truth. Having diſcovered and proved the truth of a propoſtion with reſpect to any particular object, examine whether this truth flows from a quality peculiar to this ſingle object, or common to ſeveral objects. In the latter caſe all theſe objects may be comprehended under one general idea, founded on their common quality. Subſtitute this general idea inſtead of the particular object, and the propoſition will become general, without ceaſing to be true; becauſe whatever evidently and ſolely reſults from the identity, on which an analogy is founded, muſt neceſſarily be true with reſpect to all thoſe objects in which the analogy is the ſame. 3. To prove the truth or falſehood of propoſitions which cannot be otherwiſe demonſtrated. 4. To diſcover new truths in both natural and moral philoſophy.

ANALOGY, among grammarians, is the correſpondence which a word or phraſe bears to the genius and received forms of any language.

ANALYSIS, in a general ſenſe, implies the reſolution of ſomething compounded into its original and conſtituent parts. The word is Greek, and derived from ἀναλυω, to reſolve.

ANALYSIS, in mathematics, is properly the method of reſolving problems by means of algebraical equations; whence we often find that theſe two words, *analyſis* and *algebra*, are uſed as ſynonymous.

Analyſis, under its preſent improvements, muſt be allowed the apex or height of all human learning: it is this method which furniſhes us with the moſt perfect examples of the art of reaſoning; gives the mind an uncommon readineſs at deducing and diſcovering, from a few data, things unknown; and, by uſing ſigns for ideas, preſents things to the imagination, which otherwiſe ſeemed out of its ſphere: by this, geometrical demonſtrations may be greatly abridged, and a long ſeries of argumentations, wherein the mind cannot without the utmoſt effort and attention diſcover the connection of ideas, are hereby converted into ſenſible ſigns, and the ſeveral operations required therein effected by the combination of thoſe ſigns. But, what is more extraordinary, by means of this art, a number of truths are frequently expreſſed by a ſingle line, which in the common way of explaining and demonſtrating things would fill whole volumes. Thus, by mere contemplation of one ſingle line, whole ſciences may be ſometimes learnt in a few minutes time, which otherwiſe could ſcarce be attained in many years.

ANALYSIS is divided, with regard to its object, into that of *finites* and *infinites*.

ANALYSIS *of Finite Quantities*, is what we otherwiſe call ſpecious arithmetic or algebra.

ANALYSIS *of Infinites*, called alſo the *New Analyſis*, is particularly uſed for the method of fluxions, or the different calculus.

ANALYSIS, in logic, ſignifies the method of tracing things backward to their ſource, and of reſolving knowledge into its original principles. This is alſo called the method of *reſolution*; and ſtands oppoſed to the ſynthetic method, or that of *compoſition*. The art of logical analyſis conſiſts principally in combining our perceptions, claſſing them together with addreſs, and contriving proper expreſſions for conveying our thoughts, and repreſenting their ſeveral diviſions, claſſes, and relations.

ANALYSIS, in rhetoric, is that which examines the connections, tropes, figures, and the like, inquiring into the propoſition, diviſion, paſſions, arguments, and other apparatus of rhetoric.

ANALYSIS, in chemiſtry, implies the decompounding of a mixed body, or the ſeparation of the principles and conſtituent parts of a compounded ſubſtance.

To analyze bodies, or reſolve them into their component parts, is indeed the chief object of the art of chemiſtry. Chemiſtry furniſhes ſeveral means for the decompoſition of bodies, which are all founded on the differences of the properties belonging to the different principles of which the body to be analyzed is compoſed. If, for example, a body be compoſed of ſeveral principles, ſome of which have a great, and others a moderate degree of volatility; and, laſtly, others are fixed, its moſt volatile parts may be firſt ſeparated by a gradual heat in diſtilling veſſels; and then the parts which are next in volatility will paſs over in diſtillation; and laſtly, thoſe parts which are fixed, and capable of reſiſting the action of fire, will remain at the bottom of the veſſel.

ANALYSIS, in lectures, is a kind of ſyllabus, or table of the principal heads or articles of a continued diſcourſe, diſpoſed in their natural order and dependency. Analyſes are more ſcientifical than alphabetical indexes; but they are leſs uſed, as being more intricate.

ANALYSIS is frequently uſed for a brief, but methodical, illuſtration of the principles of a ſcience; in which ſenſe it is nearly ſynonymous with what we otherwiſe call a *ſynopſis*.

ANALYTIC, or ANALYTICAL, ſomething that belongs to, or partakes of, the nature of analyſis.

The analytic method ſtands oppoſed to the ſynthetic. In natural philoſophy, as in mathematics, the inveſtigation of difficult things by the analytic method ought to precede the method of compoſition. This analyſis conſiſts in making of experiments and obſervations, and in drawing general concluſions therefrom by induction; and admitting of no objections againſt the concluſions, but ſuch as are drawn from experiments, or other certain truths: and although reaſoning from experiments and obſervations by induction be no demonſtration of general concluſions, yet it is the beſt method which the nature of things will admit of; and may be eſteemed ſo much the ſtronger, as the induction is more general; and, if no exception occur from phenomena, the concluſion may be pronounced general.

By this way of analyſis, we may proceed from compounds to their ingredients; from motions to the forces producing them; and in general from effects to their cauſes, and from particular cauſes to more general ones, until we arrive at thoſe which are the moſt general. This is the analytic method, according to the illuſtrious Sir Iſaac Newton.

The ſynthetic method conſiſts in aſſuming the cauſes diſcovered and received as principals: and by them explaining the phenomena proceeding from them, and proving the explanation.

ANALYTICS, *Analytica*, the ſcience and uſe of analyſis. The great advantage of the modern mathematics above the ancient is in point of analytics.

Pappus, in the preface to his ſeventh book of Mathematical Collections, enumerates the authors on the ancient analytics; being Euclid, in his *Data* and *Poriſmata*; Apollonius, *de Sectione Rationis*, and in his *Conics*; Ariſtæus, *de Locis Solidis*; and Eratoſthenes, *de Mediis Proportionalibus*. But the ancient analytics were very different from the modern analytics, to which principally belong algebra and fluxions.

ANAMELECH, in mythology, an idol of the Sepharvaites, who are ſaid in Scripture to have burned their children in honour of Adrammelech and Anamelech. Theſe idols probably ſignified the ſun and moon. Some of the rabbins repreſent Anamelech under the figure of a mule, others under that of a quail or pheaſant.

ANAMIM, in Scripture, the ſecond ſon of Mizraim (Gen. x. 13.) who peopled the Mareotis; or the Pentapolis of Cyrene, according to the paraphraſt of Jeruſalem. Bochart is of opinion that theſe Anamims were the people that dwelt in the parts adjacent to the temple of Jupiter Ammon, and in the Naſamonitis. Calmet thinks the Amanians and Garamantes to be deſcended from Anamim.

ANAMORPHOSIS, in perſpective drawings, is a deformed or diſtorted portrait or figure, generally confuſed and unintelligible to the common unaſſiſted view; but when ſeen at a certain diſtance and height, or as reflected from a plain or curved mirror, will appear regular and in right proportion.

ANAMNESTICS, among phyſicians, imply the former habits of body of a patient. It alſo denotes thoſe medicines which are neceſſary to ſtrengthen the animal ſyſtem, particularly the memory.

ANANAS, in botany, the trivial name of a ſpecies of bromelia.

ANANCITIS, in antiquity, a kind of figured ſtone, otherwiſe called *ſynochitis*, celebrated for its magical virtue of raiſing the ſhadows of the infernal gods.

ANANIAS, in holy writ, a Sadducee, high-prieſt of the Jews, who put to death St. James the couſin of our Lord, and was depoſed by Agrippa.

ANANISABTA, or ANANISAPTA, a magical word frequently found inſcribed on coins and other amulets, ſuppoſed to have a virtue of preſerving the wearer from the plague.

ANANTA PADMANABA URATAM, in the Eaſtern code of religion, implies a ſolemn feſtival of the Indian Bramins.

It is celebrated annually on the 14th day after the new moon of Auguſt, in order to obtain health in this life, and happineſs in the next.

ANAPÆST, in ancient poetry, a foot conſiſting of two ſhort ſyllables and one long: ſuch is the word ſcŏpŭlōs. It is juſt the reverſe of the dactyl.

ANAPÆSTIC VERSES, thoſe conſiſting wholly or chiefly of anapeſts.

ANAPHORA, in rhetoric, the repetion of the ſame word or words in the beginning of a ſentence or verſe. Thus Virgil:

Pan etiam Arcadia mecum ſe judice certet,
Pan etiam Arcadia dicat ſe judice victum.

ANAPHORA, among phyſicians, the throwing off purulent matter by the mouth.

ANAPHRODISIA, ſignifies impotence, or want of power to procreate.

ANAPLASIS, in ſurgery, ſignifies the replacing or ſetting a fractured bone.

ANAPHYSEMATA, in antiquity, implies the iſſuing forth of a religioniſt from his cell, or the miner from his ſubterranean employment.

ANAPLEROSIS, in ſurgery, denotes repletion, or whatever is wanting to be amply ſupplied.

ANAPLORETICS, in medicine, are ſuch remedies as promote the growth or granulation of the fleſh, in wounds, ulcers, &c. ſometimes called incarnatives.

ANARCHI, Αναρσχοι, in antiquity, a name given by the Athenians to four ſupernumerary days in their year, during which they had no magiſtrates.

The attic year was divided into ten parts, according to the number of tribes, to whom the precedency of the ſenate fell by turns. Each diviſion conſiſted of 35 days; what remained after the expiration of theſe, to make the lunar year complete, which according to their computation conſiſted of 354 days, were employed in the creation of magiſtrates, and called *αναρχοι ημεραι* and *αρχαιρεσιοι*.

ANARCHY, the want of government in a nation, where no ſupreme authority is lodged, either in the prince or other rulers; but the people live at large, and all things are in confuſion.

The word is derived from the Greek privative *α*, and *αρσχη*, command, principality. Anarchy is ſuppoſed to have reigned after the deluge, before the foundation of monarchies.

ANARCHY is frequently applied to certain troubleſome and diſorderly periods, even in governments otherwiſe regular. In England, the period between the death of Cromwell and king Charles's reſtoration, is commonly repreſented as an anarchy.

No modern nation is more ſubject to anarchies than Poland; where every interval between the death of one king, and the election of another, is a perfect picture of confuſion; inſomuch, that it is a proverb among that people, *Poland is governed by confuſion.*

The Jewiſh hiſtory preſents numerous inſtances of anarchies in that ſtate, uſually denoted by this phraſe, that *in thoſe days there was no king in Iſrael, but every man did that which was right in his own eyes*; which is a juſt picture of an anarchy.

ANARGYRUS, in church hiſtory, denotes a name given by the Greek Chriſtians to Coſmus and Damianus, whoſe feſtival is kept on the 1ſt of November.

In ancient law books it implies the ſtate of a perſon without money.

ANARRAPHE, in ſurgery, denotes a kind of ſuture or retraction of the upper eyelid, when relaxed and hanging over the eye.

ANARRHICAS, in ichthyology, a genus of fiſhes of the order of apodes. There is but one ſpecies of this genus, the anarrhicas lupus, or ſea-wolf; which ſeems to be confined to the northern parts of the globe. It is found in the Greenland ſeas, and in thoſe of Iceland and Norway, and ſometimes on the coaſts of Scotland and Yorkſhire; and, laſtly, in that part of the German ocean which waſhes the ſhores of Holland.

It is a ravenous fierce fiſh, and, when taken, faſtens on any thing within its reach; the fiſhermen, dreading its bite, endeavour as ſoon as poſſible to beat out its fore-teeth, and then kill it by ſtriking it behind the head.

It feeds almoſt entirely on cruſtaceous animals and ſhell-fiſh, which it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells.

It does not appear they are diſſolved in the ſtomach, but are voided with the feces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize.

It is full of roe in February, March, and April, and ſpawns in May and June. They have been taken near Shetland ſeven feet long, and even more.

The head is a little flatted on the top: the noſe blunt; the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe.

The teeth are very remarkable, and finely adapted to its way of life. The fore-teeth are ſtrong, conical, diverging a little from each other, ſtand far out of the jaws, and are commonly ſix above and the ſame below; though ſometimes there are only five in each jaw: theſe are ſupported within-ſide by a row of leſſer teeth, which makes the number in the upper jaw 17 or 18, in the lower 11 or 12. The ſides of the under jaw are convex inwards, which greatly adds to their ſtrength, and at the ſame time allows room for the large muſcles with which the head of this fiſh is furniſhed. The *dentes molares*, or grinding teeth of the under jaw, are higher on the outer than the inner edges, which inclines their ſurfaces inward: they join to the canine teeth in that jaw, but in the upper are ſeparate from them. In the centre are two rows of flat ſtrong teeth, fixed on an oblong baſis upon the bones of the palate and noſe.

The body is long, and a little compreſſed ſidewiſe; the ſkin is ſmooth and ſlippery: it wants the lateral line. The pectoral fins conſiſt of 18 rays. The dorſal fin extends from the hind-part of the head almoſt to the tail; the rays in the freſh fiſh are not viſible. The anal fin extends as far as the dorſal fin. The tail is round at its end, and conſiſts of 13 rays. The ſides, back, and fins, are of a livid lead colour; the two firſt marked downwards with irregular obſcure duſky lines; theſe in different fiſh have different appearances.

ANARROPIA, among phyſicians, a tendency of the humours to the head or ſuperior parts.

ANARRPHINON, in botany, a trivial name for a ſpecies of flax.

ANAS, in ornithology, a genus of birds belonging to the order of anſeres. The beak of this genus is a little obtuſe, covered with an epidermis or ſkin, gibbous at the baſe, and broad at the apex: the tongue is obtuſe and fleſhy; the feet are webbed and fitted for ſwimming. The ſpecies are,

1. The cygnus, *ferus & manſuetus.*

The ferus, with a ſemi-cylindrical black bill, yellow wax, and a white body, is the whiſtling or wild ſwan, which is leſs than the tame or mute ſpecies, being about five feet in length. Theſe birds inhabit the northern hemiſphere from Iceland to Greece. They ſwarm, during ſummer, in the great lakes and marſhes of the Tartarian and Siberian deſerts; and reſort in great numbers to winter about the Caſpian and Euxine ſeas. Thoſe of the eaſtern parts of Siberia retire beyond Kamtſchatka, either to the coaſts of America, or to the iſles north of Japan.

In Carolina they are ſaid to be of two ſorts; the larger, called from its note the Trumpeter, arrive in great flocks to the freſh rivers in winter, and in February retire to the great lakes to breed: the leſſer are called Hoopers, and frequent moſtly the ſalt water. In Auguſt theſe birds loſe their feathers, and are not able to fly; when the natives of Iceland and Kamtſchatka hunt them with dogs, which catch them by the neck, and eaſily ſecure their prey.

The eggs are accounted good food; and the fleſh, eſpecially that of the young, is much eſteemed by inhabitants. The uſes of the feathers are manifeſt to every one; and the ſkins of the body are worn by the inhabitants; beſides which, that of the legs, taken off whole, is uſed for purſes, and appears not very unlike ſhagreen.

Wild ſwans, Linnæus ſays, frequently viſit Sweden after a thaw, and are caught with apples in which a hook is concealed.

The wild ſwan frequents our coaſts, in hard winters, in large flocks, but does not breed in Great Britain.

This ſpecies has ſeveral diſtinctions from the ſpecies which we call the tame ſwan. In Ruſſia this ſpecies more fitly claims the name, it being the kind moſt commonly tamed in that empire.

The whiſtling ſwan carries its neck quite erect, the other ſwims with it arched.

It is from this ſpecies alone that the ancients have given the fable of the ſwan being endued with the powers of melody.

Thus Horace calls Pindar *Dircæum Cygnum*; and in an ode ſuppoſes himſelf changed into a ſwan. Virgil ſpeaks of his poetical brethren in the ſame manner:

> *Vare, tuum nomen,*
> *Cantantes ſublime ferent ad ſidera cygni.*
>
> Eclog. ix.

When he ſpeaks of them figuratively, he aſcribes to them melody, or the power of muſic; but when he talks of them as birds, he lays aſide fiction, and, like a true naturaliſt, gives them their real note:

> *Dant ſonitum rauci per ſtagna loquacia cygni.*
>
> Æneid. lib. x. 50.

It was alſo a popular opinion among the ancients, that the ſwan foretold its own end. To explain this, we muſt conſider the twofold character of the poet, *vates* and *poeta*, which the fable of the tranſmigration continues to the bird; or they might be ſuppoſed to derive that faculty from Apollo, their patron deity, the god of prophecy and divination.

As to their being ſuppoſed to ſing more ſweetly at the approach of death, the cauſe is beautifully explained by Plato, who attributes that unuſual melody to the ſame ſort of ecſtaſy that good men are ſometimes ſaid to enjoy at that awful hour, foreſeeing the joys that are preparing for them on putting off mortality.

The manſuetus, or mute ſwan, is the largeſt of the Britiſh birds. It is diſtinguiſhed externally from the white ſwan; firſt, by its ſize, being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob: the whole plumage, in old birds, is white; in young ones, aſh-coloured till the ſecond year: the legs are duſky.

The ſwan is found wild in Ruſſia and Siberia, moſt plentiful in the laſt. It arrives later from the ſouth, and does not ſpread ſo far north. Thoſe about the ſouthern part of the Caſpian ſea are very large, and much eſteemed for the uſe of the table.

The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceeding fierce: has not unfrequently been known to throw down and trample under feet youths of between fifteen or ſixteen years of age, and an old one to break the leg of a man with a ſtroke of the wings. It is ſaid to be very long-lived, and frequently to arrive at the hundredth year. They lay eight eggs, and ſit ſix weeks. They feed on both fiſh and herbage.

No bird, perhaps, makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes on that element, as the ſwan; almoſt every poet has taken notice of it; but none with that juſtneſs of deſcription, and in ſo pictureſque a manner as our Milton:

> The ſwan, with arched neck
> Between her white wings mantling, proudly rows
> Her ſtate with oary feet.
>
> Par. Loſt, B. vii.

In former times, it was ſerved up at every great feaſt, when the elegance of the table was meaſured by the ſize and quantity of the good cheer.

Swans were formerly held in ſuch great eſteem in England, that, by an act of Edward IV. c. 6. "no one that poſſeſſed a freehold of leſs clear yearly value than five marks, was permitted to keep any, *other than the ſon of our ſovereign lord the king*." And by the eleventh of Henry VII. c. 17. the puniſhment for taking their eggs was impriſonment for a year and a day, and a fine, at the king's will. Though at preſent they are not ſo highly valued as a delicacy, yet great numbers are preſerved for their beauty.

2. The cygnoides, with a ſemi-cylindrical bill, gibbous wax, and tumid eye-brows. It is the ſwan-gooſe, of Ray, from Guinea. Theſe birds likewiſe inhabit Ruſſia, China, and are common at the Cape of Good Hope.

They are ſufficiently common in Britain, and readily mix with the common gooſe; the breeds uniting as freely, and continuing to produce as certainly, as if no ſuch mixture had taken place.

3. The tadorna, or ſheildrake, has a flat bill, a compreſſed forehead, a greeniſh black head, and the body is variegated with white. This ſpecies is found as far as Iceland to the north. It viſits Sweden and the Orkneys in the winter, and returns in ſpring. It is found in Aſia about the Caſpian Sea, and all the ſalt lakes of the Tartarian and Siberian deſarts, as well as in Kamtſchatka.

4. The ſpectabilis, has a compreſſed bill gibbous at the baſe, a black feathery carina, and a hoary head. It is the grey-headed duck of Edwards, and the king-duck of Pennant. This beautiful ſpecies is found at Hudſon's Bay, at Churchill River, and (though ſcarce) at York Fort; in winter it is met with as far ſouth as New York. It is pretty frequent in the north of Siberia and Kamtſchatka; it is found alſo on the coaſt of Norway, and has been killed in the Orkneys. It is common in Greenland; where the fleſh is accounted excellent, and the crude gibbous part of the bill a great delicacy. It produces a down equally valuable as the eider.

5. The fuſca, or velvet duck, is of a blackiſh colour, has a white ſpot behind the eyes, and a white line on the wings. The male of this ſpecies is diſtinguiſhed by a gibboſity at the baſe of the bill. It is the black duck of Ray, and is in length about 20 inches. This ſpecies frequents Hudſon's Bay in ſummer, where it breeds.

6. The nigra, or ſcoter, is totally black, and has a gibboſity at the baſe of the bill; the tail reſembles a wedge; the female is browniſh. It is the leſſer black diver of Ray, and meaſures in length 22 inches. Theſe birds are found on the northern coaſts of England, Scotland, and France, in the winter ſeaſon.

7. The anſer, *ferus et manſuetus*; or grey lag, and tame gooſe. The *grey lag*, or *wild gooſe*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a fleſh colour, tinged with yellow; the head and neck cinerous; breaſt and belly whitiſh, clouded with grey or aſh colour; back, grey; the legs of a fleſh colour. This ſpecies reſides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, eaſily tamed, and eſteemed moſt excellent meat, ſuperior to the domeſtic gooſe. Towards winter they collect in great flocks, but in all ſeaſons live and feed in the fens.

The *manſuetus*, is the grey lag in a ſtate of domeſtication, and from which it varies in colour, though much leſs ſo than either the mallard or cock, being ever more or leſs verging to grey; though in all caſes the whiteneſs of the vent, and upper tail coverts, is manifeſt. It is frequently found quite white, eſpecially the males: and doubts have ariſen, which of the two colours ſhould have the preference in point of eating.

The gooſe in general breeds only once in a year; but will frequently have two hatches in a ſeaſon, if well kept. The time of ſitting is about 30 days. They produce eggs ſufficient for three broods, if they are taken away in ſucceſſion. It is ſaid to be very long-lived, arriving at no leſs than 100 years.

8. The *bean gooſe* is two feet ſeven inches in length; in extent four feet eleven. The bill, which is the chief diſtinction between this and the former, is ſmall, much compreſſed near the end, whitiſh, and ſometimes pale red in the middle, and black at the baſe and nail: the head and neck are cinereous brown, tinged with ferruginous; breaſt and belly dirty white, clouded with cinereous; the back of a plain aſh colour; feet and legs of a ſaffron colour; claws black.

This ſpecies arrives in Lincolnſhire in autumn; and is called the *bean-gooſe*, from the likeneſs of the nail of the bill to a horſe-bean. They always light on corn-fields, and feed much on the green wheat. They never breed in the fens; but all diſappear in May. They retreat to the ſequeſtered wilds of the north of Europe; in their migration they fly a great height, cackling as they go.

9. The erythropus, or laughing-gooſe of Edwards, is a native of Europe and America. The length of this ſpecies is about two feet four, the extent four feet ſix; the bill is elevated, of a pale yellow colour, with a white ring at the baſe; the fore-head is white; the breaſt and belly are of a dirty white, marked with great ſpots of black; and the legs yellow. Theſe viſit the fens and other parts of England during winter, in ſmall flocks; they keep always in marſhy places, and never frequent the corn-lands. They diſappear in the earlieſt ſpring, and none are ſeen after the middle of March.

Linnæus makes this gooſe the female of the *bernacle*; but Mr. Pennant thinks his opinion not well founded.

The *bernacle* (erythropus *mas*, Lin.) is two feet one inch in length, the breadth four feet five inches: the bill is black; the forehead and cheeks are white; from the bill to the eyes, there is a black line; the hind part of the head, the whole neck, and upper part of the breaſt and back, are of a deep black; the tail is black, the legs are of the ſame colour, and ſmall. Theſe birds appear in vaſt flocks during winter, on the north-weſt coaſts of this kingdom: they are very ſhy and wild; but on being taken, grow in a few days as familiar as our tame geeſe. In February they quit our ſhores, and retire as far as Lapland, Greenland, and even Spitzbergen, to breed.

10. The race-horſe or loggerhead gooſe, is in length 32 inches, and weighs from 20 to 30 pounds. The bill is three inches long, and of an orange colour: the irides are orange, ſurrounded with black, and then with orange: the head, neck, and upper parts of the body are of a deep aſh-colour; the outer edge of the ſecondaries white, forming a band of the ſame on the wing: the under parts of the body duſky down the middle; over the thighs cinereous blue; vent white; quills and tail black: the wings are very ſhort, not reaching to the rump: on the bend of the wing is a yellow knob, half an inch in length: the legs are browniſh orange, the webs duſky, and the claws black. Theſe inhabit Falkland Iſlands, Staaten Land, &c. and were moſtly ſeen in pairs, though ſometimes they were obſerved in large flocks.

11. The ſnow-gooſe is in length two feet eight inches, and weighs between five and ſix pounds. The bill is ſomewhat ſerrated at the edges; the upper mandible ſcarlet, the lower whitiſh: the general colour of the plumage is ſnow white, except the firſt ten quills, which are black, with white ſhafts: the legs are of a deep red. The young are of a blue colour, till they are a year old. Theſe are very numerous at Hudſon's Bay. They viſit Severn River in May, and ſtay a fortnight; but go farther north to breed.

12. The great gooſe is of a very large ſize, weighing near 25 or 30 Ruſſian pounds. The bill is black; baſe of it tawny: body duſky: the under parts are white; the legs ſcarlet. It is found in the eaſt of Siberia, from the river Lena to Kamtſchatka; and is taken in great numbers, together with the red-necked gooſe, in glades, as we do woodcocks in England, but upon a larger ſcale.

13. The ruficolis, or red-breaſted gooſe, is in length 21 inches; weight three pounds troy. The bill is ſmall, and brown; the tail black: the irides are yellow brown; round the eyes, fringed with brown: fore part of the head and crown black, paſſing backwards in a narrow ſtripe quite to the back: on the breaſt is a narrow band of white feathers with black ends, forming a band of white and another of black; the ſides are ſtriped with black: back and wings black, the laſt even with the tail: legs black. This moſt elegant of geeſe is found to breed from the mouth of the Ob, along the coaſts of the Icy ſea, to that of the Lena. Its winter quarters are not certainly known.

14. The caſarca, or ruddy gooſe, is larger than a mallard, and ſeems even larger than it really is, from the length of wing, and ſtanding high on its legs. The bill is black: the irides are yellowiſh brown: forehead, cheeks, and throat, yellowiſh: fore-part of the neck ferruginous, encircled with a collar of black, inclining to deep rufous on the throat: the breaſt and ſides are pale rufous; the belly is obſcure: the back is pale; the lower part is undulated, hoary, and brown, not very diſtinct; the rump and tail are greeniſh black; the legs long and black. This ſpecies is found in all the ſouthern parts of Ruſſia and Siberia in plenty. In winter it migrates into India, and returns northward in ſpring.

15. The bernicla, is of a brown colour; with the head, neck, and breaſt, black; and a white collar. Theſe birds, like the bernacles, frequent our coaſts in winter; and are particularly plenty, at times, on thoſe of Holland and Ireland, where they are taken in nets placed acroſs the rivers.

16. The canadenſis is brown; its neck and head are black, and the throat is white. It meaſures three and a half feet in length. It is found during the ſummer in Hudſon's Bay, and parts beyond: alſo in Greenland; and, in the ſummer months, in various parts of North America, as far as Carolina. They breed at

Hudſon's Bay, and lay ſix or ſeven eggs; but the major part retire ſtill farther north.

17. The molliſſima, or eider-duck, is double the ſize of the common duck, has a cylindrical bill, and the wax is divided behind, and wrinkled. The feathers, which are very ſoft and valuable, fall off during incubation. The male is white above, but black below and behind: the female is greeniſh. This ſpecies is found in the Weſtern Iſles of Scotland, particularly on Oranſa, Barra, Rona, and Heiſker, and on the Farn Iſles; but in greater numbers in Norway, Iceland, and Greenland; from whence a vaſt quantity of the down, known by the name of *eider* or *edder*, which theſe birds furniſh, is annually imported.

18. The maula, or ſcaup-duck, is leſs than the common duck. The bill is broad, flat, and of a greyiſh blue colour; the head and neck are black; the back, the coverts of the wings, and the ſcapulars, are finely marked with numerous narrow tranſverſe bars of black and grey; the legs are duſky.

19. The moſchata, or Muſcovy duck of Ray, has a naked papillous face, and is a native of India. It is bigger than the wild duck, being in length two feet. This ſpecies is pretty common in a domeſticated ſtate in almoſt every nation.

20. The elypeata, or ſhovelar of Ray, has the end of its bill broad, rounded, and furniſhed with a ſmall hook. It is in length 21 inches; the female a trifle ſmaller. This bird is rather ſcarce in England.

21. The ſtrepera, or gad-wall, has the wings variegated with black, white, and red. It inhabits England in the winter months, and is alſo found at the ſame ſeaſon in various parts of France and Italy. It migrates as far as Sweden as ſummer advances in order to breed; and found throughout Ruſſia and Siberia.

22. The clangula, or golden eye of Ray, is variegated with black and white, and the head is interſperſed with blackiſh green feathers: it has a white ſpot near the mouth; and the eyes are of a ſhining gold colour. It is not unfrequent on our ſea-coaſts in winter, and appears in ſmall flocks; but paſſes to the north in ſpring in order to breed.

It inhabits Sweden and Norway during the ſummer. It is an excellent diver, and feeds on ſmall ſhells. It is moſtly ſeen in the water, as it is very awkward in walking. It has been attempted to be domeſticated, but ſeems out of its element on land. With difficulty it can be brought to eat any thing but bread; and the feet ſoon grow injured, inſomuch as at laſt to hinder it from walking. The fleſh is much eſteemed, and the birds are often ſeen in the markets at the proper ſeaſon. This ſpecies is found in America; in winter, at New York; in ſummer, at Hudſon's Bay, where it frequents the freſh-water lakes, and makes in hollow trees a round neſt of graſs lined with feathers from its breaſt; lays about ten white eggs.

23. The merſa, or Ural duck of Pallas, is ſomewhat bigger than the common teal. The bill is large, broad, very tumid above the noſtrils, and bifid in the adult bird, the end marked with diverging ſtriæ; colour blue; the head, and part of the neck, are white; on the crown is a large patch of black: the middle of the neck is black: the fore-parts of the body are a yellowiſh brown, undulated with black: the back is clouded with a cinereous and pale yellow, powdered with brown; the wings are ſmall; the tail longiſh, wedge-ſhaped, and black: the legs are brown, on the fore-part blueiſh, and placed as far back as in the diver genus. This ſpecies is common to the greater lakes of the Ural mountains, and the rivers Ob and Irtiſch.

24. The American widgeon, *le canard jenſen*, of Bouffon, is rather bigger than our widgeon. The bill is of a lead colour; the crown and forehead of a yellowiſh white; the hind-part of the head and neck is black and white, ſpeckled; and behind the eye is a black mark, changing in ſome lights, to green: the back and ſcapulars are of a pale ruſt-colour, waved with tranſverſe black lines: in the middle of the wing coverts there is a large bed of white; the quills and tail are deep brown; the legs duſky. It inhabits North America, from Carolina to Hudſon's Bay; but it is no where a common bird. It is called at New-York the Pheaſant Duck.

25. The acuta, pin-tail, or ſea-pheaſant of Ray, has a long accuminated tail, black below, with a white line on each ſide of the back part of the head. It is a native of Europe.

26. The glacialis, or long-tailed duck, is inferior in ſize to the former. The bill is ſhort, black at the tip and baſe, orange-coloured in the middle; the cheeks are of a pale brown; the hind-part of the head, and the neck, both before and behind, are white; the breaſt and back are of a deep chocolate colour; the four middle feathers of the tail are black, and two of them near four inches longer than the others, which are white; the legs are duſky. Theſe birds breed in the moſt northern parts of the world; and only viſit our coaſts in the ſevereſt winters.

27. The ferina, pochard, or red-headed widgeon of Ray, has a lead-coloured bill: the head and neck are of a bright gay colour: the breaſt, and part of the back, where it joins the neck, are black: the coverts of the wings, the ſcapulars, back and ſides, under the wings, are of a pale grey, elegantly marked with narrow lines of black; the tail conſiſts of twelve ſhort feathers, of a deep grey colour: the legs are lead-coloured; and the irides of a bright yellow, tinged with red. The head of the female is of a pale reddiſh brown.

They frequent the fens in this country in the winter ſeaſon.

28. The querquela, garganey, or firſt teal of Aldrovandus, has a green ſpot on the wings, and a white line above the eyes. It frequents the freſh waters of Europe. In many places it is called the ſummer teal.

29. The creca, or common teal, has a green ſpot on the wings, and a white line both above and below the eyes. It is of a ſmall ſize, only fourteen inches in length, and is common to our markets.

The teal remains in France throughout the year, and makes a neſt in April among the ruſhes, on the edges of ponds; it is compoſed of the tendereſt ſtalks of them, with the addition of the pith, and a quantity of feathers. The neſt is of a large ſize, and placed in the water, ſo as to riſe and fall with it. The eggs are the ſize of thoſe of a pigeon, of a dirty white, marked with ſmall hazel ſpots. It is ſaid to feed on the graſs and weeds which grow on the edges of the ponds which it frequents, as well as the ſeeds of the ruſhes; it will alſo eat ſmall fiſh. The fleſh is accounted excellent. It is found to the north as high as Iceland; and is mentioned as inhabiting the Caſpian ſea to the ſouth.

30. The hiſtrionica, or duſky ſpotted duck of Edwards, is of a brown colour, variegated with white and blue; it has a double line on the ears and temples; the collar is white, and there is a white ſtreak on the neck. It inhabits from Carolina to Greenland: in the latter it frequents, during ſummer, the rapid rivers, and the moſt ſhady parts; neſtling on the banks, among the low ſhrubs. It ſwims and dives admirably. In winter it ſeeks the open ſea, flies high and ſwiftly, and is very clamorous. It feeds on ſhell-fiſh, ſpawn, and the larvæ of gnats. Is found in Iceland, and as low as Sondmor. It is common from the lake Baikal to Kamſchatka, and breeds there as well as every where elſe.

31. The minuta, or little white and brown duck of Edwards, is of a greyiſh colour, with white ears, and the prime feathers of the wings blackiſh. This and the former, according to Latham, are found both on the old and new continents.

On the firſt it is ſeen as far ſouth as the lake Baikal, and from thence to Kamſchatka, particularly up the river Ochotſka; alſo in Iceland, and as far as Sondmor.

In America, it is found from Carolina to Newfoundland, and Hudſon's Bay; alſo in Greenland, where it frequents, during ſummer, bays and rivers, eſpecially near their mouths, and is a very noiſy ſpecies. It is fond of ſhady places, and makes the neſt on ſhore among the ſhrubs. Its food is ſmall ſhells, eggs of fiſhes, and particularly the larvæ of gnats. It ſwims well, even in the moſt rapid ſtreams, and dives to admiration; it likewiſe flies ſwift, and to a great height; from which circumſtances it is not eaſily taken.

Our late navigators met with it at Aoonalaſhka. It is pretty frequent in the ſmall rivulets of Hudſon's Bay, about 90 miles inland; ſeldom in large rivers. It lays 10 or more white eggs, like thoſe of the pigeon, on the graſs; and the young brood ſpeckled in a very pretty manner. It migrates towards the ſouth in ſummer.

32. The boſchas, common wild-duck of Ray, or mallard; the intermediate tail-feathers of the drake are turned backward, and the bill is ſtreit. It frequents the lakes of different countries, and feeds upon frogs and ſeveral ſorts of inſects. The wild-ducks pair in the ſpring; build their neſts among ruſhes near the water, and lay from 10 to 16 eggs. The female is a very artful bird; and does not always make the neſt cloſe to the water, but frequently at a good diſtance from it; in which caſe the duck will take the young in its beak or between its legs. It is known ſometimes to lay the eggs in a high tree, in a deſerted magpie's or crow's neſt.

At moulting time, when they cannot fly, they are caught in great numbers. They abound particularly in Lincolnſhire, the great magazine of wild fowl in this kingdom; where prodigious numbers are annually taken in the decoys.

Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills; theſe nerves are remarkably conſpicuous in the head and bill of the wild-duck, and are larger than thoſe of a gooſe, or any other bird yet known; this is the reaſon aſſigned why they grope for food more than any other bird whatever.

The common tame ſpecies of ducks take their origin from theſe, and may be traced to it by unerring characters. The drakes, however they vary in colours, always retain the colours of the tail, and both ſexes the form of the bill, of the wild kind.

Nature ſports in the colours of all domeſtic animals; and for a wiſe and uſeful end, that mankind may the more readily diſtinguiſh and claim their reſpective property.

In France this ſpecies is not often ſeen, except in winter; appearing in October, and going north in ſpring. They are caught in various manners; among the reſt, in decoys, as in England; the chief place for which is Picardy, where prodigious numbers are taken, particularly on the river Somme. It is alſo cuſtomary there to wait for the flocks paſſing over certain known places, and the ſportſman, having a wicker cage, containing a quantity of tame birds, lets out one at a time, at a convenient ſeaſon, which enticing the paſſengers within gunſhot, five or ſix are often killed at once by an expert markſman. They are now and then taken alſo by a hook baited with a bit of ſheep's lights, which ſwimming on the water, the bird ſwallows the bait, and with it the hook. Various other means of catching ducks and geeſe are peculiar to certain nations; of which one ſeems worth mentioning from its ſingularity: the perſon wiſhing to take theſe, wades into the water up to the chin, and having his head covered with an empty calabaſh, approaches the place where the ducks are; when they, not regarding an object of this ſort, ſuffer the man freely to mix with the flock; after which he has only to pull them by the legs under the water, one after another, till he is ſatisfied; returning as unſuſpected by the remainder as when he firſt came among them. This method is frequently put in practice on the river Ganges, uſing the earthen veſſels of the Gentoos inſtead of the calabaſhes; theſe veſſels are what the Gentoos boil their rice in, and are called Kutcharee pots (they likewiſe make a diſh for their tables in them, which goes by the ſame name): after theſe are once uſed they look upon them as defiled, and in courſe throw them into the river as uſeleſs; and the duck-takers find them convenient for their purpoſe, as the ducks, from conſtantly ſeeing the veſſels float down the ſtream, look upon them as objects of full as little regard as a calabaſh. The above, or ſome ſuch method, is alſo practiſed in China as well as in India. The Chineſe, however, though they make great uſe of ducks, do not prefer the wild ſort, being in general extremely fond of tame ones: and it is ſaid that the major part of theſe are hatched by artificial heat; the eggs, being laid in boxes of ſand, are placed on a brick hearth, to which is given a proper heat during the time required for hatching. The ducklings are fed with little craw-fiſhes and crabs, boiled and cut ſmall, and afterwards mixed with boiled rice; and in about a fortnight ſhift for themſelves, when the Chineſe provide them an old ſtepmother, who leads them where they are to find provender for themſelves; being firſt put on board a ſampane or boat, which is deſtined for their habitation, and from which the whole flock, often to the amount of 300 or 400, go out to feed, and return at command. This method is uſed nine months out of the twelve, for in the colder months it does not ſucceed; and is ſo far from a novelty, that it may be every where ſeen; but more eſpecially about the time of cutting the rice and gleaning the crop, when the maſters of the duck ſampanes row up and down the river according to the opportunity of procuring food, which is found in plenty, at the tide of ebb, on the rich plantations, as they are overflowed at high water. It is curious to ſee how the ducks obey their maſter; for ſome thouſands, belonging to different boats, will feed at large on the ſame ſpot, and on a ſignal given will follow their leader to their reſpective ſampanes, without a ſtranger being found among them. This is ſtill more extraordinary, if we conſider the number of inhabited ſampanes on the Tigris, ſuppoſed to be no leſs than 40,000, which are moored in rows cloſe to each other, with a narrow paſſage at intervals for boats to paſs up and down the river. The Tigris, at Canton, is ſomewhat wider than the Thames at London, and the whole river is there covered in this very ſingular manner for the exent of at leaſt a mile.

33. The galericulata, or Chineſe teal of Edwards, has a hanging creſt; and on the hinder part of the back, on both ſides, there is a crooked, flat, elevated feather; the creſt is green and red; and the back is brown, ſpotted with blue; and erect feathers on the back are red and blunt; one edge of the inmoſt wing feather, when the wings are ſhut, is raiſed over the back, and is red, and like a ſickle before. This moſt ſingular and elegant ſpecies is a native of China and Japan, where it is kept by the inhabitants for the ſake of its beauty.

Attempts have been made to breed them in this country, but without ſucceſs, though they are familiar enough. This bird is known in Japan by the name of Kimnodſui. The Engliſh in China give it the name of Mandarin Duck.

34. The ſponſa, or ſummer duck of Cateſby, is a moſt elegant ſpecies. It has a depending green creſt, variegated with blue and white; the back is likewiſe variegated in the ſame manner; the breaſt is grey, ſpotted with white; and the throat is white. It inhabits Mexico, and ſome of the Weſt India iſles; migrating, in the ſummer ſeaſon, as far north as 40 degrees.

35. The aborea, or black-billed whiſtling duck of Edwards, is of a reddiſh brown colour, with a ſort of creſt on the head; the belly is ſpotted with black and white. It is a native of America.

36. The fuligula, or tufted duck of Ray, has a hanging creſt, a black body, and the wings and belly ſpotted with white. In the winter months it is not unfrequent in England; being met with in the markets in that ſeaſon, and is much eſteemed.

There are 62 other ſpecies enumerated by ornithologiſts; the whole number hitherto deſcribed being 98.

ANASARCA, among phyſicians, a ſpecies of the dropſy.

ANASSAS, in natural hiſtory, the name given by the natives of Guinea to the pine-apple; where it is ſaid to grow in the greateſt perfection, without any cultivation whatever.

ANASTASIS, a term among ancient phyſicians, for a riſing up to go to ſtool. It alſo ſignifies the paſſage of any humour, when expelled from one part, and obliged to remove to another. In Engliſh the word is the ſame as RESURRECTION.

ANASTATICA, the ROSE OF JERICHO, a genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, Siliquoſæ. There are two ſpecies:

1. The ſyriaca, a native of Syria, is not cultivated or known in Britain.

2. The hierochuntica is a native of the ſandy parts of Paleſtine and the Red Sea. It is a low annual plant, dividing into many irregular woody branches near the root. At each joint is placed a ſingle, oblong, hairy leaf; and at the ſame places come out ſmall ſingle flowers, of a whitiſh green colour, compoſed of four leaves, placed in the form of a croſs. Theſe are ſucceeded by ſhort wrinkled pods, having four ſmall horns; theſe open into four cells, in each of which is lodged a ſingle brown ſeed. It is propagated by ſeeds.

ANASTOMATICS, in medicine, denotes ſuch applications as have been the power of opening the mouths of the veſſels, and promoting the circulation; ſuch as deobſtruent, cathartic, and ſudorific medicines.

ANASTOMOSIS, in anatomy, implies the opening of the mouths of veſſels, in order to diſcharge their contained fluids. It is likewiſe uſed for the communication of two veſſels at their extremities; as the inoculation of a vein with a vein; of an artery with an artery; or of an artery with a vein, &c.

ANASTROPHE, in rhetoric, denotes the inverſion of the natural order of words.

ANATHEMA, among eccleſiaſtical writers, imports whatever is ſet apart, ſeparated, or divided; but is moſt uſually meant to expreſs the cutting off a perſon from the privileges of ſociety and communion with the faithful.

The anathema differs from excommunication in the circumſtances of being attended with curſes and execrations. It was practiced in the primitive church againſt notorious offenders; and the form of that pronounced by Synecius againſt one Andronicus, is as follows: "Let no church of God be open to Andronicus, but let every ſanctuary be ſhut againſt him. I admoniſh both private men and magiſtrates, to receive him neither under their roof, nor to their table; and prieſts more eſpecially, that they neither converſe with him living, nor attend his funeral when dead."

Several councils alſo have pronounced anathemas againſt ſuch as they thought corrupted the purity of the faith: and their deciſions have been conceived in the following form:

Si quis dixerit, &c. anathema ſit.

There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a biſhop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the hereſy he abjures.

ANATHEMA, in heathen antiquity, was an offering or preſent made to ſome deity, and hung up in the temple. Whenever a perſon left off his employment, it was uſual to dedicate the tools to the patron-deity of the trade. Alſo, perſons who had eſcaped from imminent danger, as ſhipwreck and the like, or had met with any other remarkable inſtance of good fortune, ſeldom failed to teſtify their gratitude by ſome preſent of this kind.

ANATHEMATIZING, the act of pronouncing anathemas.

ANATHEMATISM, denotes the ſame as ANATHEMA.

ANATICULA, in Greek and Roman antiquity, implies a word of tenderneſs, as, my little dear, &c.

ANATIFERA CONCHA, the trivial name of a ſpecies of the lepas, a teſtaceous animal.

ANATOCISM, ANATOCISMUS, an uſurious contract, wherein the intereſts ariſing from the principal ſum are added to the principal itſelf, and intereſt exacted upon the whole. The word is originally Greek, but uſed by Cicero in Latin; whence it is deſcended into moſt other languages. It comes from the prepoſition *ανα*, which in compoſition ſignifies repetition or duplication, and *τοκος*, uſury. Anatociſm is what we call, intereſt upon intereſt, or compound intereſt. This is the worſt kind of uſury, and has been ſeverely condemned by the Roman law, as well as by the common laws of moſt other countries. See INTEREST.

ANATOMY, *ανατομη*, the art of diſſecting, or artificially ſeparating the parts of an animal body, to diſcover their ſituation, figure, connections, fabric, and œconomy. This term is uſually applied to the examination of the ſtructure of human bodies. Where its ſubject is a deſcription of the ſtructure of the brute creation, it is denominated *Comparative* ANATOMY.

The following Syſtem of Anatomy is the ſelection and arrangement of Mr. HALL, *Member of the Corporation of Surgeons, and Profeſſor of Anatomy, in Broad-Street, Golden-Square.*

A NEW SYSTEM of ANATOMY.

THE Science of Anatomy might date its origin as far back as the firſt formation of ſociety; for it appears that the mind of man very ſoon applied itſelf to the attainment of anatomical knowledge: and the names, uſes and ſituations of the external parts of our bodies were probably among the firſt of our acquired ideas.

If we examine the attainment of the leaſt cultivated race of ſavages that have been hitherto diſcovered, we ſhall find among them conſiderable knowledge of the external ſtructure of the body; and that they have not only affixed names to many of thoſe parts, but have juſt ideas as to their ſituations and uſes: likewiſe, from their obſervations on the ſtructure of the animals which they deſtroy in their hunting, they may have ſome ideas of the internal ſtructure of the human body; and from the conſequence of their wars they muſt occaſionally inſpect even human bodies. Thus Dr. Hunter uſed to relate that Omiah, when he viſited his muſeum, evinced a knowledge of the uſes of moſt parts of the body, and particularly deſired to examine the organs of generation. So that a South-Sea iſlander, placed at the remoteſt diſtance from Science, was not found to be totally ignorant of Anatomy.

Admitting the foregoing obſervations to be founded on reaſon, and they appear ſelf-evident, it will be found that the knowledge of Anatomy had its beginning with the firſt eſtabliſhment of ſociety in the world; and that it has gradually accumulated ſince that time, in proportion to the labours or abilities of the different men who have profeſſed that art; and would have arrived much ſooner at a notable degree of perfection, had not the collected knowledge of ages been repeatedly diſſipated, by the ſudden overthrow, and almoſt total annihilation of ſtates, which were ſo frequently taking place in the early periods of civilization.

This appears ſtill more evident to our ſenſes, when we conſider, that the ſtate of knowledge was merely traditional, and handed down from father to ſon, and in that way, by a ſeries of experience, ſome families became famous in one art, and ſome in another; and made conſiderable improvements in their ſeveral profeſſions.

In this ſtate of a nation, a ſucceſsful war, carried on by a barbarous neighbour, would not only deſtroy their mode of government, but, as it were, annihilate the whole people, who were either ſlain, or carried into captivity; and thus their increaſing traditional knowledge would become extinct; for we cannot ſuppoſe that ſlaves, who met with the moſt cruel treatment, would inſtruct their barbarous maſters, but rather, from a principle of revenge, ſuffer their knowledge to die with them.

In the early ages of Greece Anatomy had made great advances in improvement, as appears from the juſt deſcriptions of the effects of wounds, which Homer has repeatedly given.

The ſources from whence this knowledge of Anatomy ſprang are numerous: in the earlieſt ages of the world, and according to Holy Writ, even in the days of Adam, animals were ſacrificed to the Deity; and in the performance of this ceremony, conſiderable art was neceſſary to ſeparate thoſe parts which were not acceptable in the ſacrifice, from thoſe which were ordained to be made uſe of.

By theſe means the internal parts of animals were frequently expoſed to the deliberate examination of the ſacrifice.

After the flood, when man began to eat animal food, anatomical knowledge muſt have been yet further improved, as the butchery gave the greateſt opportunities to inquiſitive men of informing themſelves with reſpect to the ſtructure of animals; and accidents frequently happened which gave opportunities of inſpecting human bodies; ſuch as a man particularly devoured by wild beaſts, or ſlain by the enemy in battle, or from the barbarous modes of executing criminals, which are generally practiſed by uncivilized nations. Add to theſe, the cuſtom of embalming in common uſe among the Egyptians, from which practice an increaſing ſtock of anatomical knowledge muſt have gradually ariſen.

From a conſideration of all theſe circumſtances, it does not appear wonderful that Mercurius Ægyptianus king of the Thebans, ſhould have been able to have wrote ſeveral volumes, or ſkins of parchment, on the ſubject of Anatomy, which were placed in the Temple of Memphis, a thouſand years before the time of Eſculapius: theſe are the firſt writings on that ſcience, whoſe remembrance is recorded in hiſtory, ſo that Anatomy, in the days of Homer, was a very ancient ſcience.

Hippocrates, the Father of Phyſic, wrote many detached pieces on the ſubject of Anatomy, and endeavoured to advance the knowledge of that ſcience; but ſome of them are more eſteemed for their antiquity than their real merit, as his deſcriptions of the Viſcera are little more than a recapitulation of their names; the ſame may be ſaid of his deſcription of the Nerves and Blood Veſſels: his account of the Heart is particular, and pretty accurate; but Galen and Eraſiſtratus deny its being the genuine Work of Hippocrates. However, his deſcription of the Bones, and their joints, are given with great preciſion, and enriched with many uſeful obſervations on the treatment of Fractures and Diſlocations.

Ariſtotle, by a love of ſtudy, and extraordinary opportunities of purſuing his enquiries, added much to the maſs of philoſophical knowledge. He flouriſhed about 360 years before Chriſt, and from the fame that he had acquired in philoſophy, was appointed preceptor to Alexander the Great, after the death of his maſter Plato. He wrote upon Anatomy, but chiefly comparative; and advanced the ſcience by a judicious and exact hiſtory of the incurbated egg; and by his deſcription of the human fœtus, and the gradual completion of its organized parts, ſo as to be evidently the founder of the Anthropagenetical Syſtem, which implies, a ſucceſſive organization and appoſition of the parts, a doctrine that was eſpouſed by his admirer Dr. Harvey.

We ſhould pay the more attention to the ſentiments of Ariſtotle in his anatomical deſcription of Animals, becauſe he was not only an ardent lover of that ſcience, but was poſſeſſed of wealth; therefore had the means of examining almoſt all animals by the generoſity of Alexander. He allowed him 800 talents, near 2,000,000*l.* ſterling, to procure and maintain a variety of animals, in order to obſerve their manners and genius whilſt living, and to examine their anatomical ſtructure when dead.

Diocles Caryotius, who lived ſoon after the time of Ariſtotle, according to Galen, was the firſt author who wrote on the method of diſſecting bodies; this art, before his time, being confined to private families, and only taught to the children and pupils of thoſe who poſſeſſed the ſecret. From hence he ought to have high rank among the primitive anatomiſts; he might even claim the title of the Father of Anatomy, becauſe he firſt divulged to the public the only means of acquiring knowledge and making improvements in the art; but his works having been deſtroyed by the conflagration of the Alexandrian library, he has almoſt ſunk into oblivion. He was called by the Athenians the ſecond Hippocrates. He recommended the ſwallowing of a ball of lead for the cure of the iliac paſſion, which ſeems to prove his knowledge of the nature of the diſeaſe, as acquired by diſſection.

Thus by the obſervations and improvements of Hippocrates, Ariſtotle, and Diocles Caryotius, this ſcience was put in a train for advancement, and by the labours and genius of many of their ſucceſſors the knowledge of Anatomy has been gradually brought to its preſent ſtate of perfection.

Harvey's diſcovery of the Circulation of the Blood in the laſt century is a memorable æra in the hiſtory of this art, and has deſervedly affixed immortality to his name.

The full knowledge of the Abſorbent Syſtem has graced the Anatomiſts of the preſent century, and has added much to our knowledge of the Animal Œconomy.

The name of Hewſon, like that of Harvey, will be long remembered for having firſt proved the exiſtence of thoſe veſſels in birds, amphibiæ and fiſh, as well as in the human body.

The mode of teaching this ſcience is, practically, as follows:

1. That which is called the Synthetic, or where we begin with the whole body, and diſplay the parts gradually by diſſection.
2. The Analytic, or where we firſt deſcribe the elements of the body, and then proceed to conſider the whole machine.

The ancients made uſe of the former of theſe methods; but this is now generally laid aſide, becauſe it uſually requires ſeveral bodies to explain all the parts, and an examination of the muſcles or blood veſſels is as much as we can do upon one ſubject; at the ſame time it often requires the removal of one part to diſplay another, which renders it impoſſible to ſee every part of the ſame ſubject.

In our plan we ſhall follow the Analytic method; we ſhall firſt conſider the conſtituent parts that make up the general organization: then the general properties of ſimilar parts, ſuch as Artery, Muſcle, Bone, &c. and, laſtly, give a particular deſcription of each part ſeparately, under the following heads:

I. GENERAL OBSERVATIONS

On the moſt Simple Component Parts of the Body.

II. OSTEOLOGY;

Or a particular Deſcription of the Bones.

III. MYOLOGY;

Or a particular Deſcription of the Muſcles and the Male Organs of Generation.

IV. ANGIOLOGY;

Or a Deſcription of the Vaſcular Syſtems.

V. SPLANCHNOLOGY;

Or a Deſcription of the Viſcera, with the Female Organs of Generation.

VI. NEUROLOGY;

Or the Doctrine of the Nerves, and the Organs of Senſe.

Thus we ſhall endeavour to arrange the human body in ſuch a way as to enable the ſtudent to examine the human body in the moſt natural order, and by that means to facilitate his progreſs in the ſcience; attending throughout the whole to perſpicuity and conciſeneſs, that we may inform the mind, rather than give a vain diſplay of deep reading and prolixity, which could only tend to divert the fancy.

ANATOMY.

PART I.

GENERAL OBSERVATIONS ON THE MOST SIMPLE COMPONENT PARTS OF THE BODY.

SECT. I.

ON NUTRITION.

THE variety of functions which are inceſſantly performed by the living body, and the continual circulation of the blood through it, muſt neceſſarily occaſion a conſtant diſſipation of the ſeveral parts which enter into its compoſition.

The fluids are conſtantly waſting, as is evident from the great exhalation that is daily going on from the ſkin by inſenſible perſpiration, and from the lungs by expiration. Alſo from the evacuation of urine, ſaliva, &c.

But the ſolid, as well as the fluid parts of the body, require a conſtant renewal of nutritious particles. They are expoſed to the attrition of the fluids which are circulated through them, and the contraction and relaxation they repeat ſo many thouſand times in every day, would neceſſarily occaſion a diſſolution of the machine, if the renewal was not proportioned to the waſte.

The Blood is the ſource of nutrition, containing in its compoſition the elements of every part of the body. This fluid has a continual ſupply of nutritious particles from the chyle, ſo long as health remains.

If the ſupply of nouriſhment exceeds the degree of waſte, the body increaſes; and this happens in infancy and in youth: for at thoſe periods, but more particularly the former one, the fluids bear a large proportion to the ſolids; and the fibres being ſoft and yielding, are proportionably more capable of extenſion and increaſe. But when the ſupply of nutrition only equals the waſte, we neither increaſe nor decreaſe; and we find this to be the caſe, when the body has attained its full growth, or *acme*; for the ſolids having then acquired a certain degree of firmneſs and rigidity, do not permit a farther increaſe of the body. But as we approach to old age, rigidity begins to be in exceſs, and the fluids bear a much leſs proportion to the ſolids than before. The diſſipation of the body is greater than the ſupply of nouriſhment: many of the ſmaller veſſels become gradually impervious; and the fibres loſing their moiſture and elaſticity, appear flaccid and wrinkled. The florid complexion diſappears, becauſe the fluids by which they were produced can no longer reach the extremities of the capillary veſſels of the ſkin. As theſe changes take place, the nervous power being proportionably weakened, the irritability and ſenſibility of the body, which were formerly ſo remarkable, are greatly diminiſhed; and, in advanced life, the hearing, the eye-ſight, and all the other ſenſes become gradually impaired.

The length of man's life depends upon nutrition, where no particular diſeaſe intervenes to put a period to it; and this is frequently performed with energy for ſeventy years, but it has been continued for a much longer ſpace of time; as in the caſe of Thomas Parr, who lived 152 years, and acted the part of a huſband to the age of 132 years.

In this ſection, as alſo in the following, we have, in order to elucidate the ſubjects, made various quotations from Dr. *Simmons*'s tranſlation of *Elements d'Anatomie raiſonnée, par M. Perſon*.

SECT. II.

ON THE BLOOD.

BLOOD, recently drawn from a vein into a baſon, would ſeem to be an homogeneous fluid of a red colour; but when ſuffered to reſt, it ſoon coagulates, and divides into two parts, which are diſtinguiſhed by the names of *craſſamentum* and *ſerum*. The craſſamentum is the red coagulum, and the ſerum is the water in which it floats. The craſſamentum may be ſubdivided into two parts, for, by being repeatedly waſhed in warm water, it gives out all its red particles, and what remains appears to be compoſed of the *coagulable lymph*.

The red particles have been improperly called globules, they not being of a ſpherical figure, but more like a cheeſe or piece of money. They are very minute, being no more than the 3240th part of an inch in diameter. See Hewſon.

The coagulating lymph becomes a jelly whenever it is at reſt, either in or out of the body, and in every degree of heat. The more it is agitated, the leſs is its diſpoſition to coagulate: hence, in all diſeaſes where the heart is acting ſtrongly, blood drawn from a vein is ſo long before it coagulates, that the red particles ſubſide to the bottom, whilſt the coagulating lymph occupies the upper ſurface of the craſſamentum, forming the buff.

The ſerum is principally made up of water, and a coagulable matter, with certain ſaline particles. This never coagulates in a leſs heat than 160 degrees of Farenheit's thermometer.

The ſerum and craſſamentum differ in their proportion in different conſtitutions; in a ſtrong perſon the craſſamentum is in a greater proportion to the ſerum than in a weak one, and in certain diſeaſes the ſame difference is obſerved.

SECT. III.

ON THE ARTERIES.

AN Artery is a ſtrong elaſtic ramifying tube ariſing from the heart. The Arteries are properly but two, and riſe from the two ventricles of the heart; one of them is called Aorta, or great Artery, proceeding from the left ventricle of the heart, of which all other Arteries, except the pulmonary, are but the branches. From the heart it extends itſelf, by its various branches, to the moſt diſtant parts of the body. The other is named the Pulmonary Artery, for it ſprings from the right ventricle of the heart, and is wholly confined to the lungs.

The figure of an artery ſomewhat reſembles a tree; the ſmaller ramification of the Arteries frequently anaſtamoſe with each other, as may be obſerved in the coats of the inteſtines, when they are injected. The largeſt appearances of this kind are in the Vertebral Arteries, which unite in the ſkull.

All the Arteries in the body are continuations of the ſame tube, which begins at the ventricle of the heart, and gradually divide into branches, and theſe branches grow ſmaller the farther they are from the heart.

Arteries terminate three ways: the moſt common is that into veins: the ſecond termination is into cells, as in *corpora cavernoſa penis*, &c. or the beginning of the excretory ducts of glands. The third termination is on the ſurfaces of parts, whoſe open mouths are called exhalent Arteries.

The Arteries generally lie deep, and always run on the inflected ſide of the limb, as in the Axilla, the inner part of the Cubit, &c. This ſituation prevents their being either ſtretched or compreſſed in the various motions of the body.

In the beginning of each Artery there are three valves, which appear like purſes, and prevent the return of the blood to the heart; the other parts of the Arteries are free from valves.

The coats of the Arteries are three in number.

1. The external, which contains a great number of blood veſſels, and many nerves run through it: it is elaſtic, and its fibres run quaquavaſum.

2. The middle is made of fibres, which are diſpoſed nearly circular, and parallel to each other.

3. The internal is a thin membrane, whoſe ſurface is very ſmooth, to give an eaſy paſſage to the blood.

The cellular membrane is improperly numbered among the coats of the Arteries, for it only connects the real ones.

The coats of Arteries have great elaſticity, by which they preſs on the blood, and powerfully aſſiſt in keeping up the impetus it receives from the contraction of the ventricles of the heart. They have alſo a muſcular power, which is able to contract them beyond their elaſticity, as is evident in the Arteries of an animal bled to death ſlowly, the large Arteries appearing in that caſe almoſt without cavity.

The beginning of the Aorta is furniſhed with ſemilunar valves, as the Pulmonary Artery is, and the ſame triangular bodies to cloſe up the little ſpace left by the valves. Theſe prevent the blood from being forced back upon the heart, which would otherwiſe happen at the time of its relaxation.

SECT. IV.

ON VEINS IN GENERAL.

A VEIN is a thin, ramifying elaſtic tube, which ariſes in the extremities of the body, and terminates in the heart. The blood is diſtributed all over the body by two arteries, the Aorta and the Pulmonary Artery, and is returned by ſix veins, the two Venæ Cavæ, and the four Pulmonary Veins.

In general, the Arteries have their correſpondent Veins, ſo the courſe of the one is known by that of the other.

Veins begin where Arteries end, and proceed from the branches to the trunk, making a canoid figure in the ſame way that the Arteries have been ſaid to do.

The Veins which are ſubject to frequent compreſſion from the action of the muſcles, have valves which open towards the heart; in all the Veins alſo which are perpendicular to the horizon, except thoſe of the abdomen, thorax and pelvis, are valves with their mouths towards the heart. Theſe valves prevent the regurgetation of the blood from the heart.

Thus we ſee the valves of arteries prevent the return of the blood upon the heart, and force it towards the extreme veſſels, whilſt thoſe of the Veins have a contrary effect, ſtopping the current towards the extremities, whilſt they do not impede the return of the blood to the heart; but in both caſes coinciding to facilitate the regular and accuſtomed circulation.

Beſides the deep ſeated Veins which accompany the arteries in the extremities, there are other Veins more ſuperficially ſeated, the reaſon of which is to prevent the circulation being interrupted by the action of the muſcles compreſſing the internal Veins. For the ſame reaſon alſo they anaſtomoſe very frequently with each other by large trunks.

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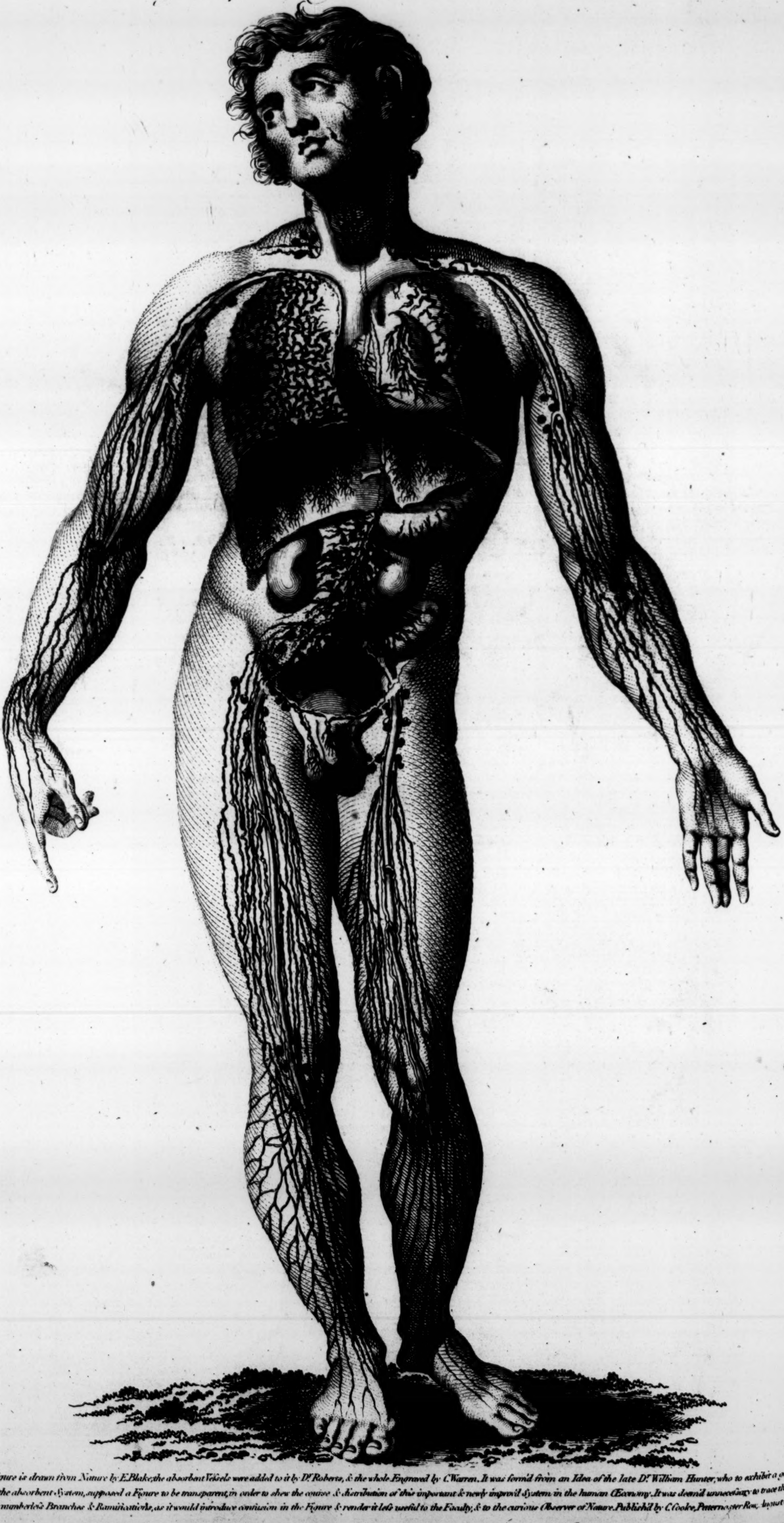
Representation of the Absorbent Veſsels: See the Article Lymphatics, and the System of Anatomy, Part 1, Section 5, and Part 4, Section 3.



This Figure is drawn from Nature by E. Blake; the absorbent Veſsels were added to it by Dr. Roberts, & the whole Engraved by C. Warren. It was form'd from an Idea of the late Dr. William Hunter, who to exhibit a general view of the absorbent System, supposed a Figure to be transparent, in order to shew the course & distribution of this important & newly improv'd System in the human Œconomy. It was deem'd unneceſsary to trace the Trunks to their numberleſs Branches & Ramifications, as it would introduce confusion in the Figure & render it leſs useful to the Faculty, & to the curious Observer of Nature. Publish'd by C. Cooke, Paternoster Row, August 6th 1790.

The coats of the Veins are the ſame as thoſe of the arteries; but they are thinner, by being compoſed of fibres in all directions; they bear ſtretching better than the artery, whoſe chief ſtrength is in the circular fibres. The coats of the Veins are thicker in the extremities than among the viſcera, particularly the vena ſtaphœna is of a remarkable thickneſs.

The capacity of the veins is much larger than the arteries, except the pulmonary veſſels, where the four Veins taken together are not equal to the artery.

SECT. V.

ABSORBENT SYSTEM.

WE have deſcribed arteries conveying the blood from the heart, and veins returning it back to that viſcus. There is in the body a third ſeries of veſſels which are univerſally diſtributed, whoſe function is to abſorb every where certain particles, and convey them into the large veins near the heart.

This is called the Abſorbent Syſtem, becauſe it is the only ſet of veſſels in animals that perform that office. This Syſtem is divided into three parts: LACTEALS, LYMPHATICS, and THORACIC DUCT.

LACTEALS.

An infinite number of very minute veſſels, called the Lacteal Veſſels, ariſe like net-work from the inner ſurface of the inteſtines, (but principally from the jejunum and ileum) which are deſtined to imbibe the nutritious fluid or chyle. Theſe veſſels, which were diſcovered by Aſellius in 1622, paſs obliquely through the coats of the inteſtine, and running along the myſentery, unite as they advance, and form larger branches, all of which paſs through the meſenteric or conglobate glands, which are very numerous in the human ſubject. As they run between the inteſtines and theſe glands, they are ſtyled *venæ lacteæ primi generis:* but after leaving theſe glands, they are found to be leſs numerous, and being increaſed in ſize, are then called *venæ lacteæ ſecundi generis,* which go to depoſit their contents in the Thoracic Duct, through which the chyle is conveyed into the blood.

THORACIC DUCT.

This Thoracic Duct begins about the lower part of the firſt vertebra lumborum, from whence it paſſes up by the ſide of the aorta, between that and the vena azygos, cloſe to the vertebræ, being covered by the pleura. Sometimes it is found divided into two branches; but they uſually unite again into one canal, which opens into the junction of the left ſubclavian and left jugular veins, after having run a little way, in an oblique courſe, between its coats. The ſubclavian vein communicates with the vena cava, which paſſes to the right auricle of the heart.

The lower part of this duct, being uſually larger than any other part of it, has been named the *receptaculum chyli*, or *Pecquet's receptacle*, in honour of the anatomiſt who firſt diſcovered it in 1651. In ſome quadrupeds, in turtle and in fiſh, this enlargement is more conſiderable in proportion to the ſize of the duct, than it uſually is in the human ſubject, where it is not commonly found large enough to merit the name of *receptaculum*.

Opportunities of obſerving the Lacteals in the human ſubject do not often occur; but they may be eaſily demonſtrated in a dog, or any other quadruped, that is killed two or three hours after feeding upon milk, for then they appear filled with white chyle.

But theſe Lacteals, which we have deſcribed as paſſing from the inteſtines, through the meſentery, to the Thoracic Duct, compoſe only a part of a Syſtem of Veſſels which perform the office of Abſorption, and which conſtitute, with their common trunk, the Thoracic Duct, and the conglobate glands that are diſperſed through the body, what may be ſtyled the Abſorbent Syſtem. So that what is ſaid of the ſtructure of one of theſe ſeries of veſſels may very properly be applied to that of the other.

LYMPHATICS.

The Lymphatic Veſſels are minute pellucid tubes, which, like the Lacteals, direct their courſe towards the centre of the body, where they pour a colourleſs fluid into the Thoracic Duct. The Lymphatics from all the lower parts of the body gradually unite as they approach this duct, into which they enter by three or four very large trunks, that ſeem to form the lower extremity of this canal, or *receptaculum chyli,* which may be conſidered as the great trunk of the Abſorbent Syſtem. The Lacteals open into it near the ſame place; and the Lymphatics, from a large ſhare of the upper parts of the body, pour their lymph into different parts of this duct as it runs upwards, to terminate between the left ſubclavian and left jugular vein. The Lymphatics, from the right ſide of the neck, thorax, and right arm, &c. terminate in the right ſubclavian vein.

The coats of theſe veſſels are too thin to be ſeparated from each other; but the mercury they are capable of ſuſtaining, proves them to be very ſtrong; and their great power of contraction, after undergoing conſiderable diſtenſion, together with the irritability with which Baron Haller found them to be endued, ſeems to render it probable, that, like the blood-veſſels, they have a muſcular coat.

The Lymphatics are nouriſhed after the ſame manner as all the other parts of the body. For even the moſt minute of theſe veſſels are probably ſupplied with ſtill more minute arteries and veins.

Both the Lacteals, Lymphatics, and Thoracic duct, are furniſhed with valves, which are much more common in theſe veſſels than in the red veins. Theſe valves are uſually in pairs, and ſerve to promote the courſe of the chyle and lymph towards the Thoracic Duct, and to prevent its return. Mention has been made of the glands, through which the Lacteals paſs in their courſe through the meſentery; and it is to be obſerved, that the Lymphatics paſs through ſimilar glands in their way to the Thoracic Duct. Theſe glands are all of the conglobate kind, but the changes which the chyle and lymph undergo in their paſſage through them, have not yet been aſcertained.

The Lymphatic Veſſels begin from ſurfaces and cavities in all parts of the body as abſorvents. This is a fact now univerſally allowed; but how the fluids they abſorb are poured into thoſe cavities, is a ſubject of controverſy. The contents of the abdomen for inſtance, are deſcribed as being conſtantly moiſtened by a very thin watery fluid. The ſame thing takes place in the pericardium, pleura, and all the other cavities of the body, and this watery fluid is the lymph; which, in a ſtate of health, is as conſtantly abſorbed; but where the abſorbents do not perform this action, a dropſy is the conſequence.

The lymph, from its tranſparency and want of colour, would ſeem to be nothing but water; and hence the firſt diſcoverers of theſe veſſels ſtyled them *ducti aquoſi:* but experiments prove, that the lymph of an healthy animal coagulates by being expoſed to the air, or a certain degree of heat, and likewiſe by being ſuffered to reſt; ſeeming to agree, in this property, with that part of the blood called the coagulable lymph. This property of the lymph leads to determine its uſe, in moiſtening and lubricating the ſeveral cavities of the body in which it is found; and for which, by its gelatinous principle, it ſeems to be much better calculated, than a pure and watery fluid would be, for ſuch it has been ſuppoſed to be by ſome Anatomiſts.

The mouths of the Lymphatics and Lacteals, by acting as capillary tubes, ſeem to abſorb the lymph and chyle ſomewhat in the ſame manner as a capillary tube of glaſs, when put into a baſon of water, is enabled to attract the water into it to a certain height: but it is probable, that they likewiſe poſſeſs a living power, which aſſiſts in performing this office. In the human body the lymph, or chyle, is probably conveyed, upon this principle, as far as the firſt pair of valves, which ſeem to be placed not far from the orifice of the abſorbing veſſel, whether lymphatic or lacteal; and the fluid will then be propelled forwards, by a continuation of the abſorption at the orifice. But this does not ſeem to be the only inducement to its progreſs towards the Thoracic Duct; theſe veſſels have, probably, a muſcular coat, which may ſerve to preſs the fluid forwards from one pair of valves to another; and as the large Lymphatic Veſſels and the Thoracic Duct are placed cloſe to the large arteries, which have a conſiderable pulſation, it is reaſonable to ſuppoſe, that they derive ſome advantages from this ſituation, as alſo from the action of muſcles.

SECT. VI.

ON THE GLANDS AND SECRETIONS.

THE Glands are commonly underſtood to be ſmall, roundiſh, or oval bodies, formed by the convolution of a great number of veſſels, and deſtined to ſeparate particular humours from the maſs of blood.

They are uſually divided into two claſſes, but it ſeems more proper to diſtinguiſh three kinds of Glands, viz. the mucous, conglobate, and conglomerate.

The Mucous Glands, or Follicles, as they are moſt commonly called, are ſmall cylindrical tubes, continued from the ends of arteries. In ſome parts of the body, as in the tonſils, for example, ſeveral of theſe follicles may be ſeen folded together in one common covering, and opening into one common ſinus. Theſe follicles are the veſſels that ſecrete and pour out mucus in the mouth, œſophagus, ſtomach, inteſtines, and other parts of the body.

The Conglobate Glands are peculiar to the abſorbent Syſtem. Every abſorbent veſſel paſſes through a gland of this kind in its way to the thoracic duct. They are met with in different parts of the body, particularly in the axilla, groin and meſentery, and are either ſolitary, or in diſtinct cluſters.

The Conglomerate Glands are of much greater bulk than the Conglobate, and ſeem to be an aſſemblage of many ſmaller glands. Of this kind are the liver, kidnies, &c. Some of them, as the pancreas, parotids, &c. have a granulated appearance. All the Conglomerate Glands are plentifully ſupplied with blood veſſels and abſorbents, but their nerves are in general very minute, and few in number. Each little granulated portion furniſhes a ſmall tube, which unites with other ſimilar ducts, to form the common excretory duct of the Gland.

Two Syſtems of Glandular Secretions have been formed, each of which had, and ſtill continues to have its adherents.

One of theſe Syſtems was advanced by Malpighi, who ſuppoſed that an artery, entering into a gland, ramifies very minutely through its whole ſubſtance; and that its branches ultimately terminate in a veſicular cavity or follicle, from whence the ſecreted fluid paſſes out through the excretory duct.

This doctrine at firſt met with few opponents; but the celebrated Ruyſch, who firſt attempted minute injections with wax, afterwards diſputed the exiſtence of theſe follicles, and aſſerted, that every Gland appears to be a continued ſeries of veſſels, which after being repeatedly convoluted in their courſe through its ſubſtance, at length terminate in the excretory duct. Anatomiſts are ſtill divided between theſe two Syſtems.

The mode of Secretion has been explained in a variety of ways, and they are all equally hypothetical. In ſuch an enquiry, it is natural to aſk, how one Gland conſtantly ſeparates a particular humour, while another Gland ſecretes one of a very different nature and both from the blood? The bile, for inſtance, is ſeparated by the liver, and the urine by the kidnies. Are theſe Secretions to be imputed to any particular diſpoſition in the fluids, or is their cauſe to be looked for in the ſolids?

It has been ſuppoſed, that every Gland contains within itſelf a fermenting principle, by which it is enabled to change the nature of the blood it receives, and to endue it with a particular property. Can fermentation go on without expoſure to air?

The theory of Glandular Secretion, by filtration, from a peculiar attraction in a Gland, is equally vague. For many different fluids will paſs through the ſame ſtrainer.

Filtration, by the difference in the diameters of the veſſels of a Gland, is no ways ſatisfactory. Every hypotheſis that has been advanced on this ſubject, leaves many doubts in an unbiaſſed ſtudent; and we muſt know more of the animal œconomy, before this can be fully cleared up; and it has been argued, that the veſſels of the liver, for inſtance, would, upon this principle, afford a paſſage not only to the bile, but to all the other humours of leſs conſiſtence with it. In reply to this objection it has been ſuppoſed, that ſecondary veſſels exiſt, which originate from the firſt, and permit all the humours thinner than the bile to paſs through them.

Each of theſe hypotheſes is probably very remote from the truth.

SECT. VII.

ON THE CELLULAR MEMBRANE AND FAT.

THE Cellular Membrane is founded to inveſt the moſt minute fibres we are able to trace; ſo that by modern phyſiologiſts, it is very properly conſidered as the univerſal connecting medium of every part of the body.

It is compoſed of an infinite number of minute cells united together, and communicating with each other, which are conſtantly lubricated by a fluid ſecreted from the open mouths of the exhalent arteries; this is diſtinguiſhed by the name of interſtitial fluid. The two diſeaſes, peculiar to this Membrane, are proofs of ſuch a communication; for in the emphyſema all its cells are filled with air, and in the anaſarca they are univerſally diſtended with water. Beſides theſe proofs of communication from diſeaſe, a familiar inſtance of it may be obſerved amongſt butchers, who uſually puncture this Membrane, and by inflating it with air, add to the good appearance of their meat.

The cells of this Membrane contain ſmall veſicles, which are called *cellulæ adipoſæ*, and ſerve as reſervoirs to the oily part of the blood, the fat, which ſeems to be depoſited in them, by particular veſſels, continued from the ends of arteries. Theſe cells are of a glandular ſtructure, as Malpighi and others after him have ſuppoſed. The Fat is abſorbed and carried back into the ſyſtem by the lymphatics. The great waſte of it in many diſeaſes, particularly in the conſumption, is a ſufficient proof that ſuch an abſorption takes place.

The fulneſs and ſize of the body, are in a great meaſure proportioned to the quantity of Fat contained in the cells of this Membrane. The *cellulæ adipoſæ* are ſo very ſmall and pellucid, that in lean ſubjects, they are inviſible; but in fat people, they are ſo much diſtended as to fill up the cells of the Cellular Membrane.

The Fat is not confined to the ſurface of the body alone, being met with every where, in the interſtices of muſcles, in the omentum, about the kidnies, at the baſis of the heart, in the orbits, &c.

The chief uſes of the Fat ſeem to be to lubricate all the parts with which it is connected; to facilitate the action of the muſcles; and to add to the beauty of the body, by making it every where ſmooth and equal, and alſo to ſerve as a ſtore houſe of nutritious particles to ſupply the want of food occaſionally, and to nouriſh in certain diſeaſes where a ſufficient quantity of chyle is withheld from the blood.

SECT. VIII.

LIGAMENTS

ARE found almoſt univerſally in the body, and ſerve to connect parts together. Two kinds of Ligamentous fibres are found, one of them elaſtic, and the other inelaſtic.

The Elaſtic Ligament is of a dull yellow colour having no demonſtrable blood veſſels, and very few nerves; therefore has little or no ſenſibility, and is liable to very few diſeaſes. This ſpecies of Ligament is found between the vertebræ, at the brim of the glenoid cavities, connecting the os hyoides to the cranium, and in the coats of arteries, &c. and in great abundance on the necks of grazing animals, where by its elaſticity it aſſiſts greatly in raiſing the head without much muſcular aſſiſtance. It has a ſimilar effect in raiſing the human body when it is bowed down, and thereby ſaves much fatigue, as it acts without any exertion of the animal.

Inelaſtic Ligaments are compoſed of white ſhining pearl, like fibres, being little organized, and having little or no ſenſibility. Of this kind are the capſular Ligaments of the joints, which are made firm, by the fibres rather tearing aſunder, than ſuffering any elongation. And, hence, in all perfect luxations there is a laceration of the capſular Ligament. The tendons are alſo of this kind, connecting the muſcles to the part to be moved.

SECT. IX.

THE NERVES.

The Nerves take their origin from the brain, and ſpinal marrow, are ſtrong white inelaſtic cords, and are each a faſciculus of ſmaller threads, the ſmalleſt fibril of which, is computed to be no more than the 32400th part of a common hair in magnitude; each of theſe fibrils are ſuppoſed to paſs off diſtinctly from their origin in the brain.

The ſwellings or ganglions of the Nerves are not only to be met with at their exit from the ſpine, but likewiſe in various parts of the body. They occur in the nerves of the medulla oblongata, as well as in thoſe of the ſpine. They are commonly of an oblong ſhape, and of a greyiſh colour, ſomewhat inclined to red, which is perhaps owing to their being extremely vaſcular. Internally we are able to diſtinguiſh ſomething like an intermixture of the nervous filaments.

Some writers have conſidered them as ſo many little brains; Lanciſi fancied he had diſcovered muſcular fibres in them, but they are certainly not of an irritable nature; a late writer, Dr. Johnſtone, imagines they are intended to deprive us of the power of the will over certain parts, as the heart, for inſtance; but if this hypotheſis were well founded, we ſhould meet with them only in Nerves leading to involuntary muſcles; whereas it is certain, that the voluntary muſcles receive their Nerves through ganglions. Other theories have been formed concerning them, none of which, however, have as yet led to aſcertain their uſe.

The Nerves, like the blood-veſſels, in their courſe through the body, communicate with each other, and each of theſe communications conſtitutes what is called a Plexus, from whence branches are again detached to different parts of the body. Some of theſe are conſtant and conſiderable enough to be diſtinguiſhed by particular names, as the Semilunar Plexus; the Pulmonary Plexus, the Hepatic, the Cardiac, &c.

That the Nerves are deſtined to convey the principles of motion and ſenſibility to the brain from all parts of the ſyſtem, there can be no doubt; but how theſe effects are produced, no one has ever yet been able to determine. The enquiry has been a conſtant ſource of hypotheſis in all ages, and has produced ſome ingenious ideas, and many erroneous poſitions, but without having hitherto afforded much ſatisfactory information.

Some phyſiologiſts have conſidered a trunk of Nerves as a ſolid chord, capable of being divided into an infinite number of filaments, by means of which the impreſſions of feelings are conveyed to the ſenſorium commune. Others have ſuppoſed them to be an aſſemblage of many ſmall and diſtinct tubes, connected to each other, and thus forming a cylindrical chord, which tubes were ſuppoſed to convey the animal ſpirits from the brain, to every part of the body. They who contend for their being ſolid bodies, are of opinion, that feeling is occaſioned by vibration; ſo that, for inſtance, according to this ſyſtem, by pricking the finger, a vibration would be occaſioned in the Nerve, diſtributed through its ſubſtance, and the effects of this vibration, when extended to the ſenſorium, would be an excital of pain. But the inelaſticity, the ſoftneſs, the connection, and the ſituation of the Nerves, are ſo many proofs, that vibration has no ſhare in the cauſe of feeling.

Others have ſuppoſed that in the brain and ſpinal marrow, a very ſubtile fluid is ſecreted, and from thence conveyed through the imperceptible tubes, which they conſider as exiſting in the Nerves. They have farther ſuppoſed, that this very ſubtile fluid, to which they have given the name of animal ſpirits, is ſecreted in the cortical ſubſtance of the brain and ſpinal marrow, from whence it paſſes through the medullary ſubſtance, but no ſuch fluid can be demonſtrated to exiſt, nor can any cavity be diſcovered in the Nerves.

SECT. X.

ON THE MUSCLES.

THE Muſcles are the organs of motion. The parts that are uſually included under this name conſiſt of diſtinct portions of fleſh, made up of faſciculi of fibres connected together by cellular membranes, and ſo minute that we cannot ſee the ultimate fibre; theſe are ſuſceptible of contraction and relaxation; the motions of which in a natural and healthy ſtate, are ſubject to the will, and for this reaſon they are called Voluntary Muſcles, being ſet into action by a mental ſtimulus. But beſides theſe, there are other parts of the body that owe their power of contraction to their muſcular fibres; thus the heart is of a muſcular texture, forming what is called a hollow Muſcle, and the urinary bladder, ſtomach, inteſtines, &c. are enabled to act upon their contents, merely, becauſe they are provided with muſcular fibres. Theſe are called Involuntary Muſcles, becauſe their motions are not dependent on the will. Theſe are put into action by a mechanical ſtimulus. The Muſcles of reſpiration, being in ſome meaſure influenced by the will, are ſaid to have a mixed motion. The peculiar property which reſides in a muſcular fibre, and fits it to be ſet in action by a certain ſtimulus, is called its irritability, which is dependent upon the nerves.

SECT. XI.

ON THE BONES IN GENERAL.

THE Bones are of a firm and hard ſubſtance, of a white colour, and perfectly inſenſible. They are the moſt compact and ſolid parts of the body, and ſerve for the attachment or ſupport of all the other parts.

Three different ſubſtances are uſually diſtinguiſhed in them; their exterior or Bony part, properly ſo called; their ſpongy cells, and their reticular ſubſtance. The firſt of theſe is formed of many laminæ, or plates, compoſing a firm, hard ſubſtance. The ſpongy or cellular part, is ſo called on account of its reſemblance to a ſponge, from the little cells which compoſe it. This ſubſtance forms almoſt the whole of the extremities of cylindrical Bones. The reticular part is compoſed of fibres, which croſs each other in different directions. This net-work forms the internal ſurface of thoſe Bones, which have cavities.

The flat Bones, as thoſe of the head, are compoſed only of the laminæ and the cellular ſubſtance. This laſt is uſually found in the middle of the Bone dividing it into two plates, and is there called Diploë.

We uſually conſider in a Bone, its body and its extremities. The ancients gave the name of diaphyſis to the body or middle part, and divided the extremities into apophyſis or epiphyſis. An apophyſis, or proceſs, as it is more commonly called, is an eminence continued from the body of the Bone, whereas an epiphyſis is at firſt a ſort of an appendage to the Bone, by means of an intermediate cartilage. Many epiphyſes, which appear as diſtinct Bones in the fœtus, become at length ſo completely united to the body of the Bone, as not to be diſtinguiſhable from it in the adult ſtate. It is not unuſual, however, at the age of eighteen and even twenty years, to find the extremities of Bones ſtill in the ſtate of epiphyſis.

The names given to the proceſſes of Bones, are expreſſive of their ſhape, ſize, or uſe; thus if a proceſs is large, and of a ſpherical form, it is called caput, or head; if the head is flatted, it is termed condyle. Some proceſſes, from their reſemblance to a ſtiletto, a breaſt, or the beak of a crow, are called ſtyliod, maſtoid, or coracoid: others are ſtiled ridges or ſpines. The two proceſſes of the os femoris derive their name of trochanters from their uſe.

A Bone has its cavities as well as proceſſes. Theſe cavities either extend quite through its ſubſtance, or appear only as depreſſions. The former are called foramina or holes, and theſe foramina are ſometimes termed canals or conduits, according to their form and extent. Of the depreſſions, ſome are uſeful in articulation. Theſe are called Cotyloid when they are deep, as is the caſe with the os innominatum, where it receives the head of the os femoris; or Glenoid when they are ſuperficial, as in the ſcapula, where it receives the os humeri. Of the depreſſions that are not deſigned for articulation, thoſe which have ſmall apertures are called ſinuſes; others that are large, and not equally ſurrounded by high brims, are ſtiled foſſæ. Such as are long and narrow, furrows; or if broad and ſuperficial without brims, ſinuoſities.

SECT. XII.

ON THE CONNECTION OF THE BONES.

THE Bones compoſing the ſkeleton are ſo conſtructed, that the end of every Bone is perfectly adapted to the extremity of that with which it is connected; and this connection forms what is called their articulation.

Articulation is divided into Diarthroſis and Synarthroſis, or moveable and immoveable articulation. Each of the two firſt has its ſubdiviſions. Thus the Diarthroſis, or moveable articulation, includes, 1. The Enarthroſis, as it is called, when a large head is admitted into a deep cavity, as in the articulation of the os femoris with the os inominatum. 2. Arthrodia, when a round head is articulated with a ſuperficial cavity, as is the caſe with the os humeri and ſcapula. 3. Ginglimus, or hinge-like articulation, as in the connection of the thigh bone with the tibia. The Enarthroſis and Arthrodia allow of motion to all ſides; the Ginglimus only of flexion and extenſion.

The Synarthroſis, or immoveable articulation, includes, 1. The Suture, when the two bones are indented into each other, as is the caſe with the parietal Bones. 2. Gompoſis, when one Bone is fixed into another, in the manner the teeth are placed in their ſockets.

What is called Symphiſis, is the union of two Bones into one, as in the lower jaw, for inſtance, which in the fœtus conſiſts of two diſtinct Bones, but becomes one in a more advanced age, by the Oſſification of the uniting cartilage.

When Bones are thus joined by the means of cartilages, the union is ſtyled Synchondroſis, when by ligaments, Syneuroſis.

SECT. XIII.

ON THE CARTILAGES.

CARTILAGES are white, ſolid, ſmooth, and elaſtic ſubſtances, between the hardneſs of bones and ligaments, and ſeemingly of a fibrous texture. We are not able to trace any veſſels into their ſubſtance by injection, nor are they ever found tinged in animals that have been fed with madder.

They may be diſtinguiſhed into, 1ſt. Thoſe which are connected with the Bones; and, 2dly, Thoſe which belong to other parts of the body. The firſt ſerve either to cover the ends and cavities of Bones intended for motion, as in the articulations, where by their ſmoothneſs they facilitate motions, which the Bones alone could not execute with ſo much freedom; or they ſerve to unite Bones together, as in the ſymphiſis pubis, or to lengthen them as in the ribs.

Many of them oſſifying as we advance in life, their number is leſs in the adult than in the fœtus, and in courſe there are fewer Bones in the old than in the young ſubject.

Of the ſecond claſs of Cartilages, or thoſe belonging to the ſoft parts, we have inſtances in the larynx, where we find them uſeful in the formation of the voice, and for the attachment of muſcles.

SECT. XIV.

ON THE PERIOSTEUM.

THE Perioſteum is a membrane of a compact inelaſtic texture, reflected from one joint to another, and ſerving as a common covering to the bones, is thickeſt near the joints, and almoſt diſappears in the middle of large bones, and ſeems to be made up of an expanſion of tendons and capſular ligaments; it adheres very firmly to their ſurface, and, by its ſmoothneſs, facilitates the motion of muſcles. It likewiſe ſupports the veſſels that go to be diſtributed through the ſubſtance of the bones, and may ſerve to ſtrengthen the articulations. Where it covers the bones of the ſkull, it has gotten the name of Pericranium.

SECT. XV.

ON THE MARROW.

THE Marrow is a fat, oily ſubſtance, filling the cavities of bones. In the great cavities of long bones it is of a much firmer conſiſtence than in the cells of their ſpongy part. In the former it inclines ſomewhat to a yellowiſh tinge, and is of the conſiſtence of fat; in the latter it is more fluid, and of a red colour. This difference in colour and conſiſtence is owing to accidental cauſes; both kinds are of the ſame nature, and may both be deſcribed under the common name of marrow, though ſome writers give this name only to the fat-like ſubſtance, and call the other the medullary juice.

The Marrow is contained in a very fine and tranſparent membrane, which is ſupplied with a great number of blood-veſſels, chiefly from the perioſteum. This membrana medullaris adheres to the inner ſurface of the bones, and furniſhes an infinite number of minute bags or veſicles for incloſing the Marrow, which is likewiſe ſupported in the cavities of the bones by the long filaments of their reticular ſubſtance.

Beſides the veſſels from the perioſteum, the membrana medullaris is furniſhed with others, which in the long bones may be ſeen paſſing in near the extremities of the bone, and ſending off numerous branches that ramify through all the veſicles of this membrane.

The bones, and the cells containing the Marrow, are likewiſe furniſhed with lymphatics. By their means, the Marrow, like the fat, may be taken up in a greater quantity than it is ſecreted; and hence it is that ſo little is found in the bones of thoſe who die of lingering diſeaſes.

The Marrow was formerly ſuppoſed to be intended for the nouriſhment and renewal of the bones, but this doctirne is now pretty generally and deſervedly exploded. It ſeems probable that the Marrow is to the bones what fat is to the ſoft parts. They both ſerve for ſome important purpoſes in the animal œconomy, but their particular uſe has never yet been clearly aſcertained. The Marrow, from the tranſudation of the oil through the bones of a ſkeleton, is ſuppoſed to diminiſh their brittleneſs; and Havers goes ſo far, as to deſcribe the canals by which it is conveyed through every part of their ſubſtance. But from ſome recent enquiries on this ſubject, I am convinced that theſe pretended canals in a dry bone, are nothing more than the tracts of blood-veſſels, into which, when thoſe veſſels are deſtroyed, the Marrow, which then becomes oily, and burſts from its cells, eaſily inſinuates itſelf, and makes its way through the ſubſtance of the bone to its outer ſurface. There do not ſeem to be any ſuch pores in a freſh bone; and in the living body, the Marrow is not a fluid oil, but a congealed fat incloſed, as we have ſeen, within its proper cell.

SECT. XVI.

ON THE SYNOVIA.

THE ſynovia, which lubricates the ſurfaces of joints, appears to be ſecreted by the inner lamina of the capſular ligament. No glands being demonſtrable, and a ſimilar fluid being found in the thecæ of tendons.

When the Synovia is wanting, or is of too thick a conſiſtence, the joint becomes ſtiff and incapable of flexion or extenſion. This is what is termed anchyloſis.

SECT XVII.

ON THE LIGAMENTS.

LIGAMENTS are white, gliſtening, inelaſtic bands, of a compact ſubſtance, more or leſs broad or thick, and ſerving to connect the bones together. They are diſtinguiſhed by different names, adapted to their different forms and uſes. Thoſe of the joints are called either round or burſal. The round Ligaments are white, tendinous, and inelaſtic. They are ſtrong and flexible, and are found only in the joint of the knee, and in the articulation of the os femoris with the os innominatum. The burſal, or capſular Ligaments, ſurround the whole joint like a purſe, and are to be found in the articulations which allow motion every way, as in the articulation of the arm with the ſcapula.

PART II.

OSTEOLOGY.

SECT. I.

ON THE BONES OF THE SPINE.

THE ſkeleton is commonly divided into head, trunk, and extremities. Trunk and extremities are a better diviſion. The trunk ſhould be firſt underſtood; it is divided into neck, cheſt, loins and pelvis. The cheſt and pelvis have bone all round; in the neck and loins, the only bone is the ſpine.

The ſpine, being the baſis of the trunk, ſhould be firſt ſtudied; it is the pillar of ſupport, ſtraight in a front and back view, in a profile, is bended in different directions; it is formed of two pyramids joined at their baſes, and is made by the juncture of a number of bones called vertebræ.

The vertebræ are divided into two claſſes, true and falſe. True vertebræ are twenty-four in number; theſe form the upper pyramid, the ſeven ſuperior of which, forming the neck, are called cervical; the next twelve, making the back, are called dorſal; and the five inferior, the loins, are called lumbar.

The vertebræ of the neck have, nearly, a perpendicular bearing; thoſe of the back are curved from the fore to the back part; whilſt thoſe of the loins are made to project from the back to the fore part; the whole reſembling the form of an Italic *ſ*.

Of the Spine the uſe is threefold; 1ſt. To ſupport weight; 2dly, For muſcular attachment; and, 3dly, To give lodgement to ſoft parts.

The true vertebræ correſpond with each other in their general characters, tho' each claſs may be diſtinguiſhed by particular marks: each vertebra has a body forming the fore part, and rounded from ſide to ſide; has flat ſurfaces above and below, hard edges; is ſpungy within; has holes for blood veſſels, &c. Poſterior and lateral parts, formed by proceſſes, make a ring. The proceſſes are ſpinal or azygos, on the back part; on the ſides, a pair of tranſverſe or lateral; theſe give convenient attachment to muſcles.

On the upper part, there is a pair of oblique or articulating proceſſes; on the under part, a ſecond pair of oblique proceſſes for articulation. The ſubſtance of the proceſſes is harder than the body of the bone; under each tranſverſe proceſs is a notch; when two vertebræ are joined, this notch forms a hole to admit nerves to paſs through.

The roots of the Spinal proceſſes are rough, for the inſertion of elaſtic ligaments. The holes behind the bodies of the vertebræ, made by the ring of proceſſes on the back part, are ſo oppoſed to each other, that ſthey orm a canal, in which the Spinal marrow is lodged.

Cervical vertebræ have their bodies flat, and not projecting, hollowed from ſide, on the upper part, rounded from ſide to ſide below, mutually receiving and being received. The hole for the Spinal marrow is triangular, the angle behind. Spinal proceſſes are ſhort, in general bifid; tranſverſe proceſſes, ſhort, are perforated to admit the vertebral artery to paſs up to the brain. The articulating proceſſes are very oblique, are covered by articular cartilages, have capſular ligaments, and form joints; the firſt, ſecond, and ſeventh, differ from the reſt.

The ſecond vertebra is called dentata, its body flat on the fore part, Spinal proceſs very ſtrong, bifid, marked by the inſertion of muſcles; its tranſverſe proceſſes ſhort and ſmall. Superior articulating proceſſes, broad, ſtrong, and nearly horizontal; inferior articulating proceſſes more oblique. From the upper part of the body riſes a ſtrong, tooth-like proceſs called odontoid, marked by the attachment of ſtrong ligaments. The atlas differs from the general character; it is a mere ring of bone, the body wanting; the tranſverſe proceſſes are long and perforated; has no ſpinal proceſs; is broad from ſide to ſide; hole round, printed ſtrongly by ligaments, which paſs between it and the tooth-like proceſs of the dentata. The tooth-like proceſs of the dentata tied ſtrongly to the fore part of the atlas, within its bony ring; this ring has a ſmooth ſurface, on which the proceſs plays. The arch of the atlas revolves round the odontoid proceſs, which forms a centre of revolution. The oblique proceſſes above are excavated, forming glenoid cavities, into which the condyles of the os occipitis are received. The inferior oblique proceſſes broad and ſtrong, correſponding with thoſe of the dentata.

The rotary motion of the head is produced by a revolution of the atlas round the dentata. The ſeventh vertebra is very like the dorſal; its Spinal proceſs long, differs from the ſpinal proceſſes of the dorſal, in being rounded at its extremity: this is of uſe in determining muſcular attachment. The other vertebræ colli have nothing particular, except the Spinal proceſſes and bodies becoming larger as they deſcend.

Vertebræ dorſi have their Spinal proceſſes long and drooping one over the other, and have three edges. The length of the Spinal proceſſes encreaſes from the firſt, to the eighth or ninth, and then decreaſes to the laſt. Tranſverſe proceſſes are very long, ſmooth, ſtrong, and a little reclined; the extreme point has a ſmooth ſurface, covered by cartilage, for the articulation of the tubercles of the rib; the articulating proceſſes are nearly perpendicular; the bodies project conſiderably, and are thicker from the fore to the back part, printed by the heads of the ribs on each ſide; have two ſmooth ſurfaces, covered by cartilage, for the articulation of the head of the rib; the head of the rib being received between the bodies of the two vertebræ, each vertebra is imprinted, at its upper and lower edge, by two ribs on each ſide; the hole for the Spinal marrow is ſmaller in the back than in the neck or loins. The firſt and two laſt vertebræ differ from the others: the firſt receives the head of the firſt rib entirely, and part of the ſecond; the two laſt have each one impreſſion for one rib; their tranſverſe proceſſes are ſhort, and without ſurfaces for articulation with the rib.

Lumbar Vertebræ have their bodies large, and are broader from ſide to ſide. The Spinal proceſs is large, broad, and ſtrong, placed nearly horizontal, and not drooping like thoſe of the back; the tranſverſe proceſſes are long, but not ſtrong, the middle one the longeſt. The Articular proceſſes are perpendicular, and the articulation of the laſt vertebra with the ſacrum, the ſame as between each vertebra. The bodies of the vertebræ make the pillar of ſupport, which comes near the centre of the trunk; the proceſſes give convenient attachment to muſcles; the canal, formed by the holes in the vertebræ, contains the ſpinal marrow, from which nerves go off to the different parts of the body. The vertebræ are ſtrongly connected to each other by the intervertebral ſubſtance, which is elaſtic, and of different thickneſs between the bodies of different vertebræ, being thicker below, and gradually becoming thinner as we aſcend.

The Spine may be bended conſiderably forwards and backwards, but laterally, very little. The rotation principally brought out between the atlas and the dentata; the flexion and extenſion of the Spine leſs than is generally imagined, the bones of the pelvis moving on the thigh bones. The centre of gravity of the body rather before the Spine; hence, ſtrong muſcles are neceſſary on the back part. The extenſors are very numerous, and the more ſo, becauſe the lever, with which they act, is ſhort: but the flexors act with a longer lever, as the rectus abdominis.

SECT. II.

ON THE BONES OF THE PELVIS.

The Pelvis, in its general ſhape, reſembles a baſon; when ſtanding on a table the ſides are higheſt; its ridge, called the brim of the Pelvis, divides it into two parts; all that is above the ridge, is the lower part of the cavity of the abdomen; all below the ridge or brim, is properly the cavity of the Pelvis. Being formed in a circle, greater firmneſs is allowed of, with the ſame quantity of bony matter; and this being the centre of motion of the body, great firmneſs was requiſite. Neceſſary that muſcles ſhould have an attachment for motion in all directions; its form is alſo neceſſary for the expulſion of the fœtus, urine and fæces; its axis does not coincide with the axis of the trunk; the trunk is ſupported on the thigh bones; for this reaſon the axis is ſo altered, that the upper part of the ſacrum is in a line with the heads of the thigh bones, and the trunk has a perpendicular bearing on them.

The Pelvis, in a lower view, has three projecting parts, and three notches; theſe, in the freſh ſubject, are formed into two holes by the ſacro-ſciatic ligaments. The Pelvis, in the adult, conſiſts of four bones, os ſacrum, os coccygis, and two oſſa innominata.

The os ſacrum is triangular, in a fore and back view; it is concave before, for the purpoſe of enlarging the cavity of the Pelvis, and convex behind; to its angular point is attached the coccyx, which is directly downwards.

The ſacrum conſiſts of five bones, called falſe vertebræ; the bodies and tranſverſe proceſſes are anchyloſed to each other, ſo as to reſtrain all motion; theſe bones are ſeparable, in the early part of life, form a pyramid, the baſe of which is joined to the laſt vertebra of the loins. The upper part, or firſt bone of the ſacrum, has two articular proceſſes, and a flat ſurface on its body, for articulation with the laſt vertebra lumborum; and has a canal, in which the lower part of the ſpinal marrow is lodged.

The ſpinal proceſſes of the three or four firſt vertebræ, uniting with each other, form a bridge of bone, covering the back part of the canal: from thence to the coccyx, the ſpinal proceſſes are wanting, and the lower part of the ſpinal marrow is covered only by a ſtrong ligamentous membrane.

The ſacrum has four pairs of holes, on the fore and back part; through the poſterior holes paſs very ſmall nervous twigs; through the anterior, paſs the four ſuperior pairs of ſacral nerves; on each ſide of the ſacrum is a rough irregular ſurface, forming a pair of ſhoulders to the bone. The ſacrum is thick above and thin below; irregular, for muſcular attachment, on the back part.

The Os coccygis follows the ſweep of the ſacrum; it conſiſts of four bones, and terminates about an inch from the anus: the firſt bone is broad above, narrow below; and has two lateral proceſſes, making a notch for the fifth ſacral nerve. The other three bones gradually diminiſh in ſize, and are frequently anchyloſed together. The elongation of this bone makes the tail of the quadruped.

The Os Innominatum is of a flat, irregular figure, broad at the upper part, conſiſts of three oſſifications in the young ſubject, to which particular names have been given, viz. ilium, iſchium and pubis; theſe unite to form the acetabulum.

The internal and external ſurfaces of the ilium are covered by muſcles; the ſpine of the ilium, its upper rough edge, its anterior ſuperior, and anterior inferior ſpinous proceſſes, poſterior ſuperior, and poſterior inferior ſpinous proceſſes, are ſharp proceſſes thus ſituated, makes part of the brim of the Pelvis, which has a ſurface for articulation with the ſacrum.

The os pubis makes the anterior part of the Pelvis, and the union of the two forms the ſymphiſis pubis. Its ramus runs downwards, to make a part of the foramen thyroideum; it alſo makes part of the acetabulum.

The ſituation of the iſchium is the bottom of the Pelvis, the ſpinous proceſs of the iſchium, and its tuberoſity, is where the ſacro ſciatic ligaments are attached. It ſends upwards a ramus, which forms a part of the foramen thyroideum, and alſo makes a part of the acetabulum.

The Pelvis of the female is more capacious than that of the male, and the proceſſes at the under part at a greater diſtance.

SECT. III.

THE BONES OF THE THORAX.

THE Thorax, in its ſhape, is different in different people; in general, in well formed perſons, broader from ſide to ſide; in ſome decrepid people, wideſt from the fore to the back part: the bodies of the vertebræ projecting, divide it into two lateral cavities. The Lungs extend behind the ſpine, becauſe the pillar of ſupport being brought nearer to the centre of the body, the cheſt is leſs deep anteriorly than laterally. The Thorax in the freſh ſubject is not ſo large, as it appears to be, on viewing the ſkeleton. The general figure of the Thorax conoid, the apex of the cone being at the upper part.

The Thorax, conſiſts of twelve ribs, on each ſide; of the ſpine, on its back part, the ſternum and zyphoid cartilage on the fore part, and of the cartilaginous appendages of the ribs by which they are attached to the ſternum.

The ribs are divided into two claſſes, true and falſe: ſeven ſuperior on each ſide, called true ribs; five inferior, falſe. Ribs have many things in common; are curved; extend round, but not quite one half ot the body, are placed obliquely; each rib has a head, or poſterior extremity; has two impreſſions made by the two bodies of the vertebræ, to which it is attached; is covered by articular cartilage, and has capſular ligaments attached round its neck. The Tubercle is at a ſmall diſtance from the head of the rib, has two ſurfaces, the ſuperior for the attachment of a ligament; the inferior, covered by articular cartilage, forms a joint with the extreme point of the tranſverſe proceſs of the vertebra. The angle of the rib, where it is moſt bent, forms the poſterior part of the cheſt. Each rib, near the head, is rounded, flattened as it approaches the ſternum; the breadth increaſes; its ſides are ſmooth; edges ſharp; lower edge grooved; the groove becomes ſhallower towards the anterior extremity. Anterior extremity is called ſternal, it is not continued on to the ſternum, but is articulated thereto by a cartilage. The ſternal extremity hollowed, like a cup, in which the cartilage is received. Curve, not truly ſemicircular, moſt bent at the angle; each rib is, as it were, twiſted, conſiſting of two curves not on the ſame plane.

Cartilages; the three ſuperior, nearly ſtraight; the fourth turns, making an angle with the body of the bone, this angle increaſes to the eighth, which is nearly a right one, and then decreaſes. The obliquity of the ribs to the ſpine increaſes, from the firſt to the laſt. The intercoſtal ſpace increaſes from the poſterior to the anterior extremity, like the ſticks of a fan. The diſtance between the angle and head increaſes as we deſcend: in the firſt rib, the angle and tubercle coincide. The diſtance of the bony anterior extremity, from the middle line of the body, increaſes, excepting the ſecond rib. The angle between the rib and cartilage to the eighth rib, becomes more acute, then decreaſes; the length of the rib increaſes to the eighth, and then decreaſes. The crookedneſs decreaſes as we deſcend, the laſt being almoſt ſtraight. The furrow more remarkable to the eighth, then evidently becoming leſs. The motion increaſes from the firſt rib to the laſt.

The ſternum makes the fore part of the Thorax, its general ſhape, oblong; flat on the fore and back part; poſterior flat ſide turned towards the Thorax; the exact form undetermined; different in different ſubjects; its ſituation is oblique with reſpect to the ſpine; is near the ſpine at the upper part, at a greater diſtance below, conſiſts of three bones, theſe are frequently anchyloſed; on its ſides, receives the cartilages of the ſix ſuperior ribs; at the upper part are ſurfaces for articulation with the clavicles; to its lower part is attached the xephoid cartilage.

The Xiphoid Cartilage is frequently bony in old people; in young ſubjects, looſe and moveable; ſhape varies in almoſt every ſubject; ſometimes perforated; ſometimes forked at its extremity.

SECT. IV.

THE BONES OF THE UPPER EXTREMITY.

THE Upper Extremity is divided into ſhoulder or humerus, arm, fore-arm or cubitus, and hand.

The ſhoulder conſiſts of ſcapula and clavicle.

The ſcapula is formed of three oſſifications, ſituated on the ſide of the cheſt, to which it is attached by muſcles, is very moveable; its poſition varies in the action of the arm, being raiſed, depreſſed, brought backwards, forwards, &c.

Its ſhape is triangular, divided into internal and external ſurfaces; external, irregular; internal, more ſmooth and regular; it has three angles, one looks forward and has a glenoid cavity, for the purpoſe of articulation with the os brachii, this called its head, reſembles a head in nothing except having a neck; the other two angles diſtinguiſhed by the terms ſuperior and inferior; the ſides of the triangle, are unequal; upper ſide, called coſta ſuperior ſhorteſt; on the fore-part a proceſs hangs over the ſurface, for the purpoſe of articulation; the inferior looks forwards, downwards and upwards, this called coſta inferior; poſterior ſide looks backwards, called baſis of the ſcapula; the internal ſurface hollowed, has three or four lines made by the tendons of the ſubſcapularis; the external ſurface is divided into two regions, by a proceſs called ſpinal; the extreme part of the proceſs projects over the head of the ſcapula, and is called proceſſus acromion, has ſurfaces for articulation with the clavicle. Proceſſus Coracoides, the extreme part of ſuperior coſta.

The Clavicle; its general form is that of an Italic *ſ*, it is ſituated between the ſternum and ſcapula.

The Scapular Extremity generally higheſt; its two extremities are diſtinguiſhed by the epithets, ſternal and ſcapular: the Sternal extremity is triangular, unequal and irregular; between it and the ſternum is placed an intervening cartilage, which is looſe in the joint, between the cartilages that cover the ſurfaces of the bones; on the under ſide, are rough ſurfaces made by ligaments, which paſs from clavicle, to clavicle; here, alſo, is a ſcabrous ſurface, made by the attachment of a ligament, going to the firſt rib, to which the clavicle is ſtrongly tied; the body of the bone is rounded on the fore part, concave behind, and ſtrongly printed by the attachment of muſcles.

On the concave part is placed the medullary canal. Scapular extremity is large, broad and flat, the poſterior and anterior edges, are printed by muſcles, its extreme point is covered by articulating cartilage, and forms a joint with the proceſſus acromion ſcapulæ; the under ſide is ſtrongly printed by ligaments paſſing from it to the proceſſus coracoides ſcapulæ. The Clavicle is of uſe, to keep the ſcapula at a diſtance from the trunk, and to give greater extent of laternal motion.

Os Brachii, is cylindrical, though irregularly ſo; conſiſts of a head or upper extremity, a body, and a lower extremity; head is rounded; is not placed at the end of the bone, but obliquely; ſo that its axis does not coincide with that of the body of the bone; it is covered by articular cartilage, is adapted to the glenoid cavity of the ſcapula; has a ſhort neck to which the capſular ligament is attached; on the fore part are two tubercles, printed by the inſertion of muſcles; between the tubercles is a groove, in which is lodged the tendon of the long head of the biceps muſcle, the body at its upper part is cylindrical, at its lower part flattened and drawn out into two rough edges, which lead to the condyles.

Condyles forming the lower extremity of the bone, are two rough tuberoſities, for the attachment of muſcles and ligaments; the inner, the longer. The ſurface for articulation with the bones of the fore-arm, with reſpect to the os brachii, is oblique, from ſide to ſide, it conſiſts of three eminences and two cavities, hence plainly ginglymoid, the internal cavity, with two of the ridges, forms a ſurface for articulation with the ulna, called the trochlea; the other ridge is rounded, and on it the head of the radius rotates. On the fore part of the ſurface for articulation is a cavity, into which the coronoid proceſs of the ulna is received, in the flexion of the fore arm. On the back part, is a cavity for the reception of the olecranon, in the extention of the fore arm: in this part the bone is generally diaphanous, and ſometimes worn through.

The fore-arm conſiſts of two bones, radius and ulna; the Radius is ſhorter, and not placed in a line with the os brachii. Radius is external in ſupination; in pronation, partly ſo. The Ulna is priſmatical; at its upper part triangular, at the lower part rounded and ſmall; its upper extremity has two proceſſes, between which is the ſurface for articulation with the os brachii, called the Sigmoid cavity, adapted to the trochlea; the larger proceſs is placed in the axis of the bone, and called Olecranon; to it the tendons of the extenſor muſcles of the fore-arm are attached; on the fore part of the ſigmoid cavity is the ſhorter proceſs called coronoid, printed by the attachment of muſcles and ligament; on the outer ſide is a ſmooth ſurface covered by cartilage, on which the head of the radius rotates; the body of the bone is covered by mnſcles, except the internal and external edges; the internal edge may be diſtinctly felt the whole length of the bone in the living ſubject; to the external edge is attached the interoſſeous ligament, the lower extremity is nearly cylindrical, has a ſurface for articulation with the bones of the carpus; on the inner part is a ſmall ſharp proceſs, called Stiloid, which may be felt in the living body; on the outer part, a ſmooth ſurface receiving the internal part of the lower extremity of the radius.

The Radius, is ſhorter than the ulna, ſmaller above, larger below; its head or upper extremity hollowed to receive the articulating ſurface of the os brachii; the neck is covered by capſular ligament, on the inſide of the head is a ſurface for articulation with the ulna; a little below the head on the inner ſide of the bone, is a large tubertoſity, into which the tendon of the biceps flexor is inſerted, the body of this bone is rounded on the outſide, on the inſide has a thin edge, to which the interoſſeous ligament, is inſerted. The upper part of the radius is covered by muſcles; the lower extremity, large, flattened in the fore part, rounded on the back; the ſurface for articulation a little oblique and oblong; on the inſide, hollowed to receive the lower extremity of the ulna; on the outſide, a proceſs, called ſtiloid, projecting below the ſurface for articulation.

The hand, is divided into three parts, carpus, metacarpus and fingers, comprehending the thumb. The carpus conſiſts of eight bones, laid together like pavement, theſe diſpoſed in two rows, and placed obliquely: the general figure of the carpus, irregular, narrow, before, and hollowed conſiderably, convex, behind, in a fore view, plain; the exterior ſurfaces of all the bones, ſtrongly printed by ligaments paſſing from bone to bone and interſecting each other in different directions; theſe bones diſtinguiſhed by proper names, expreſſive of their general figure. In the firſt row is placed Scaphoides, Os Lunare, Os Cuneiforme, Os Piſciforme; and in the ſecond row, Trapezium, Tarpezoides, Os Magnum, and Os Unciforme.

Metacarpus is meant to expreſs the four bones placed between the carpus and firſt bones of the fingers. The firſt is the longeſt and ſtrongeſt; the ſecond ſhorter than the firſt, the third ſhorter and ſlenderer than the ſecond, the fourth ſhorter than the third, but conſiderably ſtronger; theſe bones agree with each other in their general characters; are rounded on the back part, leſs regular on the inſide, and ſtrongly printed by muſcles. The upper extremity is irregular and articulated with the bones of the carpus; the lower extremity has a rounded head for articulation with the bones of the fingers; the knuckles are formed by this rounded extremity.

The bones of the fingers agree with each other in their general characters, differ from each other only, in their degrees of length and ſtrength; each finger conſiſts of a pyramid of three bones, of which the fire is the longeſt and ſtrongeſt; the ſecond ſhorter, and the third the ſhorteſt, are rounded on the back part, and hallowed within. The upper extremity of the firſt bone, is hollowed to receive the lower extremity of the metacarpal bone; the lower extremity is formed by a pair of condyles, which are received by the upper extremity of the ſecond bone; the lower extremity of the ſecond bone, has alſo a pair of condyles, which are received by the upper extremity of the third bone: on the internal part of the third bone, are two ſcabrous ſurfaces, one, near the upper extremity of the bone, into which the tendon of the flexor muſcle is inſerted; the other forming the lower extremity, to which the ſkin, &c. is firmly connected.

The thumb, like the fingers, conſiſts of a pyramid of three bones: the firſt, at its upper extremity, is articulated with the trapezium, and forms a double ginglymoid, having flexion and extenſion in two oppoſite directions, the lower extremity is rounded, and received into a glenoid cavity, formed in the upper extremity of the ſecond bone; the lower extremity of the ſecond bone has a pair of condyles, which are received in a pair of glenoid cavities, in the upper extremity of the third bone; the third bone, on its inner ſide, has a pair of ſcabrous ſurfaces, which anſwer ſimilar purpoſes to thoſe of the laſt bones of the fingers. The ſides of the extremities of the bones of the fingers and thumb, are ſtrongly printed by the attachment of capſular ligaments.

SECT. XII.

THE BONES OF THE LOWER EXTREMITY.

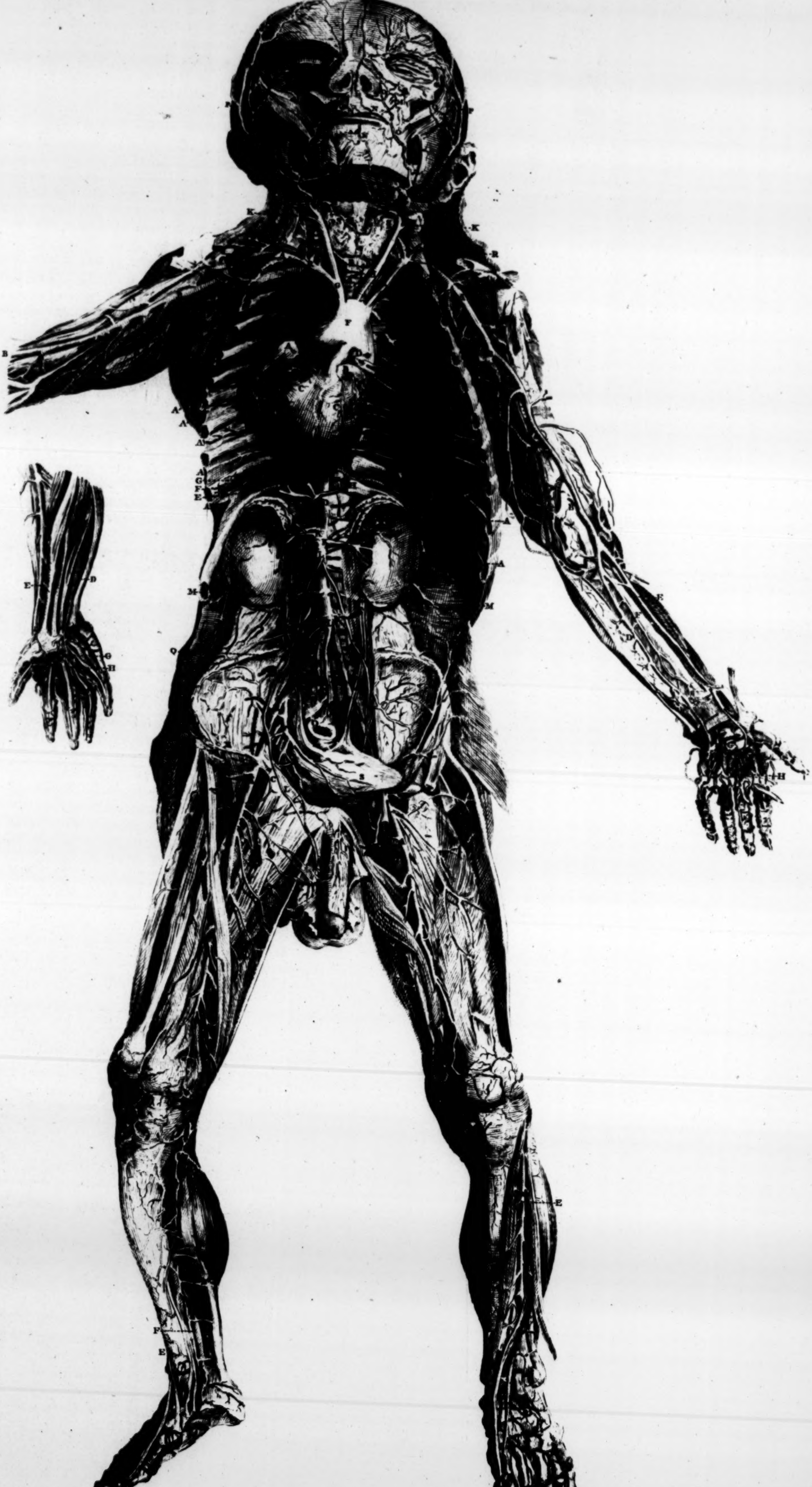
THE Os Femoris in its general ſhape is cylindrical: it is divided into the body and two extremities: the ſuperior extremity, called head, is attached to the body of the bone by a neck, the head is regularly rounded, in the middle, is a print made by the inſertion of the ligamentum ſuſpenſorium, the lower part of the neck, is marked by the attachment of the capſular ligament; the head and neck are not placed in the axis of the body of the bone, but make an angle with it; this angle differs in different perſons; the upper and outward part of the body of the bone, is formed by a large tuberoſity, called the great trochanter, ſtrongly printed by the inſertion of tendons; on the back part of the bone, between the great trochanter and neck, is a cavity, into which the tendons of many ſmall muſcles are inſerted; below the neck, on the inner and under ſide of the bone, is a leſſer tuberoſity, called the little trochanter, into which the tendons of ſome muſcles are inſerted; the fore part of the body of the femur, is regularly rounded and ſmooth, on the back part is a rough ridge, called linea aſpera; this begins from the ſpace within the two trochanters, and is continued down in the middle of the bone, about two thirds of its whole length; it then divides into two lines, one of which paſſes obliquely to each condyle.

The linea aſpera is made irregular by the attachment of the flexor tendons of the thigh; the lower extremity is conſiderably enlarged, and the articulating ſurface formed into two condyles, the inner one, longer, the external, broader; the ſides of the condyles are ſtrongly printed by the lateral parts of the capſular ligament; on the back part, between the two condyles, is a cavity, into which the crucial ligaments of the joint are inſerted; in the middle of the body of the bone, the medullary canal is placed.

The Leg may be ſaid to conſiſt of three bones, viz. tibia, fibula and petella, the laſt entering into the compoſition, of the joint of the knee. Tibia, an oblong bone of the cylindric claſs; at its upper part, priſmatical, having one edge, and one ſide, internal, which is covered only by common integuments; is divided into a body and and two extremities, which are epiphiſes; the upper extremity is large and called the head, a little below which is a print made by the attachment of the capſular ligament; its upper part formed of two glenoid cavities, adapted to the condyles of the os femoris; between them is a tuberioſity to which he ſemilunar cartilages are attached; behind this tuberoſity is a foſſa, into which the crucial ligaments are inſerted; on the outer ſide of the head of the bone, is a ſmooth ſurface covered by cartilage, to which the upper extremity of the fibula is articulated: about an inch and a half below the head, is a tuberioſity, into which the ligament of the patella is fixed: the poſterior outer edge of the bone, has a ligament attached to it, called interoſſeous, paſſing between it and the fibula; the lower part of the body of the bone, is ſmall and rounded, and is the part uſually injured in fractures; the lower extremity of the bone is irregular; on the internal part, projecting below the ſurface for articulation, is the proceſſus malleolus internus; on the outer ſide is a ſurface, a little hollowed, adapted to receive the lower extremity of the fibula: the ſurface for articulation, is oblong and hollowed from the fore to the back part: round the

lower

Front View of the Arteries in the Fœtus, the Parieties of the Thorax, & the Abdomen & Intestines removed, to shew the Arteries with greater precision. See System of Anatomy Part 4 Sect. 1.



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lower extremity is a roughneſs, made by the attachments of the capſular ligament; near the upper part of the body of the bone, the medullary canal is placed.

Fibula is a bone of the cylindric claſs; enlarged at its extremities; not given for the purpoſe of ſupporting weight, or increaſing the variety of motion, but for the convenient attachment of muſcles; its upper extremity is called head, is articulated with the head of the tibia on the outſide, but forms no part of the joint of the knee; the lower extremity is articulated with the inferior extremity of the tibia, projecting conſiderably below the ſurface for articulation, ſtrengthens the joint of the foot, and is called malleolus externus; its inner ſide is ſmooth, printed by cartilage; on it the outer part of the aſtragalus plays; the body of the bone is irregular, every where covered by the attachment of muſcles; to its inner edge the interoſſeous ligament is inſerted; the upper part of the body is ſmalleſt and moſt liable to fracture.

The patella, on the external part, is nearly triangular; one angle being turned downwards, is called its apex; to it the ligament of the patella is attached, by means of which, this bone is firmly connected with the tibia; to the upper part, called baſis, is attached the common tendon of the extenſor muſcles of the leg; its inner ſide is divided into two oblong ſurfaces by a ridge: theſe ſurfaces are adapted to the condyles of the os femoris, on which the patella plays in the different motions of the knee.

The Foot differs from the hand, in being joined to the leg at right angles, is ſtronger, being adapted to ſupport the weight of the whole body; is arched on the under part, by which the weight of the body is thrown on three points. The foot is divided into tarſus, metatarſus and toes. The Tarſus conſiſts of ſeven bones. 1ſt. Os Calcis, of a cuboid figure, has ſix ſides, forms the projecting part of the heel, on the inſide, is hollowed, forming a part of the calcaneum, is ſtrongly marked by the attachment of tendons and ligaments, has two ſurfaces for articulation, with the aſtragalus, has one ſurface for articulation, with the os cuboides. 2d. Aſtragalus placed on the centre of the arch, above is rounded from the fore to the back part, forming a ſurface for articulation with the bones of the leg, the outer ſide has a ſurface, which moves on the internal part of the lower extremity of the fibula, on the inſide, another ſmooth ſurface for motion on the malleolus internus, on the under part are two ſurfaces for articulation, with the os calcis, on the fore part is a rounded head for its articulation, with os naviculare.

3d. Naviculare, hollowed on the back part to receive the head of the aſtragalus, on the fore part, is articulared with the three cuneiform bones.

The 4th, 5th and 6th, called Oſſa Cuneiformia; that on the inſide of the foot, called cuneiforme internum, is articulated with a part of the os naviculare on the back part, and on the fore part with the firſt bone of the great toe; the next, os cuneiforme medium is, on the back part, articulated with the os naviculare, on the fore part with the metatarſal bone of the ſecond toe, ou the inſide with the cuneiforme internum, and on the outſide with the cuneiforme externum; the third, cuneiforme externum, is articulated, on the back part, with os naviculare, on the fore part, with the metatarſal bone of the third toe; on the inſide, with the os cuneiforme medium, and on the outſide, with a part of the os cuboides.

7th, Os cuboides articulated, on the back part, with the os calcis, on the fore part, with the metatarſal bones of fourth and fifth toes, on the inſide, with the cuneiforme externum, on the outer ſide, is a furrow, in which the tendon of the peroneus longus is lodged.

Note, the exterior ſurfaces of theſe bones, like thoſe of the carpus, are every where deeply printed by the inſertion of ligaments paſſing from bone to bone, and interſecting each other in a variety of different directions.

Metatarſus conſiſts of four bones like thoſe of the carpus; that which ſuſtains the ſecond toe, the longeſt; that ſuſtaining the little one, the ſhorteſt and ſtrongeſt. The bones of the toes ſo exactly correſpond with thoſe of the fingers and thumb, that they need no particular deſcription.

SECT. XIII.

THE BONES OF THE HEAD.

THE head conſiſts of a number of bones, part of which form the cranium or brain-caſe, the others form the face, in which we include the upper and lower jaw, teeth, &c. the whole making an irregular piece of mechaniſm. In a ſide view, the head is formed of two ovals, which joined, make the whole a ſhort ſpheroidal triangle.

The Cranium, when ſeparated from the bones of the face, is of an ovi-form figure; the ſmaller extremity forming the fore-head, the larger, the hind-head; it is placed obliquely, the axis looking upwards and forwards; the under part is irregular and called baſis of the ſkull; the upper part is convex, in general ſmooth, excepting five projecting parts, which point out the parts of the bones that were firſt oſſified; the anterior part is called ſinciput; the ſuperior middle part, vertex; the poſterior part, occiput, or hind-head; the lateral parts, temples.

The Cranium is formed of eight bones, one frontal, two parietal, one occipital, two temporal, the os ethmoides, and os ſphenoides; the ſix former of which are proper to the ſkull, the two latter common to it and the face; theſe bones are united to each other by ſutures; the firſt, connecting the os frontis on the back part to the two parietal bones tranſverſely, is called coronal; in the upper middle line of the ſkull, paſſing from the occipital bone behind the os frontis on the fore part, and uniting the two parietal bones, is the ſagittal ſuture.

Note, This ſuture is ſometimes contained through the middle of the os frontis to the noſe.

On the back part is the lambdoidal ſuture, articulating the ſuperior part of the os occipitis to the poſterior parts of the parietal bones; from the lower part of the leg of the lambdoidal ſuture, paſſing tranſverſely to the ſquamoſe part of the temporal bone, is the additamentum ſuturæ lambdoidalis, connecting the petrous portion of the temporal bone to the poſterior inferior angle of the parietal bone.

The upper thin part of the temporal bone, is called ſquamoſe, is articulated to the lower part of the parietal bone by the ſquamoſe, or falſe ſuture. The bones of the cranium are joined to thoſe of the face by a ſuture, called tranſverſe. The upper part is regularly rounded; its ſides are flattened, forming the temporal foſſæ; the under part very irregular, printed by muſcular attachment, perforated in many parts to admit blood veſſels, nerves, &c. to enter into and paſs from the cavity of the ſkull.

General appearance of the internal part of the ſkull in a ſide view; the ſuperior part pretty regular; the internal table of the ſkull furrowed by the artery of the dura mater; the larger branches running in the diagonal line of the parietal bone, marked by the convolutions of the brain; in the ſuperior middle line, marked by the longitudinal ſinus, oppoſite the tranſverſe occipital ridge, furrowed by the lateral ſinus; at the lower part, or internal baſis, is very irregular, divided into three regions, which correſpond with the irregularities in the baſis of the brain.

The baſis of the ſkull, externally, may be divided into three regions, the anterior being all that part before the pterygoid proceſſes of the ſphenoidal bone; the ſecond region, that part contained between the boundaries of the anterior, included within a line drawn through the maſtoid proceſſes of the temporal bones; the poſterior extends from the extreme part of the middle region to the tranſverſe occipital ridge; the anterior region has the ethmoidal bone placed in the middle, and the ſuperior parts of the orbits on each ſide; behind the ethmoidal bone is a part of the body of the ſphenoidal bone; the lateral boundaries of this region are formed by the lateral proceſſes of the os ſphenoides. The foramina, beginning from the fore part, are found in the following order: in the orbiter ridge of the os frontis, foramen orbitale externum ſuperius, through which paſſes the opthalmic branch of the fifth pair of nerves; on the inner ſide of the orbit, between the orbiter plate of the os frontis and the orbiter plate of the os ethmoides, called os planum, the foramen orbitale internum anterius, through which paſſes the naſal twig of the opthalmic branch of the fifth pair of nerves; on the outer ſide of the orbit, foramen orbitale internum exterius in the lateral proceſs of the ſphenoidal bone; at the poſterior part of the orbit, foramen opticum, through which the optic nerve and artery paſs; immediately behind this, foramem lacerum orbitale ſuperius, through it paſs the third and the fourth pair, the firſt branch of the fifth and the ſixth pair of nerves; above the foramen lacerum, is the foramen rotundum; through it the ſecond branch of the fifth pair paſſes; on the fore part of the pterygoid proceſs, foramen ſphenopterigoideum: the centre of the middle region is formed by a part of the os occipitis; the pterygoid proceſſes of the ſphenoidal bone, riſing on each ſide of the body of the os ſphonoids, point out the boundaries of the noſe.

Each proceſs divided into two alæ, called ala pterygoidea interna and externa, between which is the foſſa pterygoidea, on the point of the ala pterygoidea interna is placed an unciform proceſs, round which, the tendon of the circumflexus palati plays; the lateral parts are formed by the petrous portions of the temporal bones; in each temporal bone is a glenoid cavity, in which the condyles of the lower jaw are received; before each is a proceſs, called zygomaticus; on the poſterior part of the cuneiform proceſs of the occipital bone, the condyles of the os occipitis are placed, behind the pterigoid proceſs, the foramen ovale, through which the third branch of the fifth pair of nerves paſſes; behind this, formen ſpinoſum, through which the artery of the dura mater enters the ſkull; between the extreme part of the petrous portion of the temporal bone, and the cuneiform proceſs of the os occiptis, is a hole, which in the freſh ſubject is filled with cartilage; in the petrous portion of the temporal bone is a ſpiral canal for the caroted artery: behind this is the thimble-like cavity, through which the jugular vein paſſes; on the outſide of it, a proceſs, called vaginal, into which is placed a proceſs, called ſtiliform; between the ſtiliform and maſtoid proceſſes, is the foramen ſtilomaſtoideum, through it paſſes the portio dura of the auditory nerve; between the zygomatic and maſtoid proceſſes, on the outſide, is the meatus auditorius externus; under the condyles of the os occipitis, a pair of holes for the paſſage of the ninth pair of nerves; the poſterior region is principally formed by the inferior part of the os occipitis; on its anterior part, is the foramen magnum occipitale; on the lateral parts of the foramen magnum are ſmall holes, which allow veins to paſs through them; the back part of the poſterior region is every where printed by the inſertion of muſcles.

The internal baſis of the ſkull, like the external, is irregular, and may be divided into three regions; the anterior region, being all that part placed between the anterior clinoid proceſſes of the ſphenoidal bone; in the anterior middle part is the cribriform plate of the ethmoidal bone, in the middle of which ariſes a perpendicular proceſs, being part of the perpendicular plate of the ethmoidal bone, called criſta galli; the poſterior, made by part of the body of the ſphenoidal bone, and the ſides formed by the internal parts of the orbiter proceſſes of the os frontis. This region is occupied by the anterior lobes cerebri.

The middle region is all that part extending from the boundaries of the anterior region, to the ſpine of the petrous portion of the temporal bone behind; the middle part is formed by the body of the ſphenoidal bone; in its centre is a cavity, called ſella turcica, in which the pituitary glandule is lodged; this ſurrounded by four proceſſes, called clinoid, two anterior, two poſterior, the lateral parts are made by a pair of deep cavities, formed partly by the lateral proceſſes of the ſphenoidal bone and the internal parts of the temporal bones; in theſe lateral cavities, the middle lobes cerebri are lodged.

The poſterior region is large and more regular in its form, comprehending all the parts within the ſpine of the petrous portion of the temporal bone, and the internal tranſverſe occiptal ridge; the middle fore part is formed by the cuneiform proceſs of the os occipitis, behind which, is the foramen magnum occipitale; the back part is ſubdivided into two cavities, by the perpendicular ſpine of the os occipitis; in theſe cavities, the two lobes of the cerebellum are placed; on the anterior lateral part is a hole leading into the petrous portion of the temporal bone, called foramen auditivum, through it the auditory nerve paſſes. A little below, a foramen for the jugular vein and par vagum; in the middle, the foramen magnum occipitale for the ſpinal marrow and vertebral arteries; on the upper part, over the foramen magnum, is a pair of holes for the ninth pair of nerves.

The os frontis in its general ſhape reſembles a ſcollop ſhell, originally formed of two oſſifications; theſe commonly unite, and before the time of puberty, the ſuture is obliterated, it then making but one bone; in ſome inſtances, the ſuture remains open throughout life; the outer part pretty regularly rounded, has two projecting parts, where oſſification firſt began; the outer edge ſerrated, forming the coronal ſuture; the anterior middle part projects conſiderably, made irregular by the articulation of the oſſa naſi; on each ſide arched, forming the ſuperior orbiter ridges; the extreme parts of each orbiter ridges are articulated with the os malæ; the lateral part of the bone forming a portion of the temporal foſſa, articulated with the lateral proceſs of the ſphenoidal bone; beneath the orbiter ridges, a pair of broad proceſſes, which form the ſuperior parts of the orbits; between theſe proceſſes the ethmoidal bone is articulated; at the lower anterior part of the bone, the bony plates are at a diſtance from each other, forming a cavity, called frontal ſinus: the internal part, printed by the convolutions of the brain; in the middle line, divided into two lateral cavities by a proceſs, called ſpine of the os frontis; this, as it recedes from the fore part, is furrowed, and gives lodgment to the anterior portion of the longitudinal ſinus; to it, the falciform proceſs of the dura mater is attached.

The parietal bones are two in number, convex on the outer part, concave within; each bone of a quadrilateral figure, conſiſting of four ſides and four angles; the angles are diſtinguiſhed by anterior ſuperior, anterior inferior, poſterior ſuperior, and poſterior inferior: the anterior ſide, ſerrated, and articulated with the back part of the os frontis, forming one half of the coronal ſuture; the upper ſide, ſerrated, and articulated with its fellow, making the ſagittal ſuture; the poſterior ſide, articulated with one half of the occipital bone, making a part of the lambdoidal ſuture; the inferior ſide, near the anterior inferior angle, articulated with a ſmall part of the lateral proceſs of the ſphenoidal bone; the middle part, articulated with the ſquamoſe portion of the temporal bone, forming the ſquamoſe ſuture; the poſterior inferior angle, being articulated with the maſtoid proceſs of the temporal bone, forms the additamentum ſuturæ lambdoidalis; the internal part of the bone, furrowed in a diagonal line by the artery of the dury mater, the larger branches running from the anterior inferior, to the poſterior ſuperior angle; on the upper ſide, near the ſuperior poſterior angle, a ſmall hole, which admits an artery to paſs from the external parts to the dura mater. Os occipitis, a quadrilateral figure; the upper part is externally, ſmooth and regular, articulated with the two parietal bones, forming the lambdoidal ſuture; below, irregular, and printed by the inſertion of the extenſor-muſcles of the head; in it are the foramen magnum occipitale, the condyles of the os occipitis, and on the fore part the cuneiform proceſs; the lateral parts, articulated with the petrous portions of the temporal bones; the cuneiform proceſs, on the fort part, articulated with the back part of the body of the ſphenoidal bone; under each condyle, a hole for the paſſage of the ninth pair of nerves; on the back part of the condyles, a pair of holes which tranſmit veins; the internal part of the bone divided into four cavities, by a crucial ſpine; to the upper part of the perpendicular limb, is attached the poſterior portion of the falciform proceſs of the dura mater, being alſo furrowed by the longitudinal ſinus; the tranſverſe limb is oppoſite to the tranſverſe occipital ridge, and furrowed by the lateral ſinuſes; to this limb are attached the lateral proceſſes of the dura mater, forming the Tentorium cerebello ſuper expanſum; the inferior part of the perpendicular limb gives attachment to a proceſs of the dura mater, dividing the two lobes of the cerebellum; the internal part of the cuneiform proceſs, hollowed, and gives lodgment to the medulla oblongata.

Os temporis; one on each ſide; is divided into two parts, a ſuperior thin part, called the ſquamoſe portion; an inferior thick irregular one, called the petrous portion; the ſquamoſe portion has an oblique ſurface for articulation, with the lower ſide of the parietal bone, on the back part; and with the lateral proceſs of the ſphenoidal bone, on the fore part; the external ſurface of the ſquamoſe portion gives attachment to a part of the temporal muſcle, and forms the inferior poſterior part of the temporal foſſa; from the ſquamoſe portion ariſes a proceſs, called proceſſus zygomaticus, which, running forwards, is articulated with the os malæ; on the under part of the zygomatic proceſs, a glenoid cavity, into which the condyle of the lower jaw is received; on the fore part of this cavity, an eminence, called tuberoſity of the maxilla ſuperior. The petrous portion irregular, in it the organ of hearing is contained; the external poſterior part is articulated with the os occipitis; on the fore part of the maſtoid proceſs, is the meatus auditorius externus; on the under ſide, the vaginal proceſs, in which, the ſtiliform proceſs is placed; between the ſtiliform and maſtoid proceſſes, foramen ſtilomaſtoideum; before the ſtiliform proceſs, the ſpiral canal for the caroted artery; on the anterior point of the petrous portion, meatus auditorius internus; on the internal ſide, the ſquamoſe portion, marked by the convolutions of the brain; the petrous portion has a ſpine, to which the tranſverſe proceſs of the dura mater is attached, and below which, is the foramen auditivum.

Os Ethmoides, a four-ſided figure, placed between the orbiter proceſſes of the os frontis, dividing the two orbits from each other; the larger part of this bone enters into the compoſition of the noſe; the ſuperior part is perforated by a number of ſmall holes; hence called cribriform plate of the ethmoid; this is the only part of the bone ſeen in the baſis of the ſkull; the whole bone is ſub-divided into two lateral parts by a perpendicular plate, forming the upper portion of the ſeptum narium, and being continued through the cribriform plate, makes the criſta galli, to which the falciform proceſs of the dura mater is attached; on each ſide is a ſmooth bony plate, called os planum, forming the inner ſide of each orbit; between the os planum and the perpendicular plate, on either ſide, an irregular ſpungy bone is hung out, covered by Schnider's membrane, called os turbinatum ſuperius; between the os turbinatum ſuperius and os panum, is a number of ſmall cells, called cells of the ethmoid; theſe ſubdivided by very thin bony plates, called oſſa papyracea.

The os ſphenoides is placed in the baſis of the ſkull, like a wedge; on the anterior part, articulated with the orbiter proceſſes of the os frontis; laterally to the inferior anterior part of the os frontis, to the os malæ and os temporis; the middle anterior part to the cribriform plate of the os ethmoides; and the back part to the cuneiform proceſs of the os occipitis. In an internal view, may be divided into a body and two lateral proceſſes; the body is ſurrounded by four proceſſes, called clinoid, between which is the ſella turcica; in the lateral proceſſes are cavities giving lodgment to the middle lobes cerebri; under each anterior clinoid proceſs, foramen opticum; between the anterior clinoid and lateral proceſſes, foramina lacera orbitalia ſuperiora; behind theſe, foramina rotunda; a little further back, foramina ovalia; and in the poſterior points of the lateral proceſſes, the foramina ſpinoſa; in a front view, the lateral proceſſes form the external parts of the orbits; the body of the bone divided into two cavities, by a perpendicular plate; theſe are called ſphenoidal ſinuſes; below, the anterior parts of the pterygoid proceſſes; in a back view, the ſurface for articulation with the cuneiform proceſs of the os occipitis; on each ſide of the body is, foramen ſphenoptery goideum; at the lower part, and on the under ſide of the pterygoid proceſſes, are the alæ pterygoidæ, ariſing from the lateral parts of the bone; thoſe on the back part are ſubdivided into two proceſſes, called ala externa and ala interna, between which is the foſſa pterygoidea; on the ala interna is an unciform proceſs, round which the tendon of the circumflexus palati plays; the lateral parts complete the temporal foſſæ.

SECT. XIV.

ON THE BONES OF THE FACE.

THE Bones of the Face, beſides the lower jaw and teeth, are thirteen in number, viz. ſix pairs and one azygos. The Bones of the Face and Noſe, are united to thoſe of the ſkull by the tranſverſe ſuture.

BRITISH 18 MR 63 MUSEUM

Osteology — See System of Anatomy —

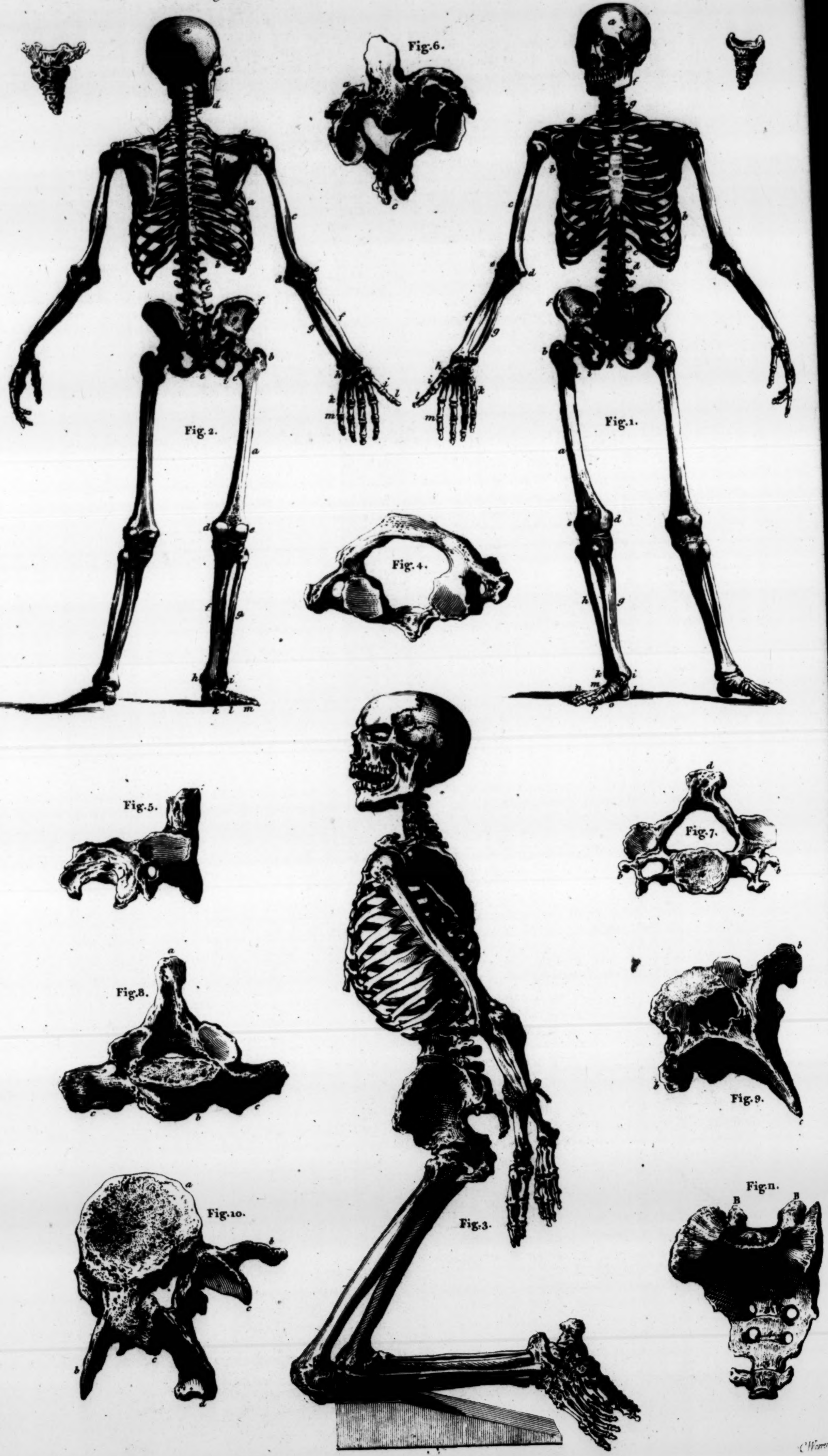
Fig.6.
Fig.2.
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The Oſſa Naſi are two in number, convex on the outer part, and hollowed within; at the upper part of the noſe they are articulated to the middle part of the os frontis by the tranſverſe ſuture; in the middle line of the Face, to each other by a proper ſuture; laterally, to the naſal proceſſes of the maxillary bones; and, at the lower part, to the cartilaginous part of the noſe; near the middle of each bone is generally a foramen, that admits of an artery to paſs through it.

The Os Malæ is of a four-ſided figure, having four ſides and four angles.

The ſuperior part is articulated with the outer part of the orbiter brim of the os frontis; poſteriorly, with the zygomatic proceſs of the temporal bone, forming the zygoma, anteriorly, with the outer part of the maxilla ſuperior, and forms the outer part of the orbit; between, the lateral proceſs of the ſphenoidal bone, and the orbiter proceſs of the maxilla ſuperior, is the foramen lacerum orbitale inferius; on the outer part of the bone is a ſmall hole, which admits of an artery and vein to enter, and of a nerve to come from the orbit.

The Os Maxillare Superius, is a bone of an irregular figure on the outer ſide, a little hollowed on the fore part, to which muſcles are attached.

On the back part it is rounded, forming the tuberoſity of the upper jaw; above is a ſurface for articulation with the os malæ, on the fore part of which is the foramen orbitale externum inferius; the upper part is drawn out into two proceſſes; the anterior, called naſal, is at its upper part articulated by the tranſverſe ſuture to the os frontis; on the inſide it is grooved, forming the ductus ad naſum; the poſterior proceſs, called orbiter, is ſmooth, and forms the lower part of the orbit; the internal part of the body of the bone is hollow, forming the Antrum Highmorianum: on the inſide irregular, forming a part of the noſe; it has an horizontal proceſs, called palatine, by which it is articulated with its fellow; this proceſs forms the anterior part of the roof of the mouth; behind the palatine proceſs is a ſurface for articulation with the os palati; on the under part are the alveoli, in which the teeth are placed.

The Os Unguis is of a four-ſided figure, extremely thin; it is grooved on the fore part to give lodgment to a part of the ſaccius lacrymalis; is articulated above with the arbiter proceſs of the os frontis; behind, with the os planum; below, with the orbiter proceſs of the maxilla ſuperior; and before, with the naſal proceſs of the maxillary bone.

The Os Palati, a bone of an irregular figure, has a proceſs which forms the back part of the palate: it is articulated with the palatine proceſs of the maxilla ſuperior on the fore part, and to its fellow on the oppoſite ſide, and has a proceſs articulated to the poſterior part of the upper jaw; behind is articulated to the fore part of the pterygoid proceſs of the ſphenoidal bone; a ſmall portion of this bone comes into the orbit; between the pterygoid proceſs, and the inferior proceſs of this bone, is a hole, called foramen ſphenopalatinum, and, in the palatine proceſs, the foramen palatinum.

The Os Turbinatum Inferius, is an irregular ſpungy bone hung out in the cavity of the noſe, covered by Schneider's membrane, articulated to the internal part of the maxillary bone; under it is the opening of the ductus ad naſum.

The Vomer forms the poſterior part of the ſeptum narium; behind it is articulated with the middle lower part of the body of the ſphenoidal bone; before, with the perpendicular plate of the ethmoid; beneath, with the palatine proceſſes of the maxillary bone, and with the oſſa palati.

The Lower Jaw, in its general figure like the conſonant V, originally formed of two oſſifications, united on the fore part, and called ſymphiſes, is every where printed by the attachment of muſcles; the under part is called baſis; from it ariſes, at right angles, a broad proceſs for articulation; the poſterior part of the baſis is called the angle; the proceſs of the jaw is ſubdivided into two leſſer proceſſes; the poſterior one is formed into a condyle for articulation with the glenoid cavity of the temporal bone; the other drawn into a thin ſpine, called coronoid; on the upper part are the alveolar proceſſes, in which the teeth are placed; on the internal part of the proceſs of the jaw, is a hole which admits of an artery, vein and nerve, to ſupply the parts of the jaw and teeth; this canal opens on the fore part, near the ſymphiſis.

The Teeth, in the adult ſubject, are thirty-two in number; ſixteen in each jaw. Theſe being in pairs, in order to underſtand them, we need only examine one ſide of the jaw. Teeth are are divided into the following claſſes: the two anterior are called inciſores; the third, cuſpidatus; the fourth and fifth, bicuſpides; and the three laſt, molares. Each tooth is divided into baſis, body, neck and phang: each tooth has a cavity, correſponding with its general figure; the cavity lined with a vaſcular membrane, on which the nerves of the teeth are ſpread out.

The firſt ſet generally make their appearance about the 6th month, are twenty in number, and begin to fall about the 6th or 7th year.

The Plate of DISEASED SCULLS having been referred to ANATOMY, but coming with greater Propriety under SURGERY, the Reader will find an Explanation of the Plate in that Syſtem.

Explanation to the PLATE *of* OSTEOLOGY.

FIGURE I.

A front View of the Human Skeleton, with ſome of the Ligaments and Cartilages, which connect the Bones to each other.

HEAD AND NECK.

a, Os frontis. *b*, Os parietale. Between *a* and *b*, part of the coronal ſuture.

c, The pars ſquamoſa of the temporal bone. Between *b* and *c* the ſquamous ſuture. Below the pars ſquamoſa, the zygoma; and lower down, above *f*, the maſtoid proceſs. Between the pars ſquamoſa and the cavity, which contains the eye-ball, called orbit, the temporal proceſs of the ſphenoid bone is ſeen.

d, Os malae. Above *d*, a portion of the tranſverſe ſuture.

e, Os maxillare ſuperius, with the eight teeth of the right ſide. The naſal proceſs of ſuperior maxillary bone has the os naſi, joined by the lateral naſal ſuture, to its inſide, and at the outſide, within the orbit, the os unguis. The oſſa naſi joined to each other before, by the anterior naſal ſuture.

f, Os maxillare inferius with ſixteen teeth; the four anterior named inciſores, the two corner ones canini, and the five poſterior on each ſide, molares. Oppoſite to *f*, the angle of the lower jaw, above *f*, the condyloid proceſs, by which the jaw is connected to the temporal bone, at the root of the zygoma; and behind the os malae, the coronoid proceſs.

g, The ſeven cervical vertebræ, with their intermediate cartilages. Oppoſite to *g*, their tranſverſe proceſſes.

TRUNK.

a, Sternum. *a*, Its middle piece, to which one half of the cartilage that connects the ſecond rib, the whole of the cartilages of the third, fourth, fifth, ſixth, and one half of the ſeventh, are fixed. Above *a*, the firſt or upper triangular piece, to which the clavicle, and one half of the cartilage that connects the ſecond rib, are fixed. Below *a*, the extremity, or third piece of the ſternum, named cartilago enſiformis, to which one half of the cartilage that connects the ſeventh rib, is fixed.

b, The ſeventh, or laſt true rib.

c, The twelfth, or laſt of the five falſe ribs.

d, The five lumbar vertebræ, with their intermediate cartilages. Oppoſite to *d*, their tranſverſe proceſſes.

e, The os ſacrum, with its five diviſions.

f, Os innominatum, divided into, *g*, Os ilium. *h*, Os pubis.

i, Os iſchium. Oppoſite to *i*, the foramen thyroideum.

SUPERIOR EXTREMITY.

a, The clavicle fixed before, to the firſt piece of the ſternum, and outwards to the acromion of the ſcapula.

b, The ſcapula. Above *b*, the cervix of the ſcapula. Oppoſite to it, the inferior coſta; and below the outward extremity of the clavicle, the ſuperior coſta, and coracoid proceſs, are ſeen.

c, The os humeri. The upper end of it, which is connected to the cavity of the ſcapula, named glenoid, below the acromion, is named its head or ball; on each ſide of which is ſeen a tubercle, named external and internal, and between theſe, a groove for lodging the long head of the biceps flexor cubiti.

d, The internal condyle.

e, The external condyle. Between *d* and *e*, the trochlea, upon which the ulna moves.

f, The radius. The upper end, which moves on the external condyle of the os humeri, is named its head; below that, the tubercle for the inſertion of the biceps flexor cubiti, and between theſe the cervix. The inferior end of it is connected to the carpus.

g, Ulna. The upper end of it forms the coronoid proceſs, for the inſertion of the brachialis muſcle. The inferior end has a proceſs, named ſtyloid, which is connected to the carpus by a ligament.

h, The carpus, formed of eight bones.

i, The metacarpal bone of the thumb.

k, The metacarpal bones of the four fingers.

l, The two joints of the thumb.

m, The three joints or phalanges of the fore-finger; and the ſame are ſeen in each of the other three.

INFERIOR EXTREMITY.

a, The os femoris. The upper end of it is named its head or ball, which is lodged in a deep ſocket of the os innominatu, named acetabulum. Between the head and trochanter major, the cervix.

b, Trochanter major. *c*, Trochanter minor.

d, Internal condyle. *e*, External condyle.

f, Patella. The place where it moves upon the os femoris, is named trochlea.

g, Tibia. Between the tibia and the condyles of the os femoris, the ſemilunar cartilages are ſeen; and below the joint, the tubercle of the tibia.

h, Fibula. *i*, Malleolus internus. *k*, Malleolus externus.

l, Os calcis. Between *l* and *m*, the other ſix bones of the tarſus.

m, The metatarſal bones of the four toes.

n, The three joints, or phalanges of the four toes.

o, The metatarſal bone of the toe.

p, The two joints of the great toe.

FIGURE II.

A Back View of the Human Skeleton, with ſome of the Ligaments and Cartilages which connect the Bones.

HEAD AND NECK.

a, Os parietale, joined to its fellow by the ſagittal ſuture.

b, The os occipitis, joined to the parietal bones by the lamdoid ſuture, which is between *a* and *b*. *c*, Os malae.

d, Maxilla inferior, with a view of the teeth of both jaws from behind. *e*, The ſeven cervical vertebræ.

TRUNK.

a, The ſeventh, or laſt true rib. *b*, The twelfth, or laſt rib.

c, The five lumbar vertebræ. *d*, Os ſacrum. *e*, Os Cocygis.

f, Os innominatum, divided into, *g*, Os ilium.

h, Os pubis. *i*, Os iſchium.

SUPERIOR EXTREMITY.

a, The clavicle, joined outwards to the acromion of the ſcapula.

b, The ſcapula. *c*, Os humeri. *d*, Internal condyle.

e, External condyle. *f*, Radius. *g*, Ulna, its upper end, named Olecranon; and near the wriſt, its ſtyloid proceſs.

h, The eight bones of the carpus.

i, The metatarſal bone of the thumb.

k, The metatarſal bones of the four fingers.

l, The two joints of the thumb.

m, The three joints, or phalanges of the four fingers.

INFERIOR EXTREMITY.

a, Os femoris. *b*, Trochanter major, and at the inſide of it, the cervix. *c*, Trochanter minor. *d*, Internal condyle.

e, External condyle. *f*, Tibia. *g*, Fibula.

h, Malleolus internus. *i*, Malleolus externus.

k, The ſeven bones of the tarſus. *l*, The metatarſus.

m, The joints or phalanges of the toes.

FIGURE III.

Is a Skeleton of an adult put into this poſture to ſhew it in a greater ſcale. I thought better not to figure it, the bones being explained in *fig*. 1, and 2, the deſign of this figure being to ſhew the ſkeleton, without being defaced with references.

FIGURE IV.

The under ſide of the firſt vertebra of the neck.

FIGURE V.

A ſide view of the ſecond vertebra.

FIGURE VI.

a, The proceſſus dentatus of the ſecond vertebra.

b, The under ſide of the oblique proceſs.

c, The ſpinal proceſs.

FIGURE VII.

a, The under ſide of the body of the ſeventh vertebra of the neck. *b*, The tranſverſe proceſſes. *c*, The oblique proceſſes.

d, The ſpinal proceſs.

FIGURE VIII.

a, The ſpinal proceſs of the ſecond vertebra of the back.

b, The under and fore ſide of the body of the vertebra.

c, The tranſverſe proceſſes.

FIGURE IX.

a, The upper oblique proceſſes of the third vertebra of the back.

b, The tranſverſe proceſſes. *c*, The ſpinal proceſs.

FIGURE X.

a, The body of the third vertebra of the loins.

b, The tranſverſe proceſſes.

c, The upper oblique proceſſes.

d, The ſpinal proceſs.

FIGURE XI.

The foreſide of the os ſacrum.

1, 2, 3, 4, 5, 6, are parts of the os ſacrum, which, in young ſubjects, are diſtinct bones.

A, Part of the os ſacrum, which articulate with the ſpongy body of the loweſt vertebra of the loins.

B, B, Two proceſſes of the os ſacrum, which articulate with the inferior oblique proceſs of the laſt vertebra of the loins.

C C, The channel through which the medulla ſpinalis paſſes,

PART III.

ON MYOLOGY.

MUSCLES are generally oblong, going from one bone to another. And each extremity has tendinous fibres, which commonly run in the direction of the muſcle, but are ſometimes reverſed. Tendons are to muſcles, what ligaments are to bone; but ſome muſcles are without tendons. The tendinous fibre, is not a continuation of the muſcular fibre. The uſe of tendons, are to connect muſcle to bone, tendons are made ſmall to render the limbs more active, and to throw the weight of the muſcles nearer to the trunk. Muſcles have the following attachments: 1ſt. To bone, often penetrating the ſubſtance. 2dly, To periosteum. 3dly, To cartilage, as thoſe of the ribs. 4thly, To perichondrium, as thoſe of the external ear. 5thly, To ligaments. 6thly, To membranes, as thoſe of the eye. 7thly, To tendons, as the lumbricales. 8thly, To fleſh, as the tongue, uvula, &c. 9thly, To ſkin, as the muſcles of the face, &c.

Muſcles are divided into different kinds, as oblong, hollow, and mixed; the oblong are ſubdivided into different claſſes, rectilinear, having its fibres running in right lines. Half Penniform, its fibres running as the feathers of a quill on one ſide of the barrel. Complete Penniform; having its fibres diſpoſed as the feathers are on both ſides the barrel of a quill: and radiated; the direction of whoſe fibres is from a centre to a circumference. Hollow muſcles are thoſe ſurrounding cavities, having their fibres of different lengths, and in different directions, as the heart, inteſtines, &c. Mixed muſcles, ſuch as partly ſurround cavities, as thoſe of the abdomen. Every muſcle is divided into head, belly, and tail, ſo named from drawing a compariſon with the mouſe. Theſe muſcles, beſides tendons, have appendages, 1ſt, faſciæ, which are broad tendinous expanſions, or, aponeuroſes, to keep parts in their ſituation. 2dly, Thecæ, annular, or, tranſverſe ligaments, to keep tendons from ſtarting. 3dly, Trochleæ, to alter the direction of tendons. 4thly, Burſæ tendinibus ſubjectæ, or ſacculi mucoſi, where tendons or ligaments play over bones: they contain ſynovia, and prevent abraſion.

SECT. I.

ON THE MUSCLES OF THE ABDOMEN.

AFTER having removed the common integuments from the fore part of the abdomen, the muſcles of the belly appear: the anterior part of the parietes is covered by a broad thin tendinous expanſion, marked in different parts by lines, which are diſtinguiſhed by the following names: in the middle line of the body, extending from the xyphoid cartilage to the ſymphiſes pubis, is a white line, called linea alba, its breadth increaſes from the xyphoid cartilage to the umbilicus, then decreaſes to the pubes; on each ſide is a curved line, called linea ſemilunaris; between the cartilaginous margin of the cheſt on the fore part and the navel, are three or four tranſverſe lines, called lineæ tranſverſæ, the abdominal muſcles are five pairs in number, and ariſe in the following order:

NAME.	ORIGIN.	INSERTION.	USE.
OBLIQUUS DESCENDENS, *vel* **OBLIQUUS EXTERNUS**	By ſlips from the eight inferior ribs, about two inches from the cartilaginous margin of the cheſt; the four ſuperior making digitations with the *ſerratus major anticus*; the four inferior with the *latiſſimus dorſi*.	Inſerted into the whole length of the linea alba on the fore part, below fleſhy, to the outer labrum of the ſpine of the illium, as far as the anterior ſuperior ſpinous proceſs; from the ſuperior ſpinous proceſs to the os pubis, tendinous, which is continued into the faſcia of the thigh; this, called pouparts ligament, is perforated making the ring of the abdominal muſcle, for the paſſage of the ſpermatic cord in the male, and round ligaments in the female.	To compreſs the abdomen in expiration; aſſiſts in the expulſion of the urine, fæces, and fœtus; when both act, the body is bended forwards; when one acts unaſſiſted by other muſcles, the body is turned to a ſide.

NAME.	ORIGIN.	INSERTION.	USE.
Obliquus ascendens, *vel* obliquus internus.	Tendinous from the faſcia lumborum, from the middle part of the ſpine of the ilium, from the anterior part of the ilium and os pubis.	Is inſerted into the cartilaginous margin of the thorax, and into the whole length of the linea alba.	In its action ſimilar to the former; the fibres decuſſating, ſtrengthen the parietes
Transversalis abdominis.	By a broad thin tendon, from the tranſverſe proceſſes of the vertebræ lumborum, fleſhy from the inner margin of the ſpine of the ilium, from the internal part of the cartilaginous margin of the cheſt, making digitations with the diaphragm.	Is fixed by a broad tendon into the whole length of the linea alba; its tendon paſſes behind and before the rectus, & forms a ſheath.	Compreſſes the lateral parts of the abdomen in reſpiration.
Rectus abdominis.	By a thick ſhort tendon from the ſuperior anterior part of the os pubis, is divided into three or four diſtinct muſcles by the *lineæ tranſverſæ.*	Is inſerted into the cartilages of the 5th, 6th, and 7th ribs, near the ſternum.	It compreſſes the anterior part of the abdomen, bends the trunk, and raiſes the pelvis towards the trunk.
Pyramidalis.	Fleſhy from the anterior middle part of the os pubis.	Is inſerted into the linea alba, a little below the umbilicus	Compreſſes the bladder, & the lower part of the cavity of the abdomen.

SECT. II.

ON THE MALE ORGANS OF GENERATION.

THE Male organs are divided into the internal and external parts, all contained within the pelvis, internal; all without, external: in order to underſtand them, they muſt be traced in the courſe of the ſecretion of ſemen, &c. The teſticles, though lodged in the ſcrotum, receive their blood-veſſels from the aorta. The blood-veſſels going to the teſticles, called ſpermatic; each teſticle receives an artery, that ariſes from the fore part of the aorto, immediately below the emulgents. The veins accompany the arteries, that on the right ſide opening into the fore part of the cava inferior, near the emulgent vein; that on the left, opening into the emulgent vein on the ſame ſide. The nerves come from the par vagum and intercoſtal, and attend the arteries.

The Spermatic chord conſiſts of the following parts: the ſpermatic artery and vein, nerves, lymphatic veſſels, and the vas deferens, or excretory duct; theſe are united by reticular ſubſtance, and have a common covering, called tunica vaginalis communis: this is formed by an expanſion of the tendon of the external oblique, cremaſter muſcle, and the ligamentous remains of a proceſs of the peritonæum. Tunica vaginalis teſtis, inveſts the external part of the teſticle.

Tunica vaginalis propria teſtis, is a complete bag or reflected membrane, immediately inveſting the body of the teſtis; in it the water collected in the hydrycele is contained. The teſticle is divided into two parts; the larger anterior rounded part called body; on the back part, an oblong proceſs, called epididymis; theſe are covered with tunica albuginea. The outer part of the tunica albuginea, formed by the inner portion of the tunica vaginalis propria teſtis. The internal part of the teſticle conſiſts of a congeries of tubes, extremely convoluted; theſe are interſected by ſmall ligamentous chords, which paſs from one ſide of the tunica albuginea to the other.

The tubes of the teſticle unite at the upper part, and form the rete teſtis; the tubes uniting form about thirteen larger tubes, called vaſa afferentia; theſe run on, to form the upper part of the epididymis. The epididymis is one long convoluted tube, made by the union of the vaſa afferentia; this becoming larger at the extreme or lower part, makes the vas deferens, which being continued on, forms a part of the ſpermatic chord. The blood veſſels of the teſtes run convoluted, or in a ſerpentine direction; hence they have been called vaſa pyramidalia. The extreme branches of the ſpermatic veſſels ramify on the tubes of the teſtis, into which the ſemen is ſecreted.

The teſticles, in the early period of life, are ſituated behind the peritonæum, in the cavity of the abdomen, near the kidnies; they generally deſcend about the ſeventh month, but frequently later, and ſometimes not till the time of puberty; in ſome inſtances, they have remained in the cavity of the abdomen throughout life.

The teſticles deſcend in the following manner: from the lower part of each teſticle, going to be inſerted into the ſcrotum, is a ligamentous ſubſtance, called the gubernaculum; the teſticle, gradually deſcending, takes with it a proceſs of the peritonæum; in its paſſage through the ring of the external oblique, it receives a tendinous expanſion from that muſcle, which, with the cremaſter, forms the tunica vaginalis communis; immediatel after the deſcent of the teſticle, is a vaginal ſheath, leading from the cavity of the abdomen to the body of the teſtis; the gut protruding immediately after the deſcent of the teſtis, forms the hernia congenita, the teſtis and gut being in contact.

Shortly after the deſcent of the teſtis, the peritonæal proceſs, at its upper part, becomes obliterated; the lower part, remaining open, forms the tunica vaginalis, propria teſtis.

SECT. III.

SCROTIUM.

THE Scrotium is a purſe or bag formed for the reception of the teſtes; externally, is formed of common integuments; internally, of a bed of looſe reticular ſubſtance, in which the teſtes are lodged; it is divided into two ſides by a ſeptum; on the outer part, has a raphe. The dartos muſcle cannot be demonſtrated.

SECT. IV.

PENIS.

THE Penis conſiſts of three ſpungy bodies, viz. two corpora cavernoſa, and one corpus ſpongioſum urethræ. The two cavernoſe bodies are covered by a ſtrong inelaſtic ligamentous membrane, and are united to each other from the anterior part, two thirds of their whole length; at their poſterior part, they diverge, and form the cruræ penis; theſe are attached to the bones of the pubis; between the two corpora cavernoſa, is the pecten; their internal parts interſected by ſmall ligamentous fibres. The corpus ſpongioſum urethræ has the urethra paſſing through it, and begins from the membranous part of the urethra; at that part it is enlarged, forming the bulbous part of the urethra; is continued on the under part of the corpora cavernoſa, and at the end of theſe, is enlarged, covering their extremities, and forming, what has by ſome been called, the corpus quartum or glans penis; it has a more delicate ligamentous covering than the corpora cavernoſa. The corpora cavernoſa and corpus ſpongioſum are united by condenſe reticular ſubſtance; their internal texture are nearly the ſame; and theſe are covered by the common integuments, but have no fat. The arteriæ pudicæ enter the crurœ penis, and ſome branches paſs into the corpus ſpongioſum urethræ, and ramify to all parts; a ſmall part runs in dorſo penis, ſupplying the integuments with blood; this blood is returned by two veins; one lying in dorſo penis, in the ſpace between the two corpora cavernoſa, and returns the blood from the centre of the penis, which is carried to it for the purpoſe of erection; this is called vena magna ipſius penis; the other, ſuperficial, returns the blood from the integuments, and is called vena tegmentorum. The glans penis is covered by a folding of the ſkin, called præputium; this, at its lower part, is attached to the under ſide of the glans, takes the name of the frænum. The following muſcles, are ſituated about the penis and anus.

NAME.	ORIGIN.	INSERTION.	USE.
Erector penis *ſeu* iſchio-cavernoſus.	From the branch of the iſchium and pubis.	Into the crus penis by a broad tendon, ſpread over it as far as the ſymphyſis pubis.	Does not erect the penis, but gives to it greater turgeſcency in erection.
Accelerator urinæ *ſeu* ejaculator ſeminis.	From the internal part of the branch of the os pubis, and from the ligamentous part of the crus penis.	Meets with its fellow from the oppoſite ſide, and uniting with it in a common tendon, the two form a complete penniform muſcle, covering the whole bulb of the urethra.	Expels the laſt drops of the urine, and aſſiſts in the ejection of the ſemen.
Transversalis perinæi.	From the inſide of the tuberoſity of the iſchium.	Into the corpus ſpongioſum, near the bulb.	Dilates the bulb, for the reception of the ſemen.
Sphincter ani.	Surrounds the lower part of the gut, and is ſpread under the ſkin, about an inch from the verge of the anus.	Its fibres, being circular, terminate in each other.	Conſtricts the anus and prevents the involuntary diſcharge of the fæces.

NAME.	ORIGIN.	INSERTION.	USE.
Levator ani.	Ariſes from the internal part of the pelvis, a little below its bony brim.	Is a broad muſcle, and inſerted into the lower ſide of the rectum.	Prevents an inverſion of the rectum in the excluſion of the fæces.
Cremastor.	From the internal oblique, near the junction of the ilium and pubis over which it paſſes along with the ſpermatic cord.	Into the ſunica vaginalis teſtis.	To draw up the teſticle and compreſs it in coition.

SECT. V.

A SIDE VIEW OF THE CONTENTS OF THE PELVIS.

THE contents of the pelvis in the male, are the bladder on the anterior part; that ſide only, which is next to the cavity of the abdomen, covered by peritonæum; on the poſterior part, following the ſweep of the ſacrum, is the rectum; at the under part of the bladder, between it and the rectum, veſiculæ ſeminales; between theſe, ſurrounding the neck of the bladder, is the proſtrate gland; behind the peritonæum, are the ureters, bringing the urine from the kidneys to the bladder; and the vaſa deferentia, conveying the ſemen from the teſticles to the veſiculæ ſeminales.

SECT. VI.

VESICULÆ SEMINALES.

WHEN cut through tranſverſely, exhibit the appearance of cells; but when carefully unravelled, are found to conſiſt of one tortuous tube; the internal ſurface is villous and extremely vaſcular. The vas deferens enter the ring of the abdominal muſcle, and when in the cavity of the abdomen, ſeparates from the blood veſſels, and paſſing over the brim of the pelvis, gets to the under part of the bladder, and opens into the duct of the Veſiculæ Seminalis; Veſiculæ Seminales attached to the bladder by reticular ſubſtance.

SECT. VII.

BLADDER.

THE Bladder receives a partial covering from the peritonæum; has a coat conſiſting of muſcular fibres, called Detruſor urinæ; this coat may be divided into two layers, one external, conſiſting of fibres running from the neck towards the fundus of the bladder; and the other of circular fibres, inveſting it tranſverſely; the internal part is lined by a thin denſe membrane to prevent tranſudation; is vaſcular, but not villous, and this membrane has a mucus ſecreted on it. When the penis is cut through on the back part, and the urethra and bladder laid open, the following parts appear: the recipient orifices made by the openings of the urethers, and the expellent orifice; theſe form nearly an equilateral triangle. The neck of the bladder, in the human ſubject, is an imaginary line. From the expellent orifice of the bladder to the bulb of the urethra, is called membranous part of the urethra; the upper portion is inveſted by the proſtrate gland; on the back part is a ridge, called Caput Gallinaginis, in the middle of which, is a blind hole, called foramen cœcum; on each ſide of which are the openings of the ſeminal ducts, called oculi gallinaginis; the internal part of the bladder ſeems continued on, to form the internal membrane of the urethra. The whole length of the urethra is ſtudded with glands, that have long excretory ducts, called lacunæ; one of theſe ſituated about half an inch within the meatus urinarius, at the upper part of the paſſage, is large, and called lacuna magna. The mucus, for the lubrication of the urethra, is ſecreted by theſe glands.

SECT. VIII.

PROSTATE GLAND.

THE Proſtate Gland is of a triangular figure, nearly repreſenting the form of a heart, as painted on cards; it is extremely vaſcular; and ſecretes a brown fluid, that is poured into the upper part of the urethra, which mixes with the ſemen at the time of coition.

Explanation to the PLATE *on* THE MALE ORGANS OF GENERATION.

FIGURE I.

A poſterior View of the Male Organs.

A, The under ſurface of the bladder, or that ſide of it which comes in iumediate contact with the rectum; the letter A is placed on what is called the fundus of the bladder. B B, The two ureters. C C, Vas deferens. D D, Veſiculæ ſeminales. E, Proſtrate glands. F F, Cowper's glands. They are two ſmall glands, each of them nearly the ſize of the common pea, lately diſcovered by Dr. Cowper.

G G, Acceleratores muſcle; the bulb of the urethra underneath them is the cauſe of their ſhape in the print.

H, The urethra, or common paſſage for the urine and the ſemen.

I I, Muſculi erectores penis.

K K, The corpora cavernoſa penis.

L, Glans penis; juſt above the letter L was the inſertion of the frœnum, or bridle of the penis, but unavoidably was cut away with the ſkin that covered it.

FIGURE II.

An anterior View from the ſame Sabject, with the Bladder and Urinary Canal laid open.

A, The upper ſurface of the bladder, or that ſide of it which comes in contact with the ſmall inteſtines.

B, The internal coat of the bladder, or the inner ſurface where the urine is contained.

C, C, Two orifices of the ureters by which the urine comes from the kidney into the bladder.

D, D, The ureters. E, E, Vaſa deferentia.

F, F, Portions of the veſiculæ ſeminales ſeen.

G G, Proſtrate gland.

H, H, The two cut edges of the urethra.

I I, Roſtrum or caput gallinaginus.

K, K, Two orifices through which the ſemen paſſes at the time of the coctus, from the veſiculæ ſeminales; round theſe two orifices is a circle of excretory ducts, perceptible to the naked eye, which belong to a like number of glands, the whole of the urethra being filled with them, but not apparent enough to be repreſented iu the print.

L, L, L, Lacunæ of the urethra, or oblong holes leading to capillary blood veſſels.

M, Orifice of the urethra.

FIGURE III.

A View of the Proſtrate Gland, Veſiculæ Seminales, Bladder, and Rectum in Situ.

A, Oſſa pubis. B, Symphyſes pubes.

C, Ramus of the os iſchium.

D, D, The two cut edges of the urethra; it being divided to ſhew the paſſage of the ſeminal ducts into it.

E, Caput gallinaginus.

F, F, Occuli gallinaginus, or the two orifices of the veſiculæ ſeminales.

G, G, The proſtrate gland divided to ſhow the ducts of the veſiculæ ſeminales.

H, H, Veſiculæ ſeminales. I, I, Vaſa deferentia.

K, The ſame veſſel going round the poſterior ſurface of the bladder, and coming over the brim of the pelves to go down to the teſticle.

L, L, L, The bladder. M, M, The rectum.

FIGURE IV.

A View of the teſticle, with its coats; in this Preparation there is little or no diſſection, but as it is pulled out of the ſcrotum or purſe.

A, The ſpermatic chord.

B, Tunica vaginalis, the coat which covers this and the teſticle.

C, The cremaſter muſcle.

FIGURE V.

The Spermatic Chord injected, and the Coverings removed; we now diſcover in the Chord four Sets of Veſſels; viz. The Vas Deferens, the Arteries, the Veins and Abſorbents; alſo the Nerve; all of them going and coming from the Teſticle.

A A, The ſpermatic plexus. B, Vas deferens.

C, Epididymis. D, Convolutions of the epididymis.

E, The body of the teſticle, covered by the tunica albuginea, with a few of its blood veſſels indiſtinctly ſeen.

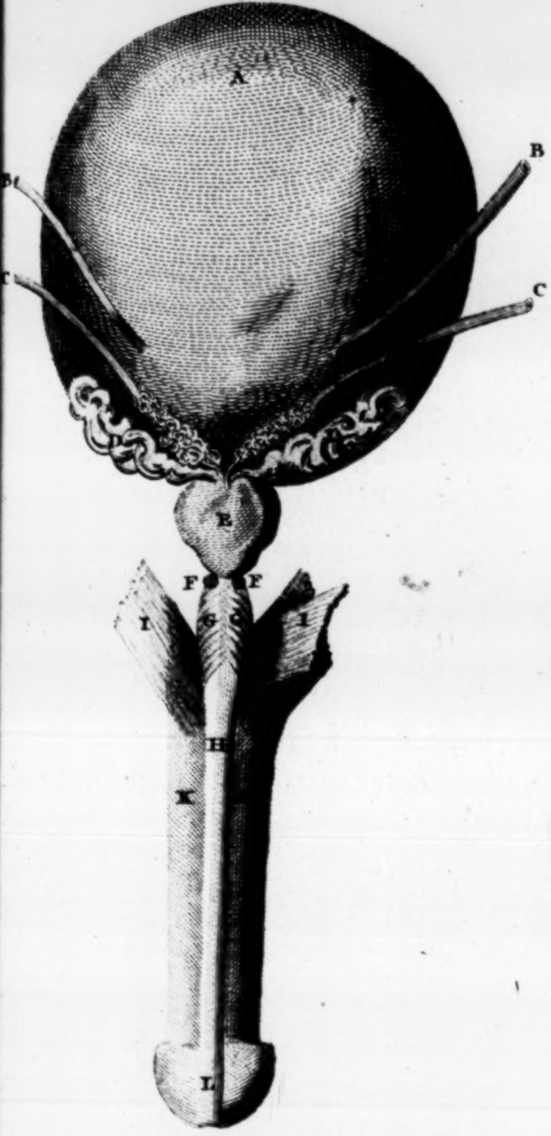
SECT. IX.

MUSCLES OF THE HEAD, FACE, &c.

NAME.	ORIGIN.	INSERTION.	USE.
Corrugator superciliі.	From the lower middle part of the os frontis, from the oſſa naſi, and naſal proceſs of the maxillary bone.	Paſſing obliquely upwards, and outwards is inſerted into the ſkin of the forehead, above the eyebrow.	Brings the ſkin of the forehead towards the noſe, as in frowning.

Male Organs of Generation; See System of Anatomy, Part 3 Sect 8.

Fig.1.


A
B
C
B
C
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F
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G
I
I
H
K
L

Fig.4.

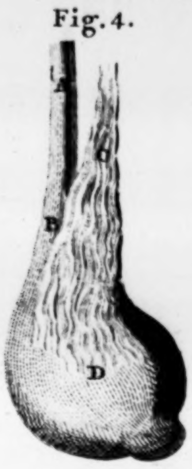

Fig.5.

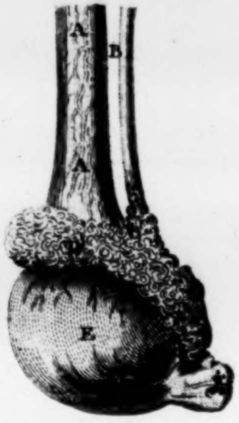

Fig.2.

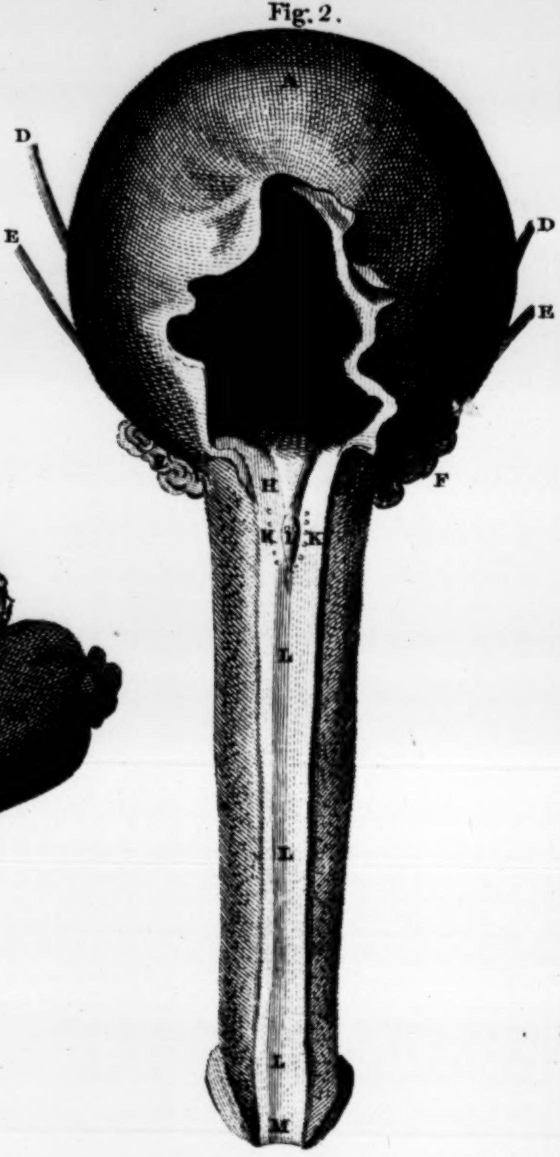
A
D
E
D
E
F
H
K
K
L
L
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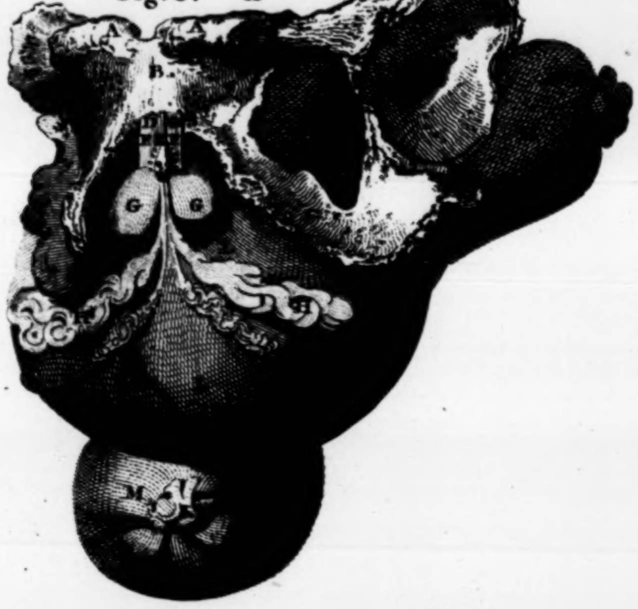
Fig.3.



Female Organs of Generation Part 5 Sect 21.

Fig.1.

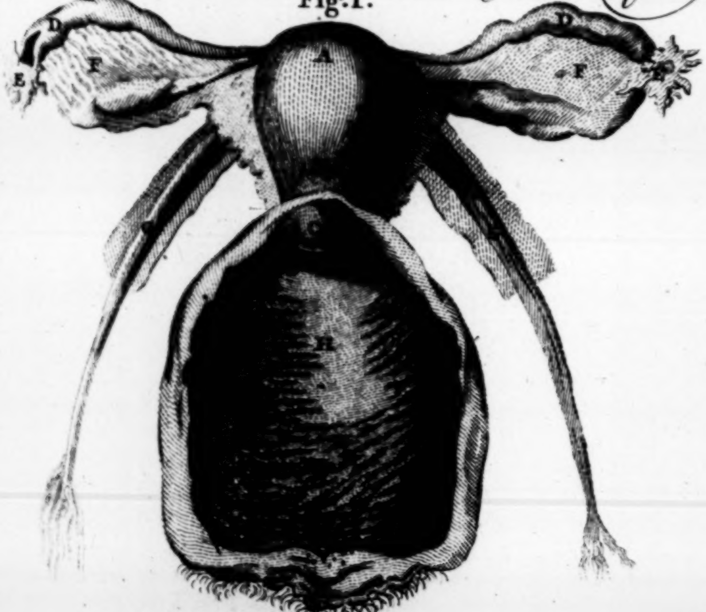


Fig.3.

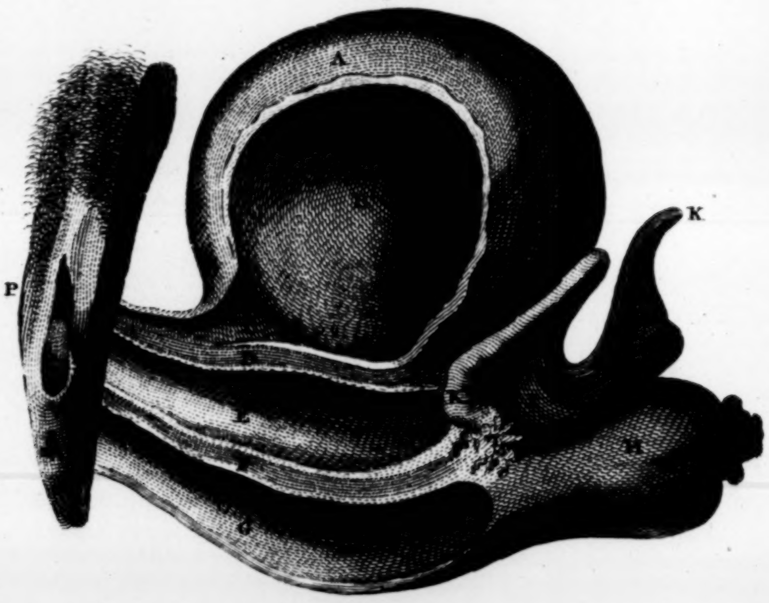


Fig.2.

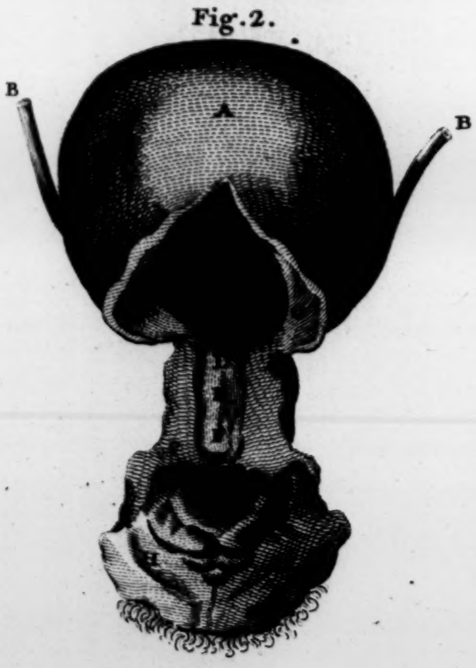


Fig.5.

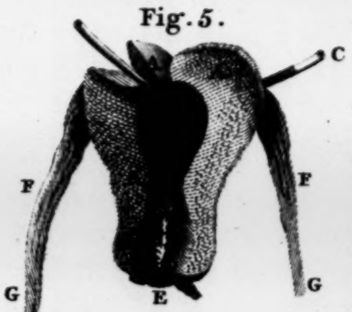
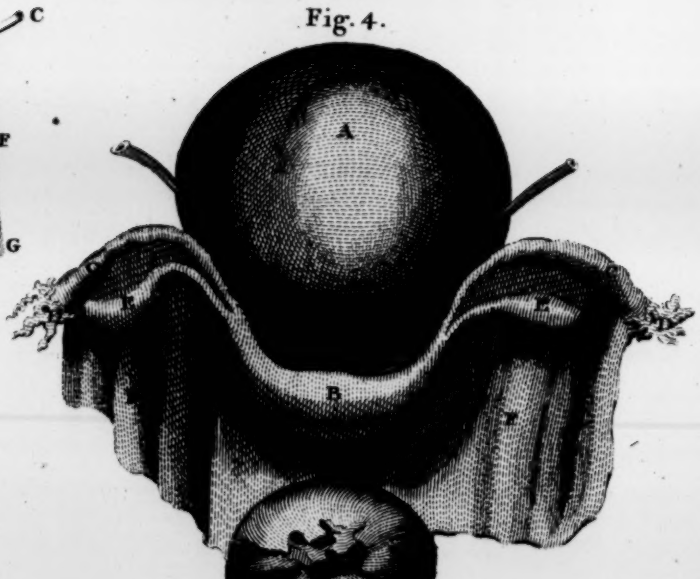


Fig.4.



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NAME.	ORIGIN.	INSERTION.	USE.
OCCIPITO FRONTALIS.	The frontal portion from the inferior part of the os frontis and ſuperior orbiter proceſs; the occipital portion from the tranſverſe occipital ridge.	Each portion forming a broad thin tendon, unite at the upper part of the head, this tendon joining with its fellow below on the oppoſite ſide, forms a tendinous expanſion, covering the upper part of the ſcull.	Corrugates the ſkin of the ſcalp and forehead.
APERIENS PALPEBRAM	The lower part of the orbit, near the foramen opticum.	The cartilage of the upper eye-lid.	Raiſes the upper eye-lid, and opens the eye.
ORBICULARIS PALPEBRARUM, *ſive Sphincter Oculi*	By a ſmall round tendon from the internal part of the os naſi, and naſal proceſs of the maxillary bone.	Spread out under the ſkin of the eye-lids, covering the upper part of the cheek.	By raiſing the lower eye-lid, and depreſſing the upper one, cloſes the eye.
RINÆUS *Naſalis ſeu Rectus Naſi.*	The upper part of the os naſi, and naſal proceſs of the maxillary bone.	The cartilaginous part of the noſe.	By drawing the ala naſi outwards, dilates the noſe.
ZYGOMATICUS, *ſive Diſtortor Anguli Oris.*	The Zygoma.	The angle of the lips.	Raiſes the angle of the mouth.
ELEVATOR LABIORUM COMMUNIS.	The outer part of the maxilla ſuperior	The angle of the mouth.	Raiſes the lip.
ELEVATOR LABII SUPERIORIS PROPRIUS ALÆQUE NASI.	Is a broad muſcle, ariſing from that part of the maxilla ſuperior, below the orbit.	The upper lip and ala naſi.	Raiſes the lip.
ORBICULARISORIS, *vel Sphincter Labiorum.*	The fibres of this muſcle are orbicular and ſpread out under the ſkin of the lips.	The ſkin of the lips.	By contracting the ſkin of the lips, cloſes the mouth.
DEPRESSOR LABIORUM COMMUNIS, *ſive Triangularis.*	The fore part of the baſis of the lower jaw.	The ſide and angle of the lips.	Depreſſes the angle of the mouth.
DEPRESSOR LABII INFERIORIS PROPRIUS.	The fore part of the baſis of the lower jaw.	The middle part of the lower lip.	Depreſſes the under lip.
DEPRESSOR LABII SUPERIORIS PROPRIUS.	The alveolar proceſſes on the fore part of the maxilla ſuperior.	The ſuperior part of the upper lip.	Depreſſes the upper lip.
ELEVATOR LABII INFERIORIS PROPRIUS.	The alveolar proceſſes on the fore part of the lower jaw.	Into the lower lip & ſkin of the chin.	Raiſes the lower lip and chin.
BUCCINATOR.	The alveolar proceſſes of both jaws.	The angle of the lips.	Contracts the cavity of the mouth, counteracts the tongue, and applies the food to the circle of the teeth in maſtication
QUADRATUS GENÆ, *vel* LATISSIMUS COLLI.	The ſkin of the breaſt and ſhoulder.	Is ſpread out under the ſkin of the neck, and inſerted into the baſis of the lower jaw, ſkin of the cheek and angle of the lips.	Depreſſes the lower jaw and lips.
ANTERIOR AURIS.	The os malæ and maxilla ſuperior.	On the anterior cartilaginous part of the meatus auditorius.	Dilates the meatus auditorius.
ELEVATOR AURIS.	The faſcia of the temporal muſcle.	The cartilage of the ear.	Raiſes the auricula.
RETRACTOR AURIS.	The tranſverſe proceſs of the occipital ridge, and faſcia of the occipito frontalis.	The poſterior part of the concha.	Dilates the meatus auditorius.
DIAPHRAGINA.	Has by ſome been conſidered as conſiſting of two muſcles; on the anterior part, its fibres are radiated; on the back part, rectilinear; the anterior part ariſes about an inch within the cartilaginous margin of the thorax, making digitations with the tranſverſalis abdominis; the poſterior part, called crura of the diaphragm, ariſes from the anterior and lateral parts of the bodies of the three or four ſuperior vertebræ lumborum, and from the fore part of the body of the laſt vertebra dorſi; between the crura, the œſophagus paſſes into the cavity of the abdomen.	The tendinous fibres of all parts of the muſcle unite in the middle, and form the centrum tendinoſum. This tendon is perforated to admit the cava inferior to pour its contents into the heart; it alſo admits of the aorta, thoracic duct, and œſophagus, to paſs from the cheſt into the abdomen.	Is concave towards the cavity of the abdomen; convex towards the cavity of the cheſt: in its action endeavours to reduce itſelf into a ſtraight line; enlarges the cavity of the cheſt, in inſpiration, and counteracts the abdominal muſcles.

SECT. X.

OS HYOIDES AND CARTILAGES OF THE LARYNX.

THE Os Hyoides, in its form, repreſents the *v* conſonant; its anterior part or baſis is broad, printed by the attachment of muſcles; on its inner part it is hollowed, having a ligament inſerted into it, by which it is attached to the fore-part of the thyroid cartilage; its lateral parts called horns; between the baſis and horns of this bone is a little proceſs, called the graniform appendage, is attached to it by a ligament. The horns of the os hyoides are connected to the ſuperior proceſſes of the thyroid cartilage by ligaments; in the middle of each ligament is a graniform cartilage. All parts of this bone ſtrongly printed by the attachment of muſcles.

The Thyroid Cartilage forms the anterior part of the larynx, or that part of the throat called pomum adami, which is hollowed on the outſide; at the ſuperior poſterior part, there is a pair of proceſſes, by which it is connected with os hyoides; at the inferior, a pair of proceſſes, by which it is articulated to the cricoid cartilage; at the ſuperior poſterior part, it is articulated with the aretenoid cartilages; and on its fore part, is printed by muſcles.

Cricoid Cartilage is broad at the back part, narrow before like a ring; is articulated with the lower part of the thyroid cartilage, making the inferior part of the larynx; the ſuperior parts of the larynx are formed by a pair of cartilages, called aretenoid; each aretenoid cartilage is triangular; the baſis articulated to the ſuperior poſterior part of the cricoid; their apices approach each other, and form the aperture of the glottis: to theſe cartilages, the ſacculi laryngis are attached.

SECT. XI.

MUSCLES OF THE NECK, TONGUE, &c.

NAME.	ORIGIN.	INSERTION.	USE.
MASSITER.	By three heads; the firſt from the maxillary bone, near its junction with the os malæ; the ſecond from the zygomatic proceſs of the os malæ and os temporis; the third from the internal part of the zygoma.	The external part of the proceſs of the lower jaw, from the angle, extending almoſt as far forwards as the middle part of it.	Raiſes the jaw, and carries it backwards in the act of maſtication.

NAME.	ORIGIN.	INSERTION.	USE.
TEMPORALIS *ſive Crotaphitei.*	From the whole temporal foſſa, is covered by a ſtrong tendinous expanſion which gives origin to ſome of the fibres.	The coronoid proceſs of the lower jaw.	Raiſes the jaw.
PTERIGOIDEUS INTERNUS, *ſeu maſſiter internus.*	Ala pterigoidea interna, and foſſa pterigoidea.	The internal part of the proceſs of the lower jaw, oppoſite to the maſſiter.	Aſſiſts the two former muſcles in raiſing the lower jaw.
PTERIGOIDEUS EXTERNUS.	The ala externa pterigoidea, and from the adjacent parts.	The condyloid proceſs of the lower jaw.	Moves the jaw laterally.
DIGASTRICUS, *ſeu biventer.*	Has two fleſhy bellies and one middle tendon; the poſterior part ariſes from a cavity on the inner ſide of the maſtoid proceſs; forms a round tendon which paſſes through the tendon of the ſtilohyoideus, is tied by a ligament to the lateral part of the baſis of the os hyoides.	The anterior belly is inſerted into a tubercle, on the inſide of the baſis of the lower jaw, near the ſymphyſis.	Depreſſes the lower jaw.
MASTOIDÆUS, *ſeu ſterno elido maſtoidæus.*	By a ſtrong, round tendon from the anterior ſuperior part of the firſt bone of the ſternum, and by a broad, thin tendon from the ſuperior ſternal extremity of the clavicle.	The inferior external part of the maſtoid proceſs; and by broad thin tendon into the anterior part of the tranſverſe occipital ridge.	Moves the face to the oppoſite ſide; when the two act, the head is bended forwards.
STERNO-HYOIDÆUS.	The inner part of the firſt bone of the ſternum, and from the cartilage of the firſt rib.	The fore part of the baſis of the os hyoides.	Draws the os hyoides downwards.
MYLO-HYOIDÆUS.	Fleſhy from all the internal edges of the alveolar proceſſes of one half of the lower jaw.	The inferior margin of the os hyoides.	Draws the os hyoides upwards, forwards and laterally, according to the action of the different parts of the muſcle.
GENIO-HYOIDÆUS.	From a tubercle on the inſide of the lower jaw, near the ſymphiſis.	The whole length of the os hyoides.	Raiſes the bone and brings it forwards.
STILO-HYOIDÆUS.	By a round tendon from the middle part of the ſtiliform proceſs.	The baſis of the os hyoides, near its horn.	If one muſcle acts it is moved to a ſide; if both act it is raiſed and carried backward.
STILO-CHONDRO-HYOLDAEUS, *ſeu ſtilo-hyoidæus alter.*	The lower part of the ſtili-form proceſs.	The graniform appendage of the os hyoides.	In its action aſſiſts the preceding muſcle.
CORACOHYOIDÆUS.	The ſuperior coſta ſcapulæ, and from the ligament that forms the lunated cavity into a hole, paſſing obliquely up the neck; has a middle tendon where it is preſſed upon by the ſterno maſtoidæus.	By a broad thin tendon, into the fore part of the baſis of the os hyoides.	Draws the os hyoides obliquely downwards and backwards.

NAME.	ORIGIN.	INSERTION.	USE.
GENIO-GLOSSUS.	From a tuberoſity, on the internal middle part of the lower jaw, the fibres radiate from its origin.	Into the tongue, its whole length.	Being a radiated muſcle, different portions acting will produce different effects.
HYO-GLOSSUS.	The horn, and one half the baſis of the os hyoides.	Laterally into the baſis of the tongue.	When one acts, the tongue is carried obliquely to a ſide, when both, downwards and backwards.
STILO-GLOSSUS.	The ſtili-form proceſs.	The middle and poſterior part of the ſide of the tongue.	Raiſes the tongue & carries it to one ſide.
LINGULALIS	Conſiſts of fibres running from the apex to the baſis of the tongue.		Shortens the tongue.
STERNOTHYREOIDÆUS.	The internal part of the firſt bone of the ſternum.	An oblique ridge, on the ſide of the thyreoid cartilage.	Depreſſes the larynx.
HYO-THYREOIDÆUS.	The anterior part of the baſis of the os hyoides.	The oblique ridge, on the ſide of the thyreoid cartilage.	Raiſes the larynx.
CRICO-THYREOIDÆUS.	The anterior part of the cricoid cartilage.	The inferior lateral part of the thyreoid cartilage.	By moving the thyreoid cartilage to a ſide, enlarges the cavity of the larynx.
ARYTÆNOIDEUS MAJOR	Fleſhy from the baſis of the arytænoid cartilage on the one ſide.	The whole length of the arytænoid cartilage on the oppoſite ſide.	Brings the arytænoid cartilages to each other, and contracts the aperture of the glottis.
ARYTÆNOIDEUS MINOR, *ſeu aryto-aritenoideus.*	A ſmall muſcle ariſing from the lateral part of the baſis of the arytænoid cartilage on the one ſide	Paſſing tranſverſely to the oppoſite cartilage is inſerted into it.	Aſſiſts the former muſcle in its action.
CRICO-ARYTENOIDEUS POSTICUS.	The poſterior part of the cricoid cartilage.	The baſis of the arytænoid.	Opens the glottis.
CRICO-ARYTENOIDEUS LATERALIS.	The lateral part of the cricoid cartilage.	The outward ſide of the arytænoid.	Opens the glottis.
THYREO-ARYTÆNOIDÆUS.	The whole length of the internal concave part of the thyreoid cartilage.	The internal part of the baſis of the arytænoid.	Aſſiſts in contracting the aperture of the glottis.
CEPHALO-PHARYNGEUS.	The cuneiform proceſs of the os occipitis.	This and the ten following muſcles form the pharynx.	
Chondro-pharyngæus.	The graniform appendage of the os hyoides.		
Crico-pharyngæus.	From the cricoid cartilage.		
Gloſſo-pharyngæus.	The baſis of the tongue.		
Hyo-pharyngæus.	The horn of the os hyoides.		
Pterigo-pharyngæus.	The pterigoid proceſs of the ſphænoidal bone.		

ANATOMY.

NAME.	ORIGIN.	INSERTION.	USE.
SALPINGO-PHARYNGEUS.	The extreme part of the euſtachian tube.	All theſe muſcles, from their various origins, meet their fellows, from the oppoſite ſide, and unite in a middle tendon; together they form a muſcular bag, to which the food after maſtication is tranſmitted, and, by their action is thence propelled into the œſophagus.	
Syndeſmo pharyngæus.			
Stilo-pharyngæus.	The root of the ſtili-form proceſs.		
Thyreo-pharyngæus.	The lateral part of of the thyreoid cartilage.		
GLOSSO STAPHILINUS.	The lateral part of the tongue.	Near the middle of the uvula.	When one acts the uvula is moved to a ſide, when both act, is depreſſed.
PALATO STAPHILINUS.	The ſuture of the os palati.	The ſide of the palati.	Moves the palate forwards & downwards.
SALPINGO STAPHILINUS, *ſeu Pteri Staphilinus.*	The anterior part of the euſtachian tube.	The baſis of the uvula.	Moves the uvula upwards and backwards.
THYREO STAPHILINUS.	The ſuperior part of the thyroid cartilage.	The uvula.	Shuts up the paſſage between the noſe and mouth in deglutition.
PECTORALIS MAJOR.	One half of the anterior part of the clavicle; from the lateral part of the ſternum; from the cartilages of the fifth and ſixth ribs.	The outer ridge of the canal, into which the tendon of the long head of the biceps flexor is lodged	Brings the arm inwards, and depreſſes it, when raiſed.
PECTORALIS MINOR, *ſeu Serratus Minor Anticus.*	The third, fourth, and fifth ribs.	By a ſhort round tendon into the coracoid proceſs of the ſcapula.	Aſſiſts the former in depreſſing the arm, & brings the ſcapula forwards.
Subclavius.	Tendinous from the under part of the ſcapular extremity of the firſt rib, and paſſing obliquely between the clavicle and firſt rib.	The ſuperior part of the firſt rib, near the ligament by which it is tied to the clavicle.	Depreſſes the ſcapular extremity of the clavicle.
Intercoſtales Externi.	The inferior margin of each rib, and running obliquely forwards.	Into the ſuperior margin of the rib below.	Raiſe the ribs & enlarge the cavity of the cheſt.
Triangularis Sterni.	The internal part of the xiphoid cartilage, from the lateral inferior parts of the ſternum.	Running obliquely upwards and outwards, is inſerted into the cartilages of the third, fourth, and fifth ribs.	By depreſſing the ribs, contracts the cavity of the cheſt.
Intercoſtales Interni.	Like the former, and paſſing obliquely, decuſſate the external.	The upper margin of each rib,	Raiſe the ribs.
Depreſſores Coſtarum Proprii. Ten pairs in number.	The internal part of the rib, near its articulation with the tranſverſe proceſs of the vertebræ,	Paſſing obliquely upwards & forwards are inſerted into the inferior margin of the rib above.	Depreſs the ribs & contract the cavity of the cheſt.
Trapezius vel Cucularius.	By a ſhort tendon from the middle part of the tranſverſe occipital ridge; from the ligamentum colli; from the ſpinous proceſs of the laſt vertebra colli; from the ſpinous proceſſes of the ten ſuperior vertebræ dorſi.	The fibres, from the ſuperior part, paſſing obliquely round the back part of the ſhoulder, are inſerted into the upper portion of the extremity of the clavicle and into the proceſſus acromion; all the middle and lower part, into the whole length of the ſpine of the ſcapula.	The fibres of this muſcle running into different directions, different parts acting independent of the whole, will produce different effects; the middle portion moves the ſcapula backwards; the upper portion raiſes it obliquely; the inferior portion depreſſes, and carries it backwards.
Latiſſimus Dorſi.	By a broad thin tendon from the poſterior part of the ilium; from the ſpinous proceſſes of the os ſacrum; from all thoſe of the vertebræ lumborum, and from the ſpinous proceſſes of the ſeven or eight inferior vertebræ dorſi, below the rhomboides.	A ſmall ſlip is inſerted into the inferior angle of the ſcapula; the remaining part paſſing on, forms the outer fold of the axilla, and is inſerted into the outer part of the biceps muſcle, is lodged oppoſite to the inſertion of the pectoralis major.	Depreſſes the arm, and carries it backwards.
Elevator Scapulæ, ſeu Muſculus Patientiæ	By ſlips, from the tranſverſe proceſſes of the four ſuperior vertebræ colli.	The ſlips uniting, form one muſcle, which is inſerted into the ſuperior angle of the ſcapula.	Raiſes the ſcapula, and depreſſes the arm when raiſed.
Rhomboides Minor.	From a part of the ligamentum colli, and the ſpine of the vertebra colli.	That part of the baſis of the ſcapula, which is above the ſpine.	Carries the ſuperior angle of the ſcapula upwards and backwards.
Rhomboides Major.	The ſpinous proceſſes of the four or five ſuperior vertebræ dorſi.	All that part of the baſis of the ſcapula below the ſpine.	Carries the ſcapula obliquely upwards and backwards.
Serratus Minor Anticus.	By ſlips from the eight ſuperior ribs.	The whole length of the baſis of the ſcapula on its inner ſide.	Rotates the ſcapula on its axis in the motion of the arm, and in ſtrong efforts, raiſes the ribs.
Serratus Superior Poſticus.	By a broad thin tendon, from the lower part of the ligamentum colli; from the ſpinous proceſs of the laſt vertebra of the neck; from the ſpines of the three ſuperior vertebræ of the back.	The ſecond, third, and fourth ribs by diſtinct ſlips.	By raiſing the ribs, enlarges the cavity of the cheſt.
Serratus Inferior Poſticus.	By a broad thin tendon, from the ſpinous proceſſes of the two inferior vertebræ dorſi, and of the two ſuperior vertebræ lumborum	The inferior margin of the three or four laſt ribs, paſſing obliquely upwards.	Depreſſes the ribs in the expiration.
Splenius.	By ſeveral long ſmall tendons, from the ſpines of the four ſuperior vertebræ dorſi; from that of the ſeventh vertebra of the neck, and from the whole ligamentum colli. This ligament principally formed by the union of the tendons of the two ſplenii, extending from the ſpinous proceſs of the ſecond vertebra colli to that of the laſt.	The tranſverſe proceſſes of the firſt and ſecond vertebræ colli; into the maſteoid proceſs, and a part of the occipital ridge.	When one muſcle acts, it counteracts the maſtoideus: when the two act, the head is carried backwards.

NAME.	ORIGIN.	INSERTION.	USE.
Complexus.	By tendons, from the tranſverſe proceſſes of the ſix or ſeven ſuperior vertebræ dorſi, and from the tranſverſe proceſſes of the ſix inferior vertebræ colli.	The under part of the os occipitis.	When one acts, the head is carried to a ſide; when both act, the head, if bended, is raiſed, and carried backward.
Trachælo-maſtoidæus, ſeu par tertium Fallopii	By ſlips from the tranſverſe proceſſes of the two ſuperior vertebræ dorſi, from thoſe of the three or four inferior vertebræ colli.	Paſſing up the neck under the ſpleneus, is inſerted by a thin tendon into the middle poſterior part of the maſtoid proceſs.	Aſſiſts the complexus.
Rectus major poſticus.	From one point of the ſpinous proceſs of the ſecond vertebræ colli.	Paſſing obliquely upwards and outwards, is inſerted into the os occipitis, behind the complexus.	Raiſes the head, and bends it a little backwards.
Rectus minor poſticus.	A ſmall tubercle on the back part of the atlas.	The os occipitis behind the foramen magnum occipitale.	Aſſiſts in raiſing the head.
Obiquus inferior.	The tranſverſe proceſs of the atlas.	The os occipitis, near the back part of the maſtoid proceſs.	Moves the head a little obliquely.
Obliquus inferior.	The ſpine of the dentata.	The tranſverſe proceſs of the atlas.	Rotates the head.
Rectus internus major.	The fore part of the tranſverſe proceſſes of the 3d, 4th, 5th, and 6th vertebræ colli.	The cuneiform proceſs of the os occipitis.	Bends the head forwards
Rectus internus minor.	The fore part of the body of the atlas.	The fore part of the foramen magnum.	Aſſiſts the former muſcle
Rectus lateralis	The tranſverſe proceſs of the atlas.	Near the maſtoid proceſs, into the os occipitis.	Bends the head a little to a ſide.
Muſculus Caput concutiens.	The oblique proceſſes of the ſecond and third vertebræ colli.	The root of the tranſverſe proceſs of the atlas.	Bends the head a little to a ſide.
Scalenus, divided into 4 muſcles.	Firſt, ariſes from the tranſverſe proceſſes of the fourth, fifth, and ſixth vertebræ colli.	The firſt rib, near its cartilage.	Theſe four parts of the ſcalenus, by raiſing the ribs, enlarge the cavity of the cheſt.
	The ſecond, ariſes by diſtinct tendons, from the tranſverſe proceſſes of the 2d, 3d, 4th, 5th, and 6th vertebræ of the colli.	The ſuperior middle part of the firſt rib.	
	The third, ariſes from the tranſverſe proceſſes of the fifth and 6th vertebræ of the neck.	The upper part of the ſecond rib.	
	The fourth, ariſes from the tranſverſe proceſſes of the two laſt vertebræ colli.	The poſterior part of each rib, near the tubercle.	
Longus colli.	The bodies of the four, or five ſuperior vertebræ dorſi.	The ſides of the bodies of the four inferior vertebræ colli.	Bends the ſpine.
Sacro Lumbalis.	In common with longiſſimus dorſi.	By ſlips into each rib, near its angle.	Depreſſes the ribs, and raiſes the trunk.
Acceſſorius ad ſacro lumbalem.	By ſlips from the eight or nine ſuperior ribs.	Fleſhy into the rib immediately below, lying within the attachments of the ſacro-lumbalis.	Aſſiſts the former muſcle in depreſſing the ribs.

NAME.	ORIGIN.	INSERTION.	USE.
Cervicalis deſcendens.	The tranſverſe proceſſes of the 3d, 4th, 5th, and 6th vertebræ colli.	The 3d, 4th, 5th, 6th, and 7th ribs, between the ſlips of the ſacro-lumbalis and longiſſimus dorſi.	Raiſes the ribs in inſpiration.
Levatores coſtarum proprii.	The tranſverſe proceſſes of the vertebræ dorſi, and running obliquely forwards and downwards.	Into the upper edge of each rib, except the firſt.	Raiſe the ribs, and enlarge the cavity of the cheſt in inſpiration.
Longiſſimus dorſi.	The faſcia lumborum, from the ſpinous proceſſes of the ſacrum, from the poſterior part of the ſpine of the ilium; from the ſpinous and tranſverſe proceſſes of the vertebræ lumborum, and at its origin, is blended with the ſacro-lumbalis.	Has a double inſertion by ſlips, into each rib, one ſlip being attached near the tubercle of the rib, the other midway between the angle and tubercle.	Depreſſes the ribs and raiſes the ſpine.
Semi-ſpinnlis.	The tranſverſe proceſſes of the ſix inferior vertebræ dorſi.	The ſpines of the ſix ſuperior vertebræ dorſi, and into that of the laſt vertebra colli.	Extends the ſpine.
Spinalis colli.	The tranſverſe proceſſes of the five ſuperior vertebræ dorſi.	Paſſing obliquely under the complexus, is inſerted into the ſpines of the 2d, 3d, 4th, and 5th vertebræ colli.	Extends the ſpine and raiſes the head
Tranſverſalis colli.	The oblique proceſſes of the four inferior vertebræ colli.	The roots of the the ſpines of the ſuperior vertebræ colli	Raiſes the head, and moves it obliquely backward.
Inter-ſpinales colli.	The points of the ſpinous proceſſes on their lower part.	The ſpinous proceſſes immediately beneath them.	Extend the ſpine.
Inter-tranſverſales colli.	The lower part of the tranſverſe proceſs of the vertebra above.	The upper part of the tranſverſe proceſs of the vertebra below.	Bend the neck laterally.
Inter-vertebrales.	The fore part of the body of the vertebra abcve.	Paſſing obliquely are inſerted into the ſide of the body of the vertebra below.	Bend the neck a little to a ſide
Tranſverſales dorſi interiores.	The tranſverſe proceſſes of all the vertebræ.	By a diſtinct ſlip, into the ſpinous proceſs of each vertebra.	Bend the ſpine laterally, and raiſe it.
Spinules lumborum.	Is blended with the ſacro-lumbalis, and longiſſimus dorſi.	The ſpinous proceſſes of all the vertebræ lumborum	By raiſing the lumbar vertebræ, extend the ſpine.
Tranſverſalis lumborum.	The oblique proceſſes of all the vertebræ lumborum.	The ſpines of all the lumbar vertebræ.	Aſſiſts the former.
Inter-tranſverſalis lumborum.	Are placed between all the tranſverſe proceſſes.		Bend the ſpine laterally.
Quadratus lumborum.	The inner labrum of the poſterior part of the ſpine of the ilium.	The tranſverſe proceſſes of the vertebræ lumborum, and into the laſt rib.	When one acts the ſpine is bended to a ſide; when both act, the body is bended forwards.

NAME.	ORIGIN.	INSERTION.	USE.
Pſoas parvus.	Fleſhy from the ſide of the ſuperior lumbar vertebra.	By a long tendon, into the brim of the pelvis.	Bends the ſpine on the pelvis, or raiſes the pelvis towards the ſpine.
Pſoas magnus.	The ſide of the body of the laſt dorſal vertebra, from the bodies and tranſverſe proceſſes, of all thoſe of the loins.	Paſſing over the brim of the pelvis, joins the tendon of the iliacus internus, and is inſerted into the little trochanter.	Bends the thigh, and carries it forward in progreſſion.
Iliacus internus.	All the internal ſurface of that part of the os-ilium, which is above the brim of the pelvis.	Paſſing over the brim of the pelvis, its tendon joins with that of the former muſcle, both having one common inſertion.	Aſſiſts the former.
Pectinalis.	The ſuperior, and interior part of the os-pubis.	The femur, a little below the little trochanter.	Bends the thigh forwards, and raiſes it.
Glutæus maximus.	The ſuperior part of the os coccygis, from all the ſpinous proceſſes of the ſacrum, from all the outer part of that bone below the ſpine of the ilium, from the ſacro-ſciatic ligaments, from the poſterior ſuperior part of the ſpine of the ilium, and from the faſcia, which covers the glutæus medius.	From theſe attachments it paſſes down to be inſerted by a large broad tendon, into the femur, a little below the great trochanter.	Extends the thigh, and carries it backwards.
Glutæus medius.	All the outer ſurface of the ilium, before that ſpace covered by the glutæus maximus.	By a broad tendon, the whole length of the great trochanter	Aſſiſts the former.
Glutæus Minimus.	The inferior, poſterior part, of the os ilium.	The great trochanter.	Aſſiſts the two former in extending the thigh.
Pyriformis, ſeu Iliacus Externus.	The inferior part of the os ſacrum, and from the os ilium near the ſciatic notch.	The cavity, at the root of the great trochanter.	Raiſes the thigh, and turns the toes outwards, by rotating the femur.
Germini.	The ſuperior ariſes from the ſpine of the iſchium; the inferior, from the inſide of the tuberoſity of the ſame bone.	Surrounding the tendon of the marſupialis, are inſerted into the cavity at the root of the great trochanter.	By rotating the thigh bone, turn the toes outwards.
Marſupialis, vel Obturator Internus.	The ligament which covers the obturator hole, and from the edges of the bone.	The cavity, at the root of the great trochanter.	Rotates the thigh bone obliquely outwards.
Quadratus Femoris.	The exterior ſide of the tuberoſity of the iſchium.	Paſſing tranſverſely, is inſerted into a ſpace between the two trochanters.	Carries the thigh backwards, and is a rotator.
Triceps; a title given to the four following muſcles: *Adductor Femoris longus.*	By a ſtrong tendon, from the ſuperior anterior part of the os pubis.	The linea aſpera, near the middle of the thigh bone.	

NAME.	ORIGIN.	INSERTION.	USE.
Adductor Femoris Congus.	By a broad tendon, from the os pubis, immediately under the gracilis.	That part of the linea aſpera, from the little trochanter to the inſertion of the former muſcle.	
Adductor Femoris brevis.	The exterior margin of the os pubis and iſchium, a little below the former.	Near the tendon of the gluteus maximus.	Theſe four muſcles, in their action, produce ſimilar effects.
Adductor Femoris magnus.	The tuberoſity of the iſchium, and from its inner ſide.	By a long round tendon, into the whole length of the linea aſpera.	In progreſſion they bend the thigh bone, and draw it inwards.
Obturator Externus.	The outer edge of the obturator hole, and from the ligament which covers it.	By a ſtrong tendon, into the cavity, at the root of the great trochanter.	Rotates the thigh bone, and turns the foot outwards.
Coccygæus.	The ſpine of the iſchium, and from a part of the ſacro ſciatic ligament.	The whole length of the os coccygis.	Raiſes the os coccygis.
Muſculus Membranoſus.	The anterior, ſuperior ſpinous proceſs of the ilium, is blended with the tendinous expanſion of the glutæus medius.	Forms the faſcia of the thigh, and is inſerted into the upper extremities of the tibia and fibula.	Extends the tibia, and rotates the foot a little outwards.
Sartorius.	The anterior ſuperior ſpine of the ilium.	Paſſing obliquely round the fore part of the thigh, is inſerted into the inner ſide of the head of the tibia.	Bends the leg.
Rectus Cruris.	The anterior ſuperior ſpine of the ilium.	The baſis of the patella.	Extends the leg.
Vaſtus Externus.	All the outer part of the femur, from the great trochanter to its lower extremity.	The baſis of the patella.	Extends the leg.
Vaſtus Internus.	The inſide of the femur, from the little trochanter to the inner condyle.	The upper part of the patella.	Extends the leg.
Cruræus.	The fore part of the thigh bone, joins the tendon of the three former muſcles, and	The baſis of the patella.	Extends the leg.
Gracilis.	By a broad thin tendon, from the os pubis, near the ſynphiſis.	The inner ſide of the tibia, near its head.	Bends the leg.
Seminervoſus, ſive Semitendinoſus.	The tuberoſity of the iſchium.	The inner poſterior ſpine of the tibia, about an inch below the inſertion of the ligament of the patella.	Bends the leg.
Semimembranoſus.	The tuberoſity of the iſchium.	The poſterior ſide of the tibia, near its head.	Bends the leg.
Biceps.	By two heads, the longer, originating from the tuberoſity of the iſchim, deſcends and joins with the ſhorter head, which ariſes from the linea aſpera	The outer part of the head of the fibula:	Bends the leg.

NAME.	ORIGIN.	INSERTION.	USE.
Gaſtrocnæmius.	By two heads; one from each condyle of the femur.	Below the joint, theſe unite in one common tendon; inſerted into the os calcis.	Extends the foot.
Solæus.	The poſterior parts of the tibia and fibula; joins with the tendon of the gaſtrocnæmius.	This and the former muſcle have one common tendon, called tendo achillis.	Aſſiſts the former muſcle in extending the foot.
Plantaris, vel Extenſor Tarſi Minor.	The outer condyle of the femur, and capſular ligament of the joint of the knee.	Its tendon paſſes obliquely between the tendons of the two former muſcles, and is inſerted into the os calcis.	Raiſes the foot and draws down the capſular ligament of the knee.
Tibialis Anticus.	The outer ſide of the tibia, near its upper part: ſome of its fibres originate from the faſcia of the leg.	Paſſing under the annular ligament, is inſerted into the os cuneiforme internum.	Bends the foot.
Tibialis Poſticu.	The poſterior ſuperior part of the tibia, from the fibula and interoſſeus ligament.	Its tendon, paſſing under the malleolus internus, is inſertedinto the upper and inner part of the os naviculare.	Extends the foot.
PERONÆUS LONGUS, *ſeu Peronæus Primus, ſeu Poſticus.*	The upper extremity of the fibula.	Its tendon, playing over the os cuboides, is inſerted into the os cuneiforme internum, and firſt bone of the great toe.	Moves the foot outwards, and bends it.
PERONÆUS SECUNDUS, *vel Anticus.*	The anterior middle part of the fibula.	Into the metatarſal bone ſuſtaining the little toe.	Bends the foot.
PERONÆUS TERTIUS, *ſeu Nonus Veſalii.*	The inferior anterior part of the fibula.	The metatarſal bone ſuſtaining the little toe.	Bends the foot.
Extenſor Digitorum Communis Longus.	The upper and outer ſide of the head of the tibia, and from the inner part of the fibula.	Its tendon, paſſing under the annular ligament, divides into four tendons, which go to be inſerted into the baſes of the ſecond bones of the leſſer toes.	Extends the toes.
Extenſor Digitorum Communis Brevis.	The upper part of the os calcis and cuboid bone, is divided into four tendons.	Theſe, joining the tendons of the former muſcle, have a common inſertion.	Aſſiſts the former.
FLEXOR DIGITORUM COMMUNIS LONGUS, *vel perforans, vel flexor profundus.*	The poſterior ſuperior part of the tibia: its tendon, paſſing under the malleolus internus, gets into the calcaneum.	Divides into four tendons, which are inſerted into the laſt bones of the leſſer toes.	Bends the toes.
PERFORATUS, *vel* FLEXOR-SUBLIMIS, *vel flexor digitorumcommunis brevis.*	The inferior part of the os calcis and faſcia of the foot.	Divides into four tendons, which are inſerted into the baſes of the ſecond bones of the leſſer toes.	Bends the toes.
MASSA CARNEA, *vel muſculus acceſſorius.*	The calcaneum and faſcia of the foot.	The tendon of the flexor longus.	Bends the leſſer toes.
Lumbricales.	The tendons of the flexor longus.	By a broad tendon, into the firſt bone of each of the leſſer toes. toes.	Bend the firſt joints of the toes.
Interoſſei.	The ſpace between the metatarſal bones.	The firſt bones of the leſſer toes.	Bend the firſt joints of the toes.
Adductor minimi digiti.	The bones of the tarſus, and from the metatarſal bone of the ſecond toe.	The ſide of the firſt bone of the little toe.	Draws the little toe inwards
Abductor minimi digiti.	The os cuboides and from the metatarſal bone of the little toe.	The outſide of the firſt bone of the little toe.	Expands the foot by carrying the little toe outwards.
Extenſor pollicis pedis longus.	The upper part of the fibula and interoſſeous ligament.	The upper part of the laſt bone of the great toe.	Extends the great toe, and raiſes it.
Extenſor pollicis pedis brevis.	The anterior inner part of the os calcis.	The upper part of the ſecond bone of the great toe.	Extends the ſecond joint.
Flexor longus pollicis pedis.	The ſuperior poſterior part of the fibula, near its head and from a part of the interoſſeous ligament.	Its tendon, paſſing under the malleolus internus, is inſerted into the baſis of the laſt bone of the toe.	Bends the great toe.
Flexor brevis.	The cuboid and external cuneiform bones.	The ſeſamoid bones of the ſecond joint of the toe.	Bends the ſecond joint of the toe.
Adductor pollicis.	The os calcis, from the cuneiform and cuboid bones, and from the metatarſal bone of the ſecond toe.	The ſecond bone of the great toe.	Bends the toe and draws it inwards.
Abductor pollicis.	The anterior inferior part of the os calcis, from a part of the os naviculare, and from the ſide of the firſt bone of the great toe.	The external ſeſamoid bone of the ſecond joint.	Bends the toe, and draws it outwards.
Tranſverſalis pedis.	The ſeſamoid bone of the great toe, and from the metatarſal bone that ſuſtains it.	Near the firſt joint of the leſſer toe, and its metatarſal bone.	Contracts the foot and brings the toes towards each other.
Deltoides.	The ſcapular extremity of the clavicle, from the ſpine of the ſcapula, and proceſſus acromion.	The outer middle part of the os brachii.	Raiſes the arm.
Supraſpinatus.	That part of the ſcapula which is above its ſpine,	The outer tubercle, near the head of the os brachii.	Raiſes the arm.
Infraſpinatus.	That part of the ſcapula which is below its ſpine,	The outer tubercle, near the head of the os brachii.	Raiſes the arm and moves it backwards.
Teres minor.	The fore part of the coſta ſcapulæ.	The outer tubercle, near the head of the os brachii.	Aſſiſts the former muſcle.
Teres major.	The inferior angle and coſta ſcapulæ.	Joins the tendon of the latiſſimus dorſi, and with it has a common inſertion.	Moves the arm downwards and backwards.
Coraco brachialis.	The point of the caracoid proceſs of the ſcapula.	The middle inner ſide of the os brachii.	Raiſes the arm.
Subſcapularis.	All the inner ſurface of the ſcapula.	The upper part of the os brachii.	Raiſes the arm, and brings it towards the ſide.
Biceps flexor cubiti.	Conſiſts of two heads; the longer ariſes from the neck of the ſcapular and its tendon paſſing through the capſular ligament of the humerus, plays over the head of the os brachii; is then lodged in a canal, made betwеen the two tubercles near the head of the bone.	Near the middle of the arm joins with the ſhorter head which ariſes from the coracoid proceſs of the ſcapula: inſerted into the tubercle of the radius near the joint, ſends off an aponeuroſis; which is extended over the muſcles on the inſide of the fore arm.	Is a flexor of the fore arm and a ſupinator of the hand.

NAME.	ORIGIN.	INSERTION.	USE.
Brachialis internus.	Ariſes from the middle anterior and inferior part of the os brachii.	Inſerted into the ulna, a little below the coronoid proceſs.	Bends the fore arm.
Biceps extenſor cubiti.	The long head ariſes from the inferior coſta ſcapulæ, the ſhorter, from the poſterior part of the os brachii, almoſt its whole length.	The external part of the ulna.	Extends the fore arm.
Brachialis externus.	All that part of the os brachii, which is below the teres-major.	The olecranon, in common with the biceps extenſor.	Extends the arm.
Angonæus.	Ariſes from the back part of the condyle of the os brachii.	Inſerted into the lateral part of the ulna, about an inch below the olecranon.	Aſſiſts the two former muſcles in the extenſion of the fore arm.
Palmaris longus.	The ſuperior part of that ridge leading to the inner condyle.	Has a long tendon, which is inſerted into the annular ligament of the carpus, and forms a part of the faſcia in the palm of the hand.	Bends the wriſt and tightens the faſcia.
Palmaris brevis.	The metacarpal bone ſuſtaining the little finger.	Its fibres paſſing tranſverſely are inſerted into the faſcia in the palm of the hand.	Tightens the faſcia.
Flexor carpi radialis.	The inner condyle of the os branchii, and from the upper part of the ulna.	The metacarpal bone that ſuſtains the fore finger.	Bends the carpus and hand.
Flexor carpi ulnaris.	With the former muſcle, with which its fibres are intermixed.	The os piſiforme.	Aſſiſts the former muſcle.
EXTENSOR CARPI RADIALIS, *ſeu bicornis.*	By two heads from the outer condyle of the os brachii.	Has two tendons of unequal length, the longer, inſerted into the baſis of the metacarpal bone ſuſtaining the index; the ſhorter, into the metacarpal bone ſuſtaining the middle finger.	Extends the carpus and carries the hand a little backwards.
Extenſor carpi ulinaris.	The outer condyle of the os brachii, from the outer part of the ancon, and from the outer edge of the ulna.	The upper part of the metacarpal bone ſuſtaining the little finger.	In its action aſſiſts the former muſcle.
FLEXOR SECUNDI INTERNODII DIGITORUM COMMUNIS, *ſeu perforatus.*	The inner condyle of the os brachii, from the coronoid proceſs of the ulna, and from the middle anterior part of the radius.	Divides into four tendons, paſſing under the annual ligament of the carpus; inſerted into the baſis of the ſecond bone of each finger.	Bends the ſecond joint of each finger.
FLEXOR TERTII INTERNODII DIGITORUM COMMUNIS, *ſeu perforans.*	All the upper outer part of the ulna, as it deſcends divides it into four tendons.	Theſe paſs under the annular ligament, and are inſerted into the baſis of the laſt bone of each finger; they paſs through, or perforate the tendons of the former muſcle.	Bends the laſt joint of each finger.
Lumbricales, four in number.	The upper tendons of the flexor digitorum.	By a broad tendon into the ſide of the baſis of the firſt bone of each finger.	The tendons being expanded on the back parts of the fingers, theſe muſcles bend the firſt joint and extend the others.
Extenſor digitorum communis	The external condyle of the os brachii, is blended with the ſupinator brevis, paſſing on the back part of the fore arm, is divided into five tendons.	Theſe are bound down by the annular ligament, two of them are inſerted into the little finger, and one into each of the other fingers.	Extends the fingers.
Interoſſei, ſix in number.	Are divided into external and internal, fill up the ſpaces between the metacarpal bones.	The ſides of the baſis of the firſt bones of the fingers.	Their tendons being ſpread out on the backs of the fingers, bend the firſt joint, and extend the other two.
EXTENSOR SECUNDI INTERNODII INDICIS PROPRIUS *vulgo indicator*	The middle poſterior part of the ulna.	The upper part of the baſis of the ſecond bone of the index.	Extends the fore finger.
Extenſor tertii internodii indicis.	The outer part of the metacarpal bone, ſuſtaining the fore finger.	Has two tendons, one inſerted into the ſide of the baſis of the firſt bone, the other ſpread out on the back part of the finger.	Extends the laſt joint of the fore finger.
Adductor indicis.	The ſide of the firſt bone of the thumb.	The baſes of the firſt bone of the finger next the thumb.	Bends the firſt joint of the finger, and brings it towards the thumb.
Extenſor minimi digitti.	The outer condyle of the os brachii, and from the back part of the ulna.	The laſt bone of the little finger.	Extends the little finger.
Extenſor tertii internodii minimi digiti.	The inner ſide of the bones of the carpus, and from the metacarpal bone ſuſtaining the little finger.	The upper part of the firſt bone of the little finger.	Extends the third joint of the little finger.
Abductor minimi digiti.	The inner ſide of the bones of the carpus.	The firſt bone of the little finger.	Carries the little finger outwards, and bends the firſt joint.
Flexor primi internodii minimi digiti.	The os unciforme, and from the fore part of the metacarpal bone ſuſtaining the little finger.	By two tendons, into the ſides of the baſis of the firſt bone of the little finger.	Bends the firſt joint, and hollows the hand.
Flexor tertii internodii pollicis.	The fore part of the radius, a little below its tubercle.	The baſis of the third bone of the thumb.	Bends the laſt joint of the thumb.
Flexor ſecundi internodii pollicis.	The trapezium principally at its upper part, blended with the following muſcle.	By two tendons, into the ſeſamoid bones, placed in the ſecond joint of the thumb.	Bends the ſecond join to the thumb.
Flexor primi internodii pollicis.	The annular ligament of the carpus, and from the trapezium.	The internal lateral part of the firſt bone of the thumb.	Bends the firſt joint.

NAME.	ORIGIN.	INSERTION.	USE.
Extenſor primi internodii pollicis.	The upper outer part of the ulna, from the interoſſeus ligament, and back part of the radius.	The back part of the firſt bone of the thumb.	Extends the firſt joint.
Extenſor ſecundi internoaii pollicis.	The middle back part of the radius and interoſſeus ligament.	The upper part of the baſis, of the ſecond bone of the thumb.	Extends the ſecond joint of the thumb.
Extenſor tertii internodii pollicis.	The middle back part of the ulna and interoſſeus ligament.	Its tendon, running in a ſulcus at the lower extremity of the radius, is inſerted into the laſt bone of the thumb.	Extends the laſt joint of the thumb.
Abductor pollicis.	The annular ligament of the carpus, from the trapezium and trapezoides.	The outer part of the ſecond bone of the thumb.	Moves the thumb outwards.
Adductor pollicis ad indicem.	The external lateral part of the metacarpal bone ſuſtaining the index.	The firſt joint of the thumb.	Brings the thumb towards the fore finger.
Adductor pollicis ad minimum digitum.	The metacarpal bone ſuſtaining the little finger.	The ſecond joint of the thumb, a little below the internal ſeſamoid bone.	Moves the thumb towards the little finger, and hollows the hand.
Pronator teres.	The internal condyle of the os braſſichii, from the anterior part of the ulna below the joint.	Paſſing obliquely, is inſerted into the middle outer part of the radius.	Turns the palm of the hand inwards and downwards.
Pronator quadratus.	The lower inner ſide of the ulna.	Paſſing tranſverſely, is inſerted into the inferior outer part of the lower extremity of the radius.	Aſſiſts the former muſcle in pronation of the hand.
Supinator longus.	The outer condyle of the os brachii, above the origin of the bicornis.	The external part of the lower extremity of the radius.	Turns the palm of the hand upwards
Supinator brevis.	The outer condyle of the os brachii, from the upper extremity of the ulna, and from the interoſſeous ligament.	The radius, a little below the inſertion of the biceps flexor.	Turns the palm of the hand upwards, and counteracts the pronators.

SECT. XII.

PHYSIOLOGY OF MUSCLES.

A Muſcle, in acting, either ſhortens itſelf or endeavours to do ſo. Muſcles, though in ſtrong action, may be ſometimes lengthened, *e. g.* If the force exerted by any muſcle, or ſet of muſcles, be counteracted by a force ſuperior to the relative power of the muſcle, that muſcle, though acting with its greateſt energy, will not be ſhortened. The actions of muſcles may differ, from a variety of circumſtances; 1ſt. from ſhape, viz. if a muſcle be oblong, it ſhortens itſelf in a ſtrait line, or its two extremities approach each other; but if a muſcle be circular, as a ſphincter, &c. then it puckers up the parts. 2dly, The action differs according to the courſe of the fibres; if the muſcle runs in a ſtrait line from one part to another, its contraction has the effect of bringing theſe two parts together; but if the muſcle or its tendon be reflected, the parts to which it is attached, will be moved at a diſtance from each other, as the trochlearis. 3dly, Different parts of the ſame muſcle can act independent of the whole, or of each other; this is particularly ſeen in the cucullaris, &c. 4thly, Some muſcles produce different effects, according to the different degrees of their action, and the different poſition of the limb; for inſtance, when the hand is in a ſtate of ſupination, the biceps flexor cubiti, is firſt a pronator of the hand, then a flexor of the fore-arm. 5thly, The effects of muſcles are different, according to the nature of the parts into which they are fixed; thoſe which paſs from bone to bone, by their contraction, move them towards each other; but thoſe which are inſerted into ſoft parts not only move them, but likewiſe alter the figure of the part. 6thly, The effects of muſcles are different, according to the number of them that act at the ſame time, *e. g.* If the flexors of the leg act alone, the limb will be bended, if the extenſors act they extend it, but if both extenſors and flexors act at the ſame time, the leg will neither be bended nor extended. If, whilſt a muſcle is in action, we examine it, the following phænomena may be obſerved: 1ſt, It grows tenſe, and endeavours to ſhorten itſelf in the direction of its fibres. 2dly, It grows harder in proportion to the energy with which it acts. 3dly, It becomes ſhorter if not overpowered by a ſuperior force: the degree of accurtation is in general about one third of its whole length; but in many muſcles of the body, particularly thoſe ſurrounding cavities, it is conſiderably more. 5thly, A muſcle in action is not increaſed in bulk, when we take all its parts together; it ſwells, indeed, at a particular part, but its whole bulk is neither increaſed nor diminiſhed. 6thly, Muſcles are not naturally in a ſtate of much tenſion; they have a tonic power, which enables them to adapt themſelves to the poſition in which they are placed, conſtantly keeping the fibres in a ſtraight line. The power which muſcles have, of contracting themſelves, is not owing merely to their arteries, veins or nerves, but is dependent on their longitudinal fibres, which in man and quadrupeds are red, and of different colours in other animals. Yet this power is in a particular manner dependent on the nervous ſyſtem, as appears from the following phænomena.

If a nerve going to a muſcle, be irritated, the muſcle is made to contract: this experiment has been frequently made on the diaphragm, by laying bare the phrenic nerve, and ſtripping it. Thence phyſiologiſts were led to ſuſpect, that muſcular fibres were hollow, and that contraction was produced by an influx of the nervous fluid into them. This idea was corrected, by obſerving that the experiment ſucceeds equally well, whether the nerves are ſtripped upwards or downwards, and that irritation of any kind will produce the ſame effect. If a nerve going to a muſcle be cut through, that muſcle loſes its power of contraction, though the effect is not immediate. Irritation of the brain produces contraction in the muſcles that receive their nerves from that part of it, ſimilar to irritation made on the nerves in any part of their paſſage from the brain to the muſcles they ſupply; hence ſpaſmodic contractions and convulſions are produced from irritation on the brain, *e. g.* compreſſion of the brain produces the ſame effects as the diviſion, or compreſſion of a nerve; therefore, if blood or matter be extravaſated, paralyſis will frequently enſue; all theſe phænomena ſhew ſo ſtrong a connection between the nervous and muſcular fibres, that ſome phyſiologiſts have ſuſpected, that muſcular fibres were only modifications of the nervous fibre. The nervous influence is not only neceſſary for muſcular action, but an influx of blood ſeems alſo requiſite; for if a muſcle be deprived of blood by the diviſion of its arteries, that muſcle not only ſuffers from want of nouriſhment, but alſo becomes paralytic; and this takes place in ſo ſhort a time, that ſome phyſiologiſts have ſuppoſed, that muſcular fibres were formed by a chain of hollow veſicles, and that muſcular contraction was produced by blood flowing into and diſtending them. Blood is not the efficient cauſe of contraction, though a *cauſa ſine qua non*. This power of contraction, is excited by ſtimuli, which are either corporeal, or mental. Muſcles differ from one another in being more or leſs influenced by the mind; the greater number of muſcles are obedient to the will, and the mind, when ſhe pleaſes, makes them contract; theſe we call voluntary muſcles; but ſome muſcles act involuntarily; ſome muſcles are of a mixed kind, as thoſe of reſpiration, being partly voluntary, and partly involuntary; at birth all muſcles are involuntary; the child moving the limbs in all directions, as excited by particular feelings. By degrees the mind acquires a power over moſt of the muſcles, ſo as to be able to direct their contraction; this power at firſt is very imperfect; as the power which the mind has over the muſcles is acquired, ſo it can be loſt, if diſcontinued; this ſeems to be partly the caſe in the limbs of thoſe who have been long bed-ridden. Muſcles, if long diſuſed, will degenerate into mere cellular membrane. The mind's power over the muſcles is not limited; nor is the force they are capable of exerting, ſo confined, as we might be led to ſuſpect. That the influence of the mind, and the power of action is increaſed by frequent uſe, is evinced, by obſerving, that we uſe the right hand with greater alacrity, than the left; and that the muſcles frequently uſed, act with greater energy than others, is proved by obſerving that the right arm of a fencing maſter, is ſtronger and larger than the left. The abſolute force of a muſcle, is the whole power it is capable of exerting, the relative force, the weight it is capable of raiſing, or diſplacing. Muſcles lying parallel to the bones, and being inſerted near to the centre of motion, loſe conſiderably of their abſolute force; if muſcles were inſerted into bones at right angles, they would have raiſed a weight as much heavier than that they are now capable of raiſing, as a right angle is greater than the angles they now make; but this diſadvantage is compenſated by the quickneſs of our motions. Muſcular contraction continues no longer than a ſtimulus is applied, therefore muſcles are alternately contracted and relaxed. In all voluntary motions, the mind applies the ſtimulus. Beſides the contraction which muſcles have on being irritated, they have a natural tendency to adapt themſelves to the ſpace into which they are placed; this is called the vis tonica. This power continues a ſhort time after life, and to this power, is owing: the contraction of hollow muſcles, when not diſtended mechanically.

PART IV.

ANGIOLOGY.

THE office of arteries, are to carry blood from the heart, to the diſtant parts of the body. The office of veins are to return that blood to the heart, when the purpoſes of the animal œconomy have been effected. The arteries, two in number, arteria pulmonalis, ariſing from the right ventricle of the heart, and aorta, ariſing from the left ventricle, theſe arteries, as they originate from the heart, decuſſate each other; every part of the body receives blood from the branches of the aorta, for the various purpoſes of nutrition, vivification and ſecretion. The branches of the aorta are diſtinguiſhed by particular names, deſcriptive of their ſituation and offices. The aorta, though originating from the left ventricle of the heart, is placed on the right of the ſpine: from the left ventricle, it aſcends as high as the joint between the firſt and ſecond bones of the ſternum; this part called ſinus aortæ; then bending to the left of the ſpine, it forms an arch called curvature of the aorta; between the beginning of the aorta and the left ventricle, are three valves, called valvulæ ſemilunares, theſe prevent the return of blood from the aorta into the ventricle. The arteries coming from the aorta, ariſe in the following order:

Arteriæ coronariæ, reflected from the aorta; their orifices being covered by the valvulæ ſemilunares, are diſtributed to the heart.

Arteriæ thymicæ, ariſe from the ſinus aortæ, large in the fœtus, ſupplying the thymus gland with blood. In the adult, ſmall, and principally diſtributed to the anterior mediaſtinal ſpace.

From the curvature of the aorta, here ariſes three veſſels; the firſt, being anterior, is the common trunk of the carotid and ſubclavian on the right ſide; the ſecond, the left carotid; and the third, left ſubclavian.

The carotid artery aſcends on the fore part of the neck, on the ſide of the trachea arteria, as high as the angle of the lower jaw, without giving off any branch: here, it divides into two trunks, called external and internal carotid. The external, is divided into the five following branches:

1. Thyroidæa ſuperior, or ſuperior guttural, ſupplies the ſuperior part of the thyroid gland.

2. Sublingualis, paſſing under the mylo hyoidæus, is diſtributed to the ſurface of the tongue, to the muſcles that move it, and to ſome muſcles of the pharynx.

3. Facialis, bends under the jaw and ſends off a branch to the chin, called genial; thence, paſſing over the baſis of the jaw, near the anterior edge of the maſſiter, aſcends on the ſide of the cheek, ſends a branch to the lower lip, called inferior labial, one to the upper lip, called the ſuperior labial, a branch to the noſe, called naſal, and ſome ſmall branches to the muſcles and ſkin of the face. The remaining part of the trunk, paſſing between the noſe and cheek, ſends a branch through the foramen orbitale externum inferius, then paſſing to the inner canthus of the eye, is called angular artery, this ſends a branch into the orbit, which anaſtamoſes with a branch from the arteria optica. The remaining branches are diſtributed to the muſcles and ſkin of the forehead.

4. Occipitalis paſſing behind the maſtoidæus and ſplenius, ſends branches to the muſcles and ſkin on the back part of the head, theſe anaſtamoſe with the branches of the temporal artery.

5. Superior maxillary paſſing within the proceſs of the lower jaw, ſends the ſuperficial temporal artery, which paſſing through the parotid gland, ſupplies it with blood, then aſcending on the ſide of the head, and giving off branches to the adjacent parts, divides into three branches, the middle one paſſing immediately upwards, is diſtributed to the ſuperior part of the ſcalp, and communicates with its fellow on the oppoſite ſide, the poſterior paſſing obliquely backwards, communicates with the occipitalis, the anterior running obliquely forwards, communicates with the branches of the facial artery. The trunk lying within the proceſs of the lower jaw, gives off branches to the pterigoid muſcles, the deep ſeated temporal, ſupplying the temporal muſcle with blood, ſends branches to Schnider's membrane, to the antrum highmorianum and an artery, which paſſing through the foramen ſpinoſum, is diſtributed to the dura mater.

Internal carotid or cerebralis paſſing through the ſpiral canal in the petrous portion of the temporal bone, runs on the ſide of the ſella turcica, ſends off a branch, called arteria optica, which paſſing through the foramen opticum, is diſtributed to the eye-ball and its appendages, other branches from the internal carotids, anaſtamoſe, with branches from the baſilary artery, and form a circle of communication round the ſella turcica, called circus arterioſus Williſii; the branches of the internal carotids are ſpread out on the pia mater, and ſupply the brain with blood.

Subclavian. On the right ſide, ſeparates from the carotid artery, and paſſing on nearly at a right angle, ſends off the inferior thyroid, or inferior guttural artery; this aſcending on the ſide of the neck, gives branches to the œſophagus and trachea arteria; then entering the lower part of the thyroid gland, communicates largely with the thyroidea ſuperior; the ſubclavian paſſing on a little further, gives off a large artery, called vertebralis, which, aſcending through the canal formed by the holes in the tranſverſe proceſſes of the vertebræ colli, enters the foramen magnum occipitale. On the cuneiform proceſs of the os occipitis, the two vertebral arteries uniting, form the baſilary artery. The ſubclavian paſſing between the heads of the ſcalenus muſcle, ſends off ſome branches to the muſcles of the neck, from whence running on towards the arm, and lying between the clavicle and firſt rib, it is lodged in a furrow on the upper part of that rib, and entering the axillary cavity, takes the name of axillary artery; whilſt in the axilla, it ſends off a branch to the upper part of the ſcapula, called ſcapulary artery; there are three or four branches, called thoracic or external mammary; theſe ſupply ſome of the muſcles on the ſide of the trunk in men, and the breaſts in women; a large branch paſſing near the inferior coſta ſcapulæ, is called inferior ſcapulary; the trunk of the artery being ſeated near the head of the os brachii, ſends off a branch which, ſurrounding the upper extremity of the os brachii, ſupplies with blood the deltoid, and parts about the joint; this artery paſſing below the fold of the axilla, is called brachial, lying on the inſide of the arm, ſends off branches to the ſkin and muſcles of the arm; beſides theſe, are three branches, called anaſtamoſing arteries, which communicate with branches, that are reflected from the arteries ſeated below the joint of the cubit; the ſuperior ariſes from the upper part of the brachial artery; the ſecond, called circumflexa, near the middle of the arm; the third, about an inch and a half above the joint of the cubit. The brachial artery paſſing from the arm to the fore-arm, lies on the inſide of the joint, and is covered by the faſcia of the biceps muſcle; about an inch below the joint of the cubit, it ſends off a large artery, called radial; then deſcending a little further, and becoming deep-ſeated under the muſcles on the inner ſide of the fore arm, it divides into branches; the larger called ulnar, the ſmaller, interoſſeous.

The radial reflects an artery immediately below the joint of the cubit, which ſupplies the parts of the joint with blood, and anaſtamoſes the circumflexa. The upper part of the artery lies on the fore part of the radius, and is covered by muſcles; deſcending, becomes more ſuperficial; near the joint of the carpus, ſends a branch into the palm of the hand, ſupplying the thumb; then paſſing under the tendons of the extenſor muſcles of the thumb, gives off branches to the back of the hand; the remaining part of this artery enters the palm, between the metacarpal bone ſuſtaining the index and the firſt bone of the thumb, where it ſupplies the interoſſei muſcles, &c. and communicates with the branches of the ulnar artery.

The ulnar artery, like the radial, reflects a branch to the inner condyle of the arm, which anaſtamoſes with the inferior branch of the brachial artery; at its upper part, is covered by muſcles; near the wriſt, becomes ſuperficial; paſſing over the annular ligament of the carpus, enters the palm of the hand, and ſends a branch to each ſide of each finger: theſe branches anaſtamoſe frequently with the branches of the radial artery.

The interoſſeous artery, lies upon the interoſſeous ligament, ſupplying the deep-ſeated muſcles on the fore arm; paſſing through a hole in the lower part of the interoſſeous ligament, ſupplies the ſkin and muſcles on the back of the hand.

The ſubclavian artery, before it enters between the heads of the ſcalenus muſcle, ſends down a branch to the internal part of the thorax, called internal thoracic, or mammary; deſcending on the inner ſide of the ſternum, ſends branches to the anterior part of the intercoſtal ſpaces; theſe anaſtamoſe with the anterior branches of the intercoſtal arteries; ſends branches to the anterior mediaſtinum, to the pericardium, and ſome large branches to the breaſt in the female, and to the integuments of the cheſt, in the male; theſe anaſtamoſe with the external thoracics, the remaining branches paſs down, on the fourth part of the abdominal muſcles, and communicate with ſome branches from the epigaſtric.

The Aorta having formed its curvature, paſſes obliquely to the left ſide of the cheſt, and deſcending on the left of the ſpine, forms what is called aorta deſcendens; this, whilſt in the cheſt, ſends off from the fore part, two or three ſmall branches to the œſophagus, called œſophagæal; theſe carry blood to the œſophagus; alſo, a branch to each lung, named broncheal, and a few very ſmall branches to the poſterior mediaſtinal ſpace; from the lateral parts of the aorta, the intercoſtal arteries (ten pairs in number) ariſe; they run, at the ſuperior part of each intercoſtal ſpace, in a furrow made in the inferior edge of each rib; as they approach the ſternum, they branch irregularly, being ſometimes at the lower part of the intercoſtal ſpace; the anterior branches anaſtamoſe with the branches of the mammary, and thoſe of the external thoracic arteries; the intercoſtal arteries ſupply with blood the ſpaces between the ribs, ſend branches to the pleura, and others to the muſcles and integuments ſituate on the outer parts of the cheſt. The aorto, whilſt in the thorax, ſends alſo ſome branches into the theca vertebralis, to the ſpinal marrow, &c. The aorta, as it deſcends, gets nearer to the fore part of the ſpine, and paſſing between the two cruræ of the diaphragm, enters the cavity of the abdomen; it there ſends off many large branches, ſome in pairs, and others which have no fellows, and, for this reaſon, are called azygos.

The azygos arteries, are three in number, diſtributed to the chylopoetic viſcera; the firſt, is called Cæliac, ariſes from the fore part of the trunk of the aorto, where it paſſes through, between the two cruræ of the diaphragm: divides into there branches; firſt, the coronary, is diſtributed to the leſſer curvature of the ſtomach; ſecond, the hepatic, runs towards the liver, and divides into two branches, one of which goes to each lobe of the liver: in its paſſage, the hepatic ſends off the pylorica, a branch which goes to the pylorus; the gaſtrica dextra, going to the greater curvature of the ſtomach; the duodenales ſmall branches going to the duodenum, and, laſtly, a branch going to the gall bladder. Third, the ſplenic, is lodged in a ſulcus of the pancreas, and ſupplies it with blood; thence paſſing into the left hypochondrium, divides into ſeveral branches which enter the ſinuoſity of the ſpleen; the ſplenic artery, in its paſſage, gives off four branches to the greater curvature of the ſtomach, called vaſa brevia; the laſt being near the left extremity of the ſtomach, is called gaſtrica ſiniſtra. *Note, All the arteries of the ſtomach anaſtamoſe with each other*.

The omentum receives many ſmall branches from the cœliac; thoſe on the right ſide, ariſe from the gaſtrica dextra; thoſe on the left, from the ſplenic; on the right are called gaſtro-epiploicæ dextræ; ſiniſtræ, on the left.

Meſenterica ſuperior is principally diſtributed to the ſmall inteſtines; on the left ſide, ſends up a branch to the tranſverſe arch of the colon, which is called colica ſiniſtra.

Meſenterica inferior, ſends branches to the lower part of the inteſtinal canal; a large branch to the caput coli, called colica dextra; this aſcending anaſtamoſes with the colica ſiniſtra; ſends branches to the rectum, called hæmorrhoidal. *Note, The two meſenteric arteries anaſtamoſe frequently with euch other*; they ſupply the large and ſmall inteſtines with blood. Phrenic arteries, ſent off by the aorta in the abdomen, are reflected to the under ſurface of the diaphragm, ſupplying it with blood,

Capſular arteries, are diſtributed to the renal capſulæ.

Emulgents, carry blood to the kidnies, for the ſecretion of urine.

Spermatics, ariſe below the emulgents, and commonly from the fore part of the aorta; go to the teſticles in the male; to the ovaria in the female.

Vertebral, are three or four pairs in number, ſend branches to the loins, to the extenſor muſcles of the ſpine, and to the lateral parts of the parietes of the abdomen.

The aorta, deſcending as low as the body of the fourth lumbar vertebra, divides into two branches, called iliac; this part commonly called bifurcation of the aorta; the iliacs paſſing on the inner ſide of the pſoas muſcles, each divides into two branches, the one internal, the other external; the internal iliac paſſing over the brim of the pelvis, gives branches to the bladder, called veſicales; branches to the proſtrate gland and veſicula ſeminales; branches to the muſcles on the internal part of the pelvis, and to the external part of the anus. Alſo a branch, which accompanying the obturator nerve, is diſtributed to the adductors of the thigh, called obturator artery. The trunk, paſſing through the foramen magnum iſchii, ſends off the glutæa to the glutæi muſcles and ſkin of the nates. Alſo ſends off a large branch, which accompanies the ſciatic nerves and anaſtamoſes with the branches of the profundæ. The arteriæ pudicæ runing on the inſide of the tuberoſities of the iſchium, enter the crura penis and carry blood for the erection of the penis. The external iliac, running on the fore part of the pſoas muſcle, at the lower part of the abdomen, juſt before it paſſes under Poupart's ligament, ſends off two branches. Firſt, Ilio-lumbalis, paſſing on the inſide of the ſpine of the ilium, ſends ſmall branches to the iliacus internus and pſoas muſcles; and anaſtamoſes with the vertebral arteries in the loins. Second, Epigaſtric, is reflected to the abdominal muſcles; and aſcending on the inner ſide of the rectus abdominis, ſends branches to the neighbouring parts, which anaſtamoſe with branches from the mammary. The trunk having paſſed under Poupart's ligament into the thigh, ſends off many ſmall muſcular branches to the muſcles ſeated on the thigh; alſo a large branch, which becoming deep-ſeated, goes to the joint of the thigh and muſcles ſurrounding it. A large branch, called profunda, conveying blood to the muſcles on the back part of the thigh, and anaſtamoſing with ſome branches of the internal iliac. The artery paſſing obliquely round the inner ſide of the thigh, gets into the ham, where it takes the name popliteal, entering the leg between the two heads of the gaſtrocnemius divides into three branches, the firſt paſſing through a hole in the interoſſeous ligament, comes on the outer ſide of the tibia, and deſcending on the fore part of the leg, is called tibialis antica, paſſing under the annular ligament of the tarſus, ſends a branch to the upper part of the foot, and one to the great toe; the trunk running between the bones of the tarſus, gets into the ſole of the foot, gives branches to the deep ſeated muſcles, and anaſtamoſes with the tibialis poſtica.

Tibialis poſtica; the ſecond branch, running on the poſterior part of the tibia, gives branches to the muſcles on the back part of the leg, paſſing under the maleolus internus, gets into the calcaneum, and running under the faſcia of the foot, ſends branches to the ſkin, on the under ſide of the foot, and two branches to each toe. This artery makes frequent communications with the tibialis antica. Peronea or interoſſea, is the third branch, paſſing on the inner of the perona, ſends branches to the muſcles and ſkin on the outer ſide of the leg, running on to the maleolus externus, ſends branches to the outer ſide of the foot.

Explanation to the PLATE *of* ARTERIES.

THE HEART, NECK, AND HEAD.

A, Right auricle of the heart. B, Left auricle. C, The ventricles of the heart, with the coronary arteries and veins. D, Pulmonary artery. E, Aorta aſcendens. F, Arch of aorta. G, Trunk of the right ſubclavian, and carotid arteries. H, Left carotid. I, Left ſubclavian. K, Internal carotid. E, External carotid. M, Facial. N, Labial. O, Superior maxillary. P, Occipital, Q, Temporal. R, Vertebral. S, Superior thyroid. T, Lingual.

UPPER EXTREMITY.

A, Axillary artery. B, B, Humeral. C, C, C, Its anatomoſing branches. D, Ulnar. E, Radial. F, Interoſſeal. G, External arch in the palm of the hand. H, Internal ditto.

THE TRUNK.

AAA, Intercoſtals, 12 pair. B, B, Bronchial arteries. C, Phrenic arteries. D, Cœliac artery giving off. E, Gaſtrica dextra. F, Hepatic artery. G, Splenic. H, Superior meſenteric. I, I, Inferior meſenteric. K, Emulgent. L, Spermatic. M, M, Five pair of lumbar arteries. N, Sacral artery. O, Hemorrhoidal. P, Bifurcation of aorta. Q, Q, The two iliacs. R, External iliac. S, Internal iliac. S, Veſicales. T, Pudicus internus. U, Obturator. W, Sciatica. X, Epigaſtrica.

LOWER EXTREMITY.

A, A, Crural artery. B, Profundus. C, External pudical. D, Popliteal. E, Anterior tibial. F, Poſterior tibial. G, Interoſſeal. H, External arch of the ſole of the foot. I, Internal ditto.

N. B. Almoſt all the arteries go off in pairs, ſo that a deſcription of one ſide of the body is ſufficient.

SECT. II.

VEINS.

Veins in the human body are ſix in number, which terminate in the heart, viz. cava ſuperior, cava inferior, and four pulmonary veins.

The blood carried from the left ventricle of the heart by the aorta, having performed the offices of nutrition, vivification, and ſecretion, is returned to the right auricle by the two cavæ. The blood carried from the heart by the branches of the aorta, above the diaphragm, is returned by the branches of the cava ſuperior; that below the diaphragm, by the cava inferior.

When we trace the veins phyſiologically, we begin at the extreme parts of the body, but the beſt method for ſtudents, is to trace them anatomically, like the arteries, viz. from trunk to branch.

The cava ſuperior aſcending from the heart, whilſt in the cheſt, receives branches from the thymus gland, called venæ thymicæ; ſmall branches on the fore part, from the anterior mediaſtinal ſpace; receives the vena azygos, on its back part, returning the blood carried to the parts of the cheſt, by the intercoſtal arteries; alſo the internal thoracic vein attending on the mammary artery. At the upper part of the cheſt, the cava divides into two branches, called ſubclavians; that on the right ſide ſhort; that on the left long. The left ſubclavian croſſes the cheſt on the fore part of the large veſſels ariſing from the curvature of the aorta. The two ſubclavians have ſimilar diſtributions; each one aſcending on the ſide of neck, forms the internal or deep-ſeated jugular, paſſing on the outer ſide of the carotid artery. Near the angle of the lower jaw, the internal jugular receives branches from the thyroid gland; alſo ſeveral ſmall branches from the muſcles on the neck; it then divides into branches, which accompany all the branches of the external carotid, except thoſe that go to the face and ſide of the head; and entering the thimble-like cavity in the baſis of the ſkull, forms the ſinuſes of the dura mater, which receive the blood carried to the brain by the internal carotid. Oppoſite to the firſt bone of the ſternum, the left ſubclavian receives three or four ſmall branches from the lower part of the thyroid gland and muſcles on the fore part of the neck.

The ſubclavian paſſing towards the ſcalenus, ſends off the external jugular, which aſcending obliquely on the ſide of the neck, lies ſuperficial under the platyſma myhoides; receives many ſmall branches from the ſkin of the neck, near the angle of the jaw; alſo the temporal vein returning the blood from the temporal artery, then paſſing over the baſis of the jaw, accompanies the facial

Organs of Sense See System of Anatomy.

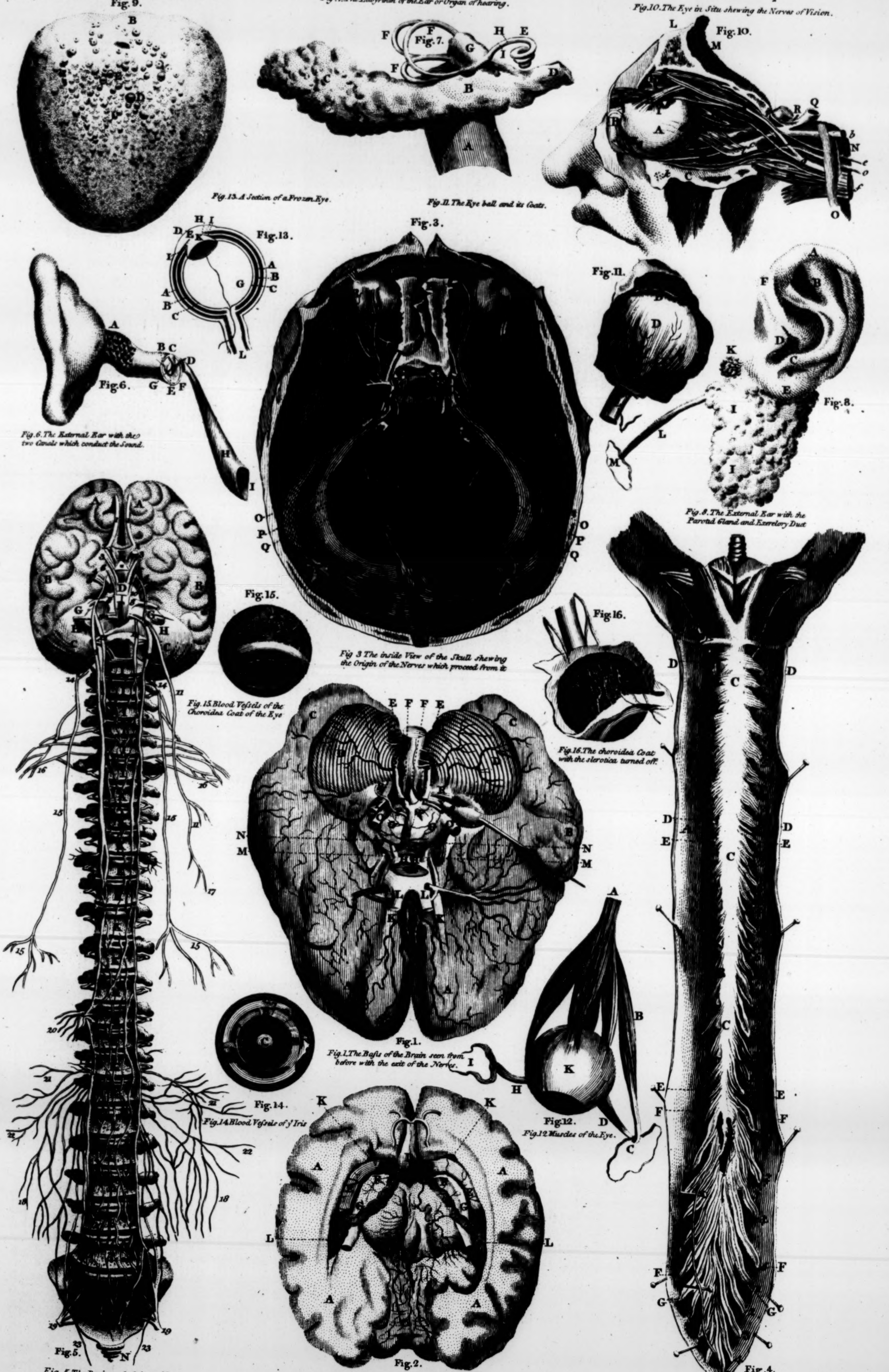
Fig. 9.
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Fig. 9. The Tongue with its Papillæ or Organs of Taste.

Fig. 7. The Labyrinth of the Ear or Organ of hearing.

Fig. 10. The Eye in Situ shewing the Nerves of Vision.

Fig. 13. A Section of a Frozen Eye.

Fig. 11. The Eye ball and its Coats.

Fig. 6. The External Ear with the two Canals which conduct the Sound.

Fig. 8. The External Ear with the Parotid Gland and Exeretory Duct

Fig. 3 The inside View of the Skull shewing the Origin of the Nerves which proceed from it

Fig. 15. Blood Veſsels of the Choroidea Coat of the Eye

Fig. 16. The choroidea Coat with the slerotica turned off.

Fig. 1. The Baſis of the Brain seen from before with the exit of the Nerves.

Fig. 14. Blood Veſsels of yᵉ Iris

Fig. 12. Muscles of the Eye.

Fig. 5. The Brain and Spine with the distant destribution of the Nerves.

Fig. 2. A Section of the Brain shewing the Lateral Ventricles and their Contents.

Fig. 4. A posterior View of the Spinal Marrow with the Origin of its Nerves

E. Birnee delin.ᵗ

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J. Taylor sculp.

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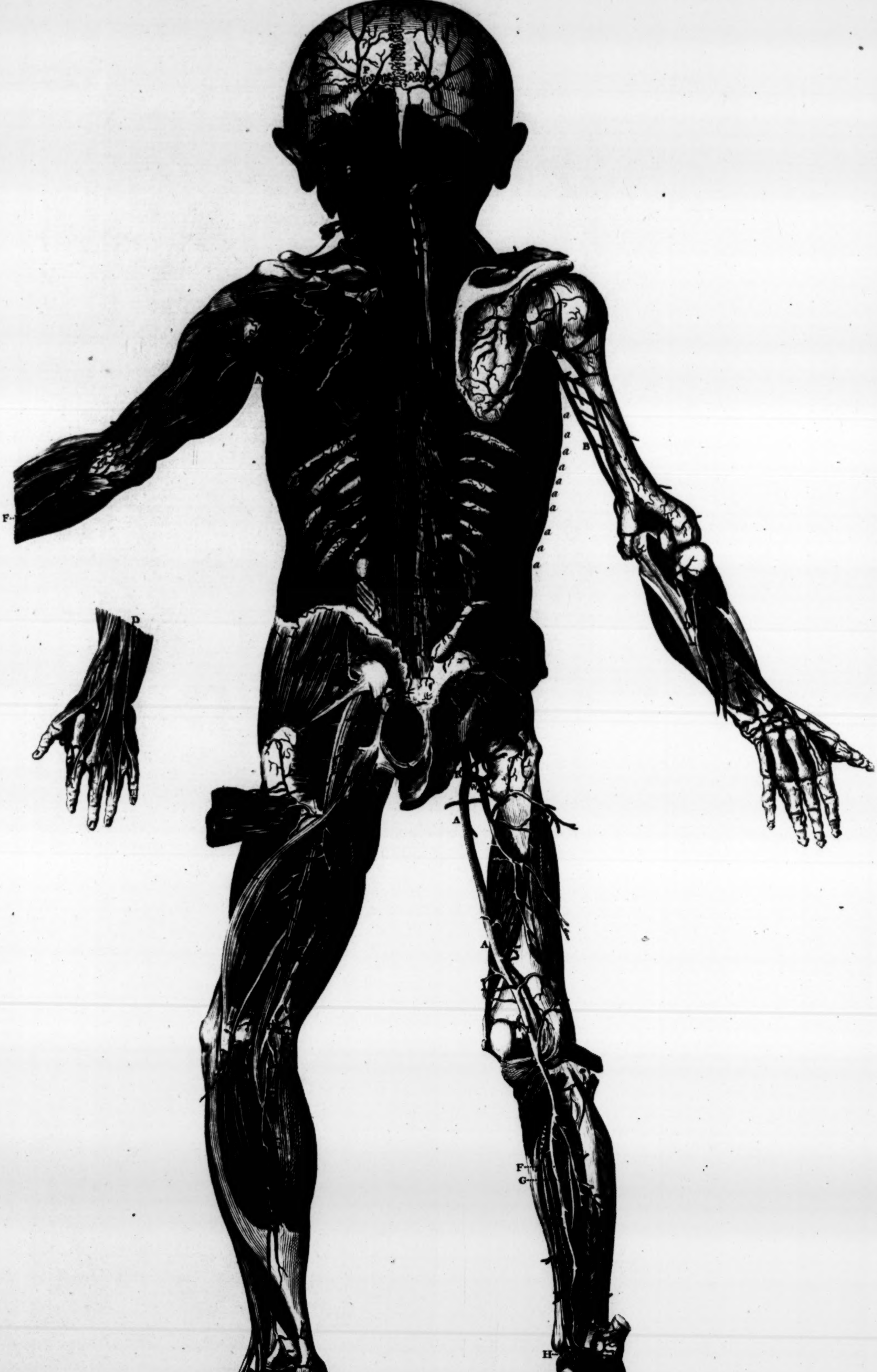
Back View of the Arteries, with the Muscles on the right side of the Body diſsected off, in order to shew the deep sealed Arteries. See System of Anatomy Part 4. Sect. 1.



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Absorbent Vessels See System of Anatomy Part 4 Sect. 3^{n}

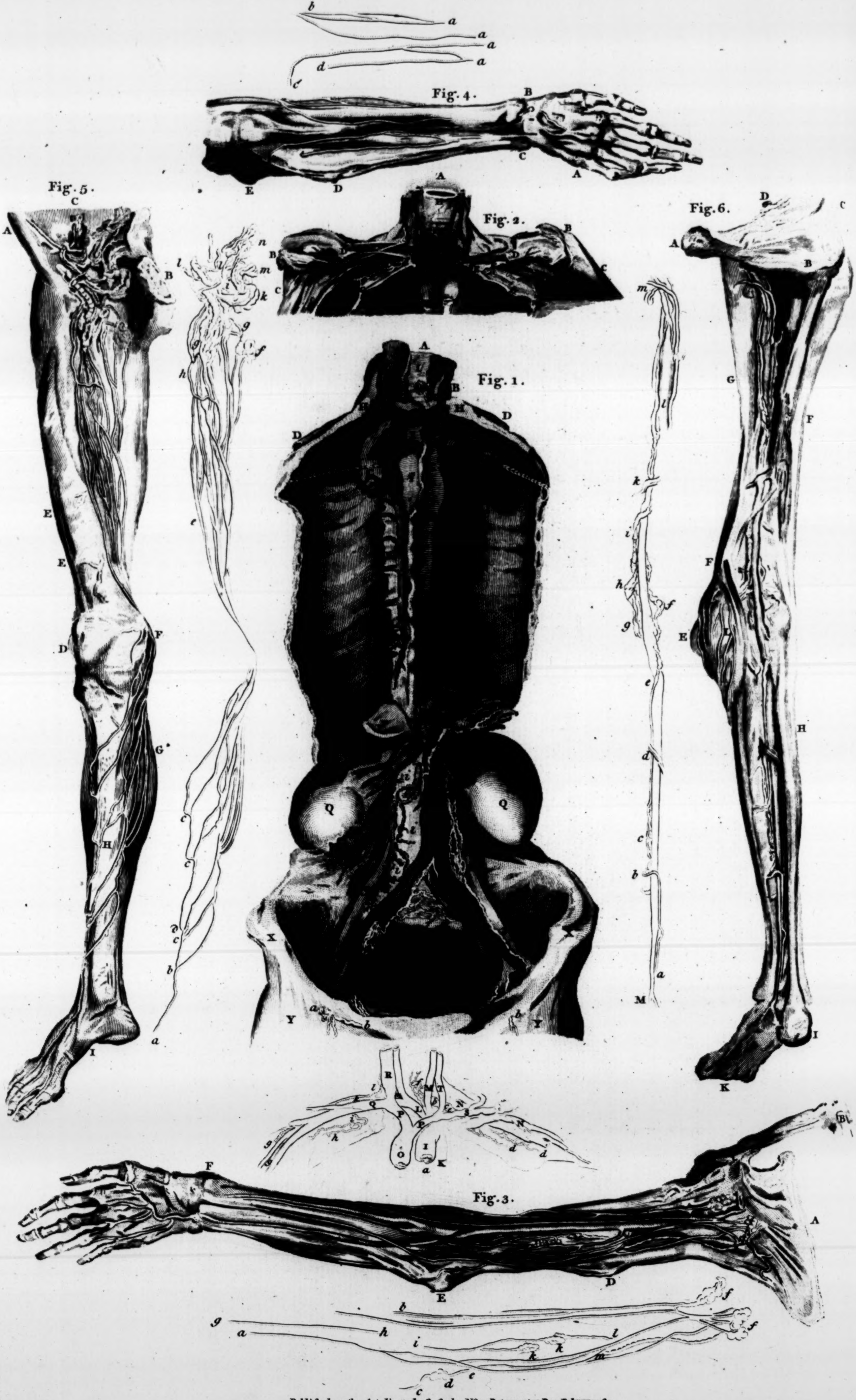
Fig. 4.
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artery, ſending branches to the different parts of the face, which receive the ſame names as are given to the arteries, to which they correſpond. The angular vein enters the orbit, and communicates with branches from the internal part of the ſkull. The external jugular frequently communicates with the internal, near the angle of the jaw; in theſe inſtances the external one is wanting on the neck. The ſubclavian paſſing on, towards the arm receives a large vein which ordinarily attends on the vertebral artery; alſo ſeveral ſmall branches from the muſcles and ſkin on the back of the neck; then paſſing between the heads of the ſcalenus, it accompanies the artery to the arm, between the clavicle and firſt rib, it is placed on the inner ſide next the ſternum; juſt before it paſſes under the clavicle, it receives the cephalic vein which running between the pectoral and deltoid muſcles, paſſes on the outer part of the biceps flexor cubiti, and gets to the joint of the cubit, where it communicates with branches which come from the fore-arm. The veins in the extremities are larger and more numerous than the arteries, and are divided into two ſets; one lying immediately under the ſkin, called ſuperficial; the other deep ſeated, accompanying the branches of the artery; in general two veins attend on each arterial branch: theſe veins take the ſame names that are given to the arteries they accompany. The axillary vein receives the external thoracic and ſuperior ſcapulary veins; deſcending on the inner ſide of the biceps flexor receives many muſcular and ſmall cutaneous branches. A little above the joint of the cubit, receives the ſuperficial vein from the fore arm. The trunk paſſing under the faſcia of the biceps becomes deep ſeated, and attends the radial, ulnar and interoſſeal arteries. The ſuperficial veins from the fore arm, at the joint of the cubit, form three branches, which communicate with each other; thoſe from the back and outer part make the cephalic; thoſe on the fore part, the median; and thoſe on the inner ſide form the baſilic; all thoſe are ſuperficial at the joint of the cubit, and the two latter open in the deep ſeated vein, a little above the joint. The vein coming from the little finger is called vena ſalvatella.

Vena cava inferior paſſes through the centrum tendinoſum of the diaphragm, is lodged in the ſulcus of the liver, receives from the liver the venæ cavæ hepaticæ; and paſſing down on the right of the ſpine receives branches, in the following order: the phrenic veins from the diaphragm; capſular veins from the renal capſulæ; emulgent veins from the kidneys; the right ſpermatic vein, and three or four ſmall vertebral veins. *Note, The veins coming from the left ſide of the ſpine are longer than thoſe on the right.* The cava attending the aorta at its bifurcation, divides into two iliacs; each iliac is divided into external and internal: the internal paſſing over the brim of the pelvis, divides into branches which attend on the branches of the internal iliac artery, and receives the ſame names applied to the arteries they accompany. The veins of the penis are two in number, one deep ſeated in dorſo penis, placed in a ſulcus between the corpora cavernoſa, and called vena magna ipſius penis; the other ſuperficial, belonging to the integuments, called vena tegmentorum; the two communicate near the ſymphiſis pubis, under which they paſs and open into the veins of the bladder. The external iliac vein, paſſing on the inner ſide of the artery, runs under Poupart's ligament into the thigh. On the inner ſide, it receives the trunk of the ſuperficial veins of the leg and foot, this called vena ſaphena, ſeated on the inſide of the knee. The deep ſeated vein accompanies the artery to all parts of the lower extremity

For the peculiarities in the female, ſee female organs of generation.

Vena portarum, is a vein peculiar to the viſcera, and formed in the following manner: the three azygos arteries having ſupplied the chylopoetic viſcera with blood for the purpoſes of ſecretion, &c. that blood is returned by branches of veins, which every where accompany the arteries, except the hepatic branch; all theſe veins unite and form a large trunk, which, inſtead of opening into the cava inferior like other veins, paſſes on to the liver, and enters its ſubſtance, at the part called portæ. (from whence this vein takes its name;) then dividing into branches ramifies to all parts of the liver, carrying blood to it for the purpoſe of ſecretion, and is, ex officio, an artery. The blood carried to the liver both by the arteria hepatica for nutrition, and by the vena portarum for ſecretion, is returned into the cava inferior, by three large and two or three ſmall veins, called venæ cavæ hepaticæ; theſe pour their blood into the cava inferior, whilſt it lies in a ſulcus of the liver, or juſt before it paſſes through the centrum tendinoſum of the diaphragm to open into the heart.

The veins of the heart, called coronary, open into the right auricle.

Deſcription of the PLATE *of the* VEINS.

A, The heart. B, The ſuperior cava. C, C, The inferior cava. D, The right ſubclavian. E, The left ſubclavian. F, Right jugular. G, Left jugular. H, External jugular. I, Facial. K, Temporal. L, Occipital. M, Lingual. N, Superior thyroid. O, Vertebral. P, Mammary.

UPPER EXTREMITY.

A, Axillary. B, Humeral. C, Cephalic. D, Baſilic. E, Median. F, Salvatella. G, G, G, Deep-ſeated veins accompanying the arteries.

TRUNK.

A A, vena azygos. B, Phrenic. C, Cavæ hepaticæ. D, Vena portarum. E, Emulgent. F, Spermatic. G, Lumbar. H, Befurcation of the cava inferior. I I, Two iliacs. K, External iliac. L, Internal iliac. M, Veſical. N, Hæmorrhoidal. O, Pudical.

LOWER EXTREMITY.

AA, Femoral. B, Epigaſtric. CC, Vena ſupphena. D, Popliteal. E, E, E, Deep-ſeated veins accompanying the arteries.

N. B. The veins alſo go off in pairs for the moſt part.

SECT. III.

COURSE AND DISTRIBUTION OF THE ABSORBENT SYSTEM.

Whoever carefully views the Abſorbent Syſtem, muſt be convinced, that as it explains, and points out the cure of many diſeaſes, it deſerves the attention of the practitioners of the healing art. And as it is ſo generally diffuſed through the animal kingdom, it ſtrongly claims the regard of thoſe who wiſh to enquire philoſophically into the animal œconomy. I have in this Section introduced Six Repreſentations, and have added to them copious deſcriptions, which with what is inſerted under General Obſervations, (in Part I. Sect. V.) *will ſufficiently illuſtrate the Syſtem of Abſorbents.*

Explanation of the PLATE *on the* ABSORBENT VESSELS.

FIGURE I.

Exhibits the Trunk of the Human Subject, prepared to ſhew the Lymphatic Veſſels and the Ductus Thoracicus.

A, The neck. BB, The two jugular veins. C, The vena cava ſuperior. DDDD, The ſubclavian veins. E, The beginning of the aorta pulled to the left ſide by means of a ligature, in order to ſhew the thoracic duct behind it. F, The branches ariſing from the curvature of the aorta. GG, The two carotid arteries. HH, The firſt ribs. II, The trachea. KK, The ſpine. LL, The vena azygos. MM, The deſcending aorta. N, The cœliac artery dividing into three branches. O, The ſuperior meſenteric artery. P, The right crus diaphragmatis. QQ, The two kidneys. R, The right emulgent arrery. SS, The external illiac arteries. g, d, The muſculi pſoæ. T, The internal illiac artery. U, The cavity of the pelvis. XX, The ſpine of the os illium. YY, The groins. *a*, A lymphatic gland in the groin, into which lymphatic veſſels from the lower extremity are ſeen to enter. *b b*, The lymphatic veſſels of the lower extremities paſſing under pouparts ligament. *c c*, A plexus of the lymphatic veſſels lying on each ſide of the pelvis. *d*, The pſoas muſcle, with lymphatic veſſels lying upon its inſide. *e*, A plexus of lymphatics, which having paſſed over the brim of the pelvis at (*c*), having entered the cavity of the pelvis, and received the lymphatic veſſels belonging to the viſcera contained in that cavity, next aſcends, and paſſes behind the illiac artery to (*g*). *f*, Some lymphatic veſſels of the left ſide paſſing over the upper part of the os ſacrum, to meet thoſe of the right ſide. *g*, The right pſoas, with a large plexus of lymphatics lying on its inſide. *h h*, The plexus lying on each ſide of the ſpine. *i i, i*, Spaces occupied by the lymphatic glands. *k*, The trunk of the lacteals lying on the under ſide of the ſuperior meſenteric artery. *l*, The ſame dividing into two branches, one of which paſſes on each ſide of the aorta; that of the right ſide being ſeen to enter the thoric duct at (*m*). *m*, The thoracic duct beginning from the large lymphatics. *n*, The duct paſſing under the lower part of the crus diaphragmatis and under the right emulgent artery. *o*, The thoracic duct penetrating the thorax. *p*, Some lymphatic veſſels joining that duct in the thorax. *q*, The thoracic duct paſſing under the curvature of the aorta, to get to the left ſubclavian vein. The aorta being drawn aſide to ſhew the duct. *r*, A plexus of lymphatic veſſels paſſing upon the trachea from the thyroide gland to the thoracic duct.

FIGURE II.

This Figure repreſents the Upper Part of the Trunk taken from a higher Point of View, in order to ſhew the Termination of the Thoracic Duct more perfectly, and alſo the Trunks of the Abſorbent Veſſels of the Head and Upper Extremities.

A, The neck. BB, The two ſhoulders with the pectoral muſcles turned over them. CC, The arms. DD, The cut ends of the clavicles. EE, The extremities of the two firſt ribs. FF, The ſubclavian muſcles. GG, The ribs. H, The trachea. I, The aorta aſcendens. K, The aorta deſcendens. L, The trunk of the carotid, and ſubclavian artery of the right ſide. M, The left carotid. NN, The left ſubclavian artery. O, The cava ſuperior. P, The trunks of the ſubclavian and jugular veins. Q, The right ſubclavian vein. R, The right jugular vein. S, The left ſubclavian vein. T, The left jugular. *a*, The thoracic duct paſſing on the right ſide of the deſcending aorta (K), behind the aſcending aorta (I), and behind the lower part of the left carotid artery (M), and then appearing at (*b*). *b*, The upper part of the thoracic duct, lying between the left carotid, and the left jugular vein, and paſſing behind that vein downwards, and outwards towards the angle between the left jugular and the left ſubclavian. *c*, The extremity of the thoracic duct, entering the angle between the left jugular and the left ſubclavian vein.

d d, Two of the trunks of the lymphatics of the left arm lying upon the outſide of the cheſt, and paſſing under the ſubclavian muſcle F (*ſee the figure*) and the ſubclavian vein S, the clavicle itſelf being removed, and its cut extremity ſeen at D, upon the figure. *e*, A trunk formed by the lymphatics of the upper extremity, which trunk joins the extremity of the thoracic duct (*c*), and enters the angle between the left jugular and the left ſubclavian vein. *f*, Lymphatics from the thyroide gland running upon the trachea, and paſſing under the aorta to get to the thoracic duct, juſt where that duct enters the veins. *g g*, A trunk of the lymphatics of the right arm, lying on the outſide of the right brachial artery. *h*, A branch of this trunk making a net-work on the outſide of the thorax juſt under the clavicle. *i*, That net-work paſſing under the right ſubclavian vein (Q), and under the ſubclavian muſcle F, (on the figure) the clavicle itſelf being removed. *k*, The common trunk both of that plexus and of all the other lymphatics of the upper extremity of the right ſide, which trunk lies between the right ſubclavian artery and vein, and paſſes into the angle between the right jugular and the right ſubclavian. *l*, The trunk of the lymphatics of the right ſide of the neck, lying on the outſide of the right jugular vein, and paſſing into the angle between that vein and the ſubclavian of the ſame ſide. *m*, One of the lymphatics of the right ſide of the thyroide gland going under the right jugular vein.

FIGURE III.

Exhibits a fore View of the Upper Extremity. This Repreſentation being made from a dried Preparation, the Muſcles therefore appear very ſmall. It has a peculiarity in the ulnar artery, running over the Muſcles inſtead of under them.

A, The ſcapula. B, The clavicle. C, The extremity of the brachial artery. D, The muſcles lying on the inſide of the arm. E, The inner condyle of the os humeri. F, The lower extremity of the radius.

On the Out-Lines to Fig. 3.

a, A lymphatic veſſel which lies in the cellular membrane immediately under the ſkin, and paſſes up on the inſide of the arm to the axillary glands. b, Superficial lymphatic veſſels paſſing over the muſcles from the back of the fore arm, and likewiſe over the biceps to the glands in the axilla. c, A ſuperficial lymphatic from the back of the fore arm. d, A gland through which it paſſes. e, The lymphatics from the anterior and the poſterior part of the fore arm uniting. f f, Lymphatic glands in the axilla. g, A deeper ſeated lymphatic veſſel, lying cloſe to the radial artery, which it accompanies all the way to (h). h, The deep ſeated lymphatic veſſel paſſing under the interoſſeous and ulnar arteries, and appearing again on the arm at (i). i, The deep ſeated lymphatic veſſel lying cloſe to the brachial artery. k k, Two ſmall lymphatic glands through which it paſſes. l, The ſame veſſel now become much larger, and paſſing under a branch of the artery and ſome cellular membrane, and appearing at (m). m, The trunk of the deep ſeated lymphatic veſſels paſſing upwards to the axilla, where it enters the glands, f f. f f, Three axillary glands, which are common both to the ſuperficial and the deep ſeated lymphatic veſſels.

FIGURE IV.

Exhibits a back View of the fore Arm and Hand. The Preparation from which this View was taken, having been previouſly dried, the Muſcles appear very ſlender.

A, The hand. B, The lower extremity of the radius. C, The lower extremity of the ulna. D, The muſcles on the back of the fore arm turned aſide to exhibit a deep ſeated lymphatic veſſel, which perforates the interoſſeous ligament to get to the fore part. E, The olecranon.

On the Out-Lines to Fig. 4.

a a a, Lymphatics appearing on the back part of the fore arm, immediately under the ſkin. b, Some of the lymphatics, bending over the upper extremity of the radius to get to the fore part of the arm. c, A lymphatic paſſing over the ulna, immediately under the olecranon, and under the inner condyle of the os humeri, to get to the fore part of the arm. d, A lymphatic which has penetrated the muſcles, perforates the interoſſeous ligament, and gets to the fore part of the arm near the radial artery.

FIGURE V.

Exhibits the more ſuperficial Lymphatic Veſſels of the Lower Extremity.

A, The ſpine of the os illium. B, The os pubis. C, The illiac artery. D, The knee. E E, F, Branches of the crural artery. G, The muſculus gaſtrocnemius. H, The tibia. I, The tendon of the muſculus tibialis anticus.

On the Out-Lines to Fig. 5.

a, A lymphatic veſſel belonging to the top of the foot. b, Its firſt diviſion into branches. c c, c, Other diviſions of the ſame lymphatic veſſel. d, A ſmall lymphatic gland. e, The lymphatic veſſels which lie between the ſkin and the muſcles of the thigh. f f, Two lymphatic glands at the upper part of the thigh below the groin. g g, Other glands. h, A lymphatic veſſel which paſſes by the ſide of thoſe glands without communicating with them; and, bending towards the inſide of the groin at (i), opens into the lymphatic gland (k). l l, Lymphatic glands in the groin, which are common to the lymphatic veſſels of the genitals and thoſe of the lower extremity. m, n, A plexus of lymphatic veſſels paſſing on the inſide of the iliac artery.

N. B. The lymphatic veſſels appear in theſe plates, more regularly cylindrical than they are repreſented by Nuck, Ruyſch, and others, in whoſe plates ſuch veſſels are painted more like chains of veſicles than I have ever ſeen them.

FIGURE VI.

Exhibits a back View of the lower Extremity, diſſected ſo as to ſhew the deeper ſeated Lymphatic Veſſels which accompany the Arteries.

N. B. This extremity was dried before the plate was made from it, and the muſcles are therefore much ſhrunk.

A, The os pubis. B, The tuberoſity of the iſchium. C, That part of the os illium, which was articulated with the os ſacrum. D, The extremity of the illiac artery appearing above the groin. E, The knee. F F, The two cut ſurfaces of the triceps muſcle, which was divided to ſhew the lymphatic veſſels that paſs through its perforation along with the crural artery. G, The edge of the muſculus gracilis. H, The gaſtrochnemius and ſoleus, much ſhrunk by being dried, and by the ſoleus being ſeparated from the tibia to expoſe the veſſels. I, The heel. K, The ſole of the foot. L, The ſuperficial lymphatic veſſels paſſing over the knee, to get to the thigh.

On the Out-Lines of Fig. 6.

M, The poſterior tibial artery. a, A lymphatic veſſel accompanying the poſterior tibial artery. b, The ſame veſſel croſſing the artery. c, A ſmall lymphatic gland, through which this deep ſeated lymphatic veſſel paſſes. d, The lymphatic veſſel paſſing under a ſmall part of the ſoleus, which is left attached to the bone, the reſt being removed. e, The lymphatic veſſel croſſing the popliteal artery. f, g, h, Lymphatic glands in the ham, through which the lymphatic veſſel paſſes. i, The lymphatic veſſel paſſing with the crural artery through the perforation of the triceps muſcle. k, The lymphatic veſſel, after it has paſſed the perforation of the triceps, dividing into branches which embrace the artery (l). m, A lymphatic gland belonging to the deep ſeated lymphatic veſſel. At this place thoſe veſſels paſs to the fore part of the groin, where they communicate with the ſupercial lymphatic veſſels. n, A part of the ſuperficial lymphatic veſſels appearing on the brim of the pelvis.

PART V.

SPLANCHNOLOGY,

OR A DESCRIPTION OF THE VISCERA AND FEMALE ORGANS OF GENERATION.

SECT. I.

OF THE ABDOMEN.

THE abdomen, or lower belly, extends from the lower extremity of the ſternum, or the hollow, uſually called the pit of the ſtomach, and more properly *ſcrobiculus cordis*, to the lower part of the trunk.

It is diſtinguiſhed into three diviſions called *regions*; of theſe the upper one, which is called the *epigaſtric region*, begins immediately under the ſternum, and extends to within four fingers breadth of the navel, where the middle or *umbilical region* begins, and reaches to the ſame diſtance below the navel. The third, which is called the *hypogaſtric*, includes the reſt of the abdomen, as far as the os pubis.

Each of the regions is ſubdivided into three others; two of which compoſe the ſides, and the other the middle part of each region.

The middle part of the upper region is called *epigaſtrium*, and its two ſides *hypochondria*. The middle part of the next region is the umbilical region, properly ſo called, and its two ſides are the flanks, or iliac regions. Laſtly, the middle part of the lower region retains the name of hypogaſtrium, and its ſides are called inguina or groins. The back part of the abdomen bears the name of lumbar region.

After having removed the ſkin, adipoſe membrane, and abdominal muſcles, we diſcover the peritonæum or membrane that envelopes all the viſcera of the lower belly. This being opened, the firſt part that preſents itſelf is the omention or cawl, floating on the ſurface of the inteſtines, which are likewiſe ſeen every where looſe and moiſt, and making a great number of circumvolutions through the whole cavity of the abdomen. The ſtomach is placed in the epigaſtrium, and under the ſtomach is the pancreas. The liver fills the right hypochondrium, and the ſpleen is ſituated in the left. The kidneys are ſeen about the middle of the lumbar region, and the urinary bladder and parts of generation are ſeated in the lower diviſion of the belly.

SECT II.

OF THE PERITONÆUM.

The peritonæum is a ſtrong ſimple membrane, by which all the viſcera of the abdomen are ſurrounded, and in ſome meaſure ſupported. Many anatomical writers, particularly Winſlow, have deſcribed it as being compoſed of two diſtinct membranous laminæ; but their deſcription ſeems to be erroneous. What perhaps appeared to be a ſecond lamina, being found to be ſimply a cellular coat, which ſends off productions to the blood-veſſels paſſing out of the abdominal cavity. The aorta and vena caav likewiſe derive a covering from the ſame membrane, which ſeems to be a part of the cellular membrane we have already deſcribed.

The peritonæum, by its productions and reduplications, envelopes the greateſt part of the abdominal viſcera. It is ſoft, and capable of conſiderable extenſion; and is kept ſmooth and moiſt by a vapour, which is conſtantly exhaling from its inner ſurface, and is returned again into the circulation by the abſorbents.

This moiſture not only contributes to the ſoftneſs of the peritonæum, but prevents the attrition, and other ill effects which would otherwiſe probably be occaſioned, by the motion of the viſcera upon each other.

When this fluid is ſupplied in too great a quantity, or the abſorbents become incapable of carrying it off, it accumulates, and conſtitutes an aſcites or dropſy of the belly; and when by any means the exhalation is diſcontinued, the peritonæum thickens, becomes diſeaſed, and the viſcera are ſometimes found adhering to each other.

The peritonæum is not a very vaſcular membrane. In a ſound ſtate it ſeems to be endued with little or no feeling, and the nerves that paſs through it appear to belong to the abdominal muſcles.

SECT. III.

OF THE OMENTUM.

The omentum, epiploon, or cawl, is a double membrane, produced from the peritonæum. It is interlarded with fat, and adheres to the ſtomach, ſpleen, duodenum, and colon: from thence hanging down looſe, and floating on the ſurface of the inteſtines. Its ſize is different in different ſubjects. In ſome it deſcends as low as the pelvis, and it is commonly longer at the left ſide than the right.

The omentum derives its arteries from the ſplenic and hepatic. Its veins terminate in the vena portæ. Its nerves, which are very few, come from the ſplenic and hepatic plexus.

The omentum parvum begins at the upper part of the duodenum, extends along the leſſer curvature of the ſtomach as far as the œſophagus, and terminates about the neck of the gall-bladder, and behind the left ligament of the liver, ſo that it covers the leſſer lobe; near the beginning of which we may obſerve a ſmall opening, firſt deſcribed by Winſlow, through which the whole pouch may eaſily be diſtended with air. The veſſels of the omentum parvum are derived chiefly from the coronary ſtomachic arteries and veins.

The uſes of the omentum are not yet ſatisfactorily determined. Perhaps by its ſoftneſs and looſeneſs it may ſerve to prevent thoſe adheſions of the abdominal viſcera, which have been found to take place when the fat of the omentum has been much waſted. Some authors have ſuppoſed, that it aſſiſts in the preparation of bile; but this idea is founded merely on conjecture.

SECT. IV.

OF THE OESOPHAGUS.

THE œſophagus or gullet is a membranous and muſcular canal, extending from the bottom of the mouth to the upper orifice of the ſtomach. Its upper part, where the aliment is received is ſhaped ſomewhat like a funnel, and is called the *pharynx*.

From hence it runs down cloſe to the bodies of the vertebræ as far as the diaphragm, in which there is an opening through which it paſſes, and then terminates in the ſtomach about the eleventh or twelfth vertebra of the back.

The œſophagus is plentifully ſupplied with arteries from the external carotid, bronchial, and ſuperior intercoſtal arteries; its veins empty themſelves into the vena azygos, internal jugular, and mammary veins, &c.

Its nerves are derived chiefly from the eighth pair.

We likewiſe meet with a mucus in the œſophagus, which every where lubricates its inner ſurface, and tends to aſſiſt in deglutition. This mucus ſeems to be ſecreted by very minute glands, like the mucus in other parts of the alimentary canal.

SECT. V.

OF THE STOMACH.

THE Stomach is a membranous and muſcular bag, in ſhape not unlike a bagpipe, lying acroſs the upper part of the abdomen, and inclining rather more to the left than the right ſide.

It has two orifices, one of which receives the end of the œſophagus, and is called the *cardia*, and ſometimes the left and upper orifice of the ſtomach; though its ſituation is not much higher than the other, which is ſtyled the right and inferior orifice, and more commonly the *pylorus*; both theſe openings are more elevated than the body of the Stomach.

The aliment paſſes down the œſophagus into the Stomach, through the cardia; and after having undergone the neceſſary digeſtion, paſſes out at the pylorus, where the inteſtinal canal commences.

The Stomach is compoſed of four tunics or coats, which are ſo intimately connected together, that it requires no little dexterity in the anatomiſt to demonſtrate them. The exterior one is membranous, being derived from the peritonæum. The ſecond is a muſcular tunic, compoſed of fleſhy fibres, which are in the greateſt number about the two orifices. The third is called the nervous coat, and within this is the villous or velvet-like coat which compoſes the inſide of the Stomach.

The two laſt coats being more extenſive than the two firſt, form the folds, which are obſerved every where in the cavity of this viſcus, and more particularly about the pylorus; where they ſeem to impede the too haſty excluſion of the aliment, making a conſiderable plait, called *valvula pylori*.

The inner coat is conſtantly moiſtened by a mucus, which approaches to the nature of the ſaliva, and is called the gaſtric juice; this liquor has been ſuppoſed to be ſecreted by certain minute glands, ſeated in the nervous tunic, whoſe excretory ducts open on the ſurface of the villous coat.

The arteries of the ſtomach called the gaſtric arteries are principally derived from the cæliac; ſome of its veins paſs to the ſplenic, and others to the vena portæ; and its nerves are chiefly from the eighth pair or par vagum.

The account given of the tunics of the ſtomach may be applied to the whole alimentary canal; for both the œſophagus and inteſtines are, like this viſcus, compoſed of four coats.

Before we deſcribe the courſe of the aliment and the uſes of the ſtomach, it will be neceſſary to ſpeak of other parts which aſſiſt in the proceſs of digeſtion.

SECT. VI.

OF THE INTESTINES.

THE Inteſtines form a canal, which is uſually ſix times longer than the body to which it belongs. This canal extends from the pylorus, or inferior orifice of the ſtomach, to the anus.

It will be eaſily underſtood, that a part of ſuch great length muſt neceſſarily make many circumvolutions, to be confined with ſo many other viſcera within the cavity of the lower belly.

Although the Inteſtines are in fact, as we have obſerved, only one long and extenſive canal, yet different parts have been diſtinguiſhed by different names. The Inteſtines are firſt diſtinguiſhed into two parts, one of which begins at the ſtomach, and is called the *ſmall Inteſtines*, from the ſmall ſize of the canal, when compared with the other part, which is called the *large Inteſtines*, and includes the lower portion of the canal down to the anus.

Each of theſe parts has its ſubdiviſions. The ſmall Inteſtines being diſtinguiſhed into duodenum, jejunum, and ileum, and the larger portion into cœcum, colon, and rectum.

The ſmall Inteſtines fill the middle and fore parts of the belly, while the large Inteſtines fill the ſides and both the upper and lower parts of the cavity.

The duodenum, which is the firſt of the ſmall Inteſtines, is ſo called, becauſe it is about 12 inches long. It begins at the pylorus and terminates in the jejunum, which is a part of the canal obſerved to be uſually more empty than the other Inteſtines. This appearance gives it its name, and likewiſe ſerves to point out where it begins.

The next diviſion is the ileum, which of itſelf exceeds the united length of the duodenum and jejunum, and has received its name from its numerous circumvolutions. The large circumvolution of the ileum covers the firſt of the large Inteſtines called the *cæcum* which ſeems properly to belong to the colon, being a kind of pouch of about four fingers in width, and nearly of the ſame length, having exteriorly a little appendix, called *appendix cæci*.

The cœcum is placed in the cavity of the os ilium on the right ſide, and terminates in the colon, which is the largeſt of all the Inteſtines.

This Inteſtine aſcends by the right kidney to which it is attached, paſſes under the hollow part of the liver, and the bottom of the ſtomach to the ſpleen, to which it is likewiſe ſecured, as it is alſo to the left kidney; and from thence paſſes down towards the os ſacrum, where, from its ſtrait courſe, the canal begins to take the name of rectum, which terminates at the anus.

There are three ligamentous bands extending through the whole length of the colon, which by being ſhorter than its too inner coats, ſerve to increaſe the plaits on the inner ſurface of this gut.

It has been already obſerved, that the Inteſtinal canal is compoſed of four tunics; but it remains to be remarked, that here, as in the ſtomach, the two inner tunics being more extenſive than the other two, form the plaits which are to be ſeen in the inner ſurface of the Inteſtines, and are called *valvulæ conniventes*; which from the inequalities they occaſion in the canal are ſufficient to retard in ſome meaſure the progreſſive motion of the fæces, and to afford a greater ſurface for the abſorption of chyle, and their natural poſition ſeems to oppoſe itſelf to the return of the aliment.

Beſides theſe *valvulæ conniventes*, there is one more conſiderable than the reſt, called the *valve of the colon*; which is found at that at that part of the canal where the Inteſtinum ileum is joined to the colon. This valve permits the alimentary pulp to paſs downwards, but ſerves to prevent its return upwards; and it is by this valve, that glyſters are prevented from paſſing into the ſmall Inteſtines.

Of the little vermiform appendix of the cœcum, it will be ſufficient to ſay, that its uſes have never yet been aſcertained. In birds we meet with two of theſe appendices.

The Inteſtines are lubricated by a conſtant ſupply of mucus, which is probably ſecreted by very minute follicles. This mucus promotes the deſcent of the alimentary pulp, and in ſome meaſure defends the inner ſurface of the Inteſtines from the irritation to which it would, perhaps, otherwiſe be continually expoſed from the aliment.

The arteries of the Inteſtines are continuations of the meſenteric arteries, which are derived in two conſiderable branches from the aorta. The redundant blood is carried back into the vena portarum.

In the rectum the veins are called *hemorrhoidal*, and are there diſtinguiſhed into internal and external: the firſt are branches of the inferior meſenteric vein, but the latter paſs into other veins. Sometimes theſe veins are diſtended with blood from obſtructions, from weakneſs of their coats, or from other cauſes, and what we call the *hæmorrhoids* takes place. In this diſeaſe they are ſometimes ruptured; and the diſcharge of blood which conſequently follows, has probably occaſioned them to be called *hæmorrhoidal veins*.

The nerves of the Inteſtines are derived from the eighth pair.

SECT. VII.

OF THE MESENTERY, AND MESOCOLON.

THE name of the Meſentery implies its ſituation amidſt the inteſtines. It is in fact a part of the peritonæum, being a reduplication of that membrane from each ſide of the lumbar vertebræ, to which it is firmly attached, ſo that it is formed of two laminæ, connected to each other by cellular membrane.

The inteſtines, in their different circumvolutions, form a great number of arches, and the Meſentery accompanies them through all theſe turns; but by being attached only to the hollow part of each arch, it is found to have only a third of the extent of the inteſtines.

That part of this membrane which accompanies the ſmall inteſtines is the *Meſentery*, properly ſo called; but thoſe parts of it which are attached to the colon and rectum are diſtinguiſhed by the names of *meſo-colon* and *meſo-rectum*.

There are many conglobate glands diſperſed through this double membrane, through which the lacteals and lymphatics paſs in their way to the thoracic duct. The blood-veſſels of the Meſentery were deſcribed in ſpeaking of the inteſtines.

This membrane, by its attachment to the vertebræ, ſerves to keep the inteſtines in their natural ſituation. The idea uſually formed of the colic called *miſerere*, is perfectly erroneous; it being impoſſible that the inteſtines can be twiſted, as many ſuppoſe they are, in that diſeaſe, their attachment to the Meſentery effectually preventing ſuch an accident; but a diſarrangement ſometimes takes place in the inteſtinal canal itſelf, which is productive of diſagreeable and ſometimes fatal conſequences. This is by an introſuſpection of the inteſtine, an idea of which may be eaſily formed, by taking the finger of a glove, and involving one part of it within the other.

SECT. VIII.

OF THE PANCREAS.

THE Pancreas is a conglomerate gland, placed behind the bottom of the ſtomach, towards the firſt vertebra of the loins; ſhaped like a dog's tongue, with its point ſtretched out towards the ſpleen, and its other end extending towards the duodunum. It is about eight fingers breadth in length, two or three in width, and one in thickneſs.

This viſcus, which is of a yellowiſh colour, ſomewhat inclined to red, is covered with a membrane which it derives from the peritoneum. Its arteries, which are rather numerous than large, are derived chiefly from the ſplenic and hepatic, and its veins paſs into the veins of the ſame name. Its nerves are derived from the intercoſtal.

The many little glands of which it has been obſerved the Pancreas is compoſed, all ſerve to ſecrete a liquor called the *Pancreatic juice*, which in its colour, conſiſtence, and other properties, does not ſeem to differ from the ſaliva. Each of theſe glands ſends out a little excretory duct, which uniting with others, help to form larger ducts; and all theſe at laſt terminate in one common excretory duct which runs through the middle of the gland, and is now uſually called *ductus pancreaticus*. This canal opens into the inteſtinum duodenum; ſometimes by the ſame orifice with the biliary duct, and ſometimes by a diſtinct opening. The liquor it diſcharges being of a mild and inſipid nature, ſerves to dilute the alimentary pulp, and to incorporate it more eaſily with the bile.

SECT. IX.

OF THE LIVER AND GALL BLADDER.

THE Liver is a viſcus of conſiderable ſize, and of a reddiſh colour; convex ſuperiorly and anteriorly, where it is placed under the ribs and diaphragm, and of an unequal ſurface poſteriorly. It is chiefly ſituated in the right hypochondrium, and under the falſe ribs; but it likewiſe extends into the epigaſtric region, where it borders upon the ſtomach. It is covered by a production of the peritoneum, which ſerves to attach it by three of its reduplications to the falſe ribs. Theſe reduplications are called *ligaments*, though very different in its texture from what are called by the ſame name in other parts of the body. The umbilical cord, too, which in the fœtus is pervious, gradually becomes a ſimple ligament after birth; and by paſſing to the Liver, ſerves likewiſe to ſecure it in its ſituation.

At the poſterior part of this organ, where the umbilical veſſels enter, it is found divided into three lobes. Of theſe, the largeſt is placed in the right hypocondrium; the other, which covers part of the ſtomach, is called the lite lobe; and the third is called Lobulus Spigelii. All the veſſels, which go to the Liver, paſs in at the fiſſure we have mentioned; and the production of the peritoneum, which inveſts the Liver, was deſcribed by Gliſſon, an Engliſh anatomiſt, as accompanying them in their paſſage, and ſurrounding them like a glove; hence this production has been commonly known by the name of *capſula of Gliſſon*: but it appears to be chiefly a continuation of the cellular membrane, which covers the vena portæ ventralis.

The Liver was conſidered by the ancients as an organ deſtined to prepare and perfect the blood; but later diſcoveries have proved that this opinion was wrong, and that the Liver is a glandular ſubſtance, formed for the ſecretion of the bile.

The blood is conveyed to the Liver by the hepatic artery, and the vena portæ. This is contrary to the mode of circulation in other parts, where veins only ſerve to carry off the redundant blood: but in this viſcus the hepatic artery, which is derived from the cæliac, is principally deſtined for its nouriſhment; and the vena portæ, which is formed by the union of the veins from moſt of the abdominal viſcera, furniſhes the blood, from which the bile is chiefly to be ſeparated: ſo that theſe two ſeries of veſſels ſerve very diſtinct purpoſes. The vena portæ, as it is ramified through the Liver, performs the office both of a vein and artery; for, like the former, it returns the blood from the extremities of arteries, while, as the latter, it prepares it for ſecretion.

The nerves of the Liver are branches of the intercoſtal and par vagum. The bile, after being ſeparated from the maſs of blood, is conveyed out of this organ by very minute excretory ducts, called *pori biliarii*; theſe uniting together, like the excretory ducts in the pancreas, gradually form larger ones, which at length terminate in a conſiderable channel, called *ductus hepaticus*.

The Gall-bladder is a little membranous bag, ſhaped like a pear, and attached to the poſterior, and almoſt inferior part of the great lobe of the Liver.

It has two tunics; of which the exterior one is a production of the peritonæum. The interior, or villous coat, is ſupplied with a mucus, that defends it from the acrimony of the bile. Theſe two coverings are intimately connected by means of cellular membrane, which, from its gliſtening appearance, has generally been ſpoken of as a muſcular tunic.

The Gall-bladder is ſupplied with blood-veſſels from the hepatic arteries. Theſe branches are called the *cyſtic arteries*, and the cyſtic veins carry back the blood.

Its nerves are derived from the ſame origin as thoſe of the Liver.

The neck of the Gall-bladder is continued in the form of a canal, called *ductus cyſticus*, which ſoon unites with the ductus hepaticus, which we have deſcribed as the excretory duct of the Liver; and forming one common canal, takes the name of *ductus coledochus communis*, thro' which both the cyſtic and hepatic bile are diſcharged into the duodenum. This canal opens into the inteſtine in an oblique direction, firſt paſſing through the exterior tunic, and then piercing the other coats, after running between each of them a very little way. This œconomy ſerves two uſeful purpoſes; to promote the diſcharge of bile, and to prevent its return.

The bile may be defined to be a natural liquid ſoap, ſomewhat unctuous and bitter, and of a yellowiſh colour, which eaſily mixes with water, oil, and vinous ſpirits, and is capable of diſſolving reſinous ſubſtances.

There are two ſorts of bile; one of which is derived immediately from the Liver, through the hepatic duct, and the other from the Gall-bladder. Theſe two biles, however, do not eſſentially differ from each other. The hepatic bile, indeed, is milder, and more liquid than the cyſtic, which is conſtantly thicker and yellower: and, by being bitterer, ſeems to poſſeſs greater activity than the other.

SECT. X.

OF THE SPLEEN.

THE Spleen is a ſoft and ſpongy viſcus, of a bluiſh colour, and about five or ſix fingers breadth in length, and three in width, ſituated in the left hypochondrium, between the ſtomach and the falſe ribs. That ſide of it which is placed on the ſide of the ribs, is convex; and the other, which is turned towards the ſtomach, is concave.

The Splenic artery, which is a branch from the cæliac, ſupplies this viſcus with blood, and a vein of the ſame name carries it back into the vena portæ.

Its nerves are derived from a particular plexus, called the *ſplenic*, which is formed by branches of the intercoſtal nerve, and by the eighth pair, or par vagum.

The ancients, who ſuppoſed two ſorts of bile, conſidered the Spleen as the receptacle of what they called *atra bilis*. Havers, who wrote profeſſedly on the bones, determined its uſe to be that of ſecreting the ſynovia; and the late Mr. Hewſon imagined, that it concurred with the thymus and lymphatic glands of the body, in forming the red globules of the blood. All theſe opinions ſeem to be equally fanciful. The want of an excretory duct has occaſioned the real uſe of this viſcus to be ſtill doubtful. Perhaps the blood undergoes ſome change in it, which may aſſiſt in the preparation of the bile. This is the opinion of the generality of modern phyſiologiſts; and the great quantity of blood with which it is ſupplied, together with the courſe of its veins into the vena portæ, ſeem to render this notion probable.

SECT. XI.

OF THE GLANDULÆ RENALES, KIDNIES, AND URETERS.

THE Glandulæ Renales, which were by the ancients ſuppoſed to ſecrete the atra bilis, and by them named *capſulæ atrabilares*, are two flat bodies of an irregular figure, one on each ſide, between the kidney and the aorta.

In the fœtus they are as large as the kidnies; but they do not increaſe afterwards in proportion to thoſe parts; and, in adults and old people, they are generally found ſhrivelled, and much waſted. They have their arteries and veins. Their arteries uſually ariſe from the ſplenic or the emulgent, and ſometimes from the aorta; and their veins go to the neighbouring emulgent veins, or to the vena cava. Their nerves are branches of the intercoſtal.

The uſe of theſe parts is not yet perfectly known. In the fœtus the ſecretion of urine muſt be in a very ſmall quantity, and a part of the blood may, perhaps, then paſs through theſe channels, which, in the adult, is carried to the Kidnies, to ſupply the matter of urine.

The Kidnies are two in number, ſituated, one on the right and the other on the left ſide, in the lumbar region, between the laſt falſe rib and the os ilium, by the ſides of the vertebræ. Each Kidney, in its figure, reſembles a ſort of bean, which, from its ſhape, is called *kidney-bean*. The concave part of each Kidney is turned towards the aorta and vena cava aſcendens. They are ſurrounded by a good deal of fat, and receive a coat from the peritonæum; and, when this is removed, a very fine membrane is found inveſting their ſubſtance, and the veſſels which ramify through them.

Each Kidney has a conſiderable artery and vein, which are called the *emulgents*. The artery is a branch from the aorta, and the vein paſſes into the vena cava. Their nerves, which every where accompany the blood-veſſels, ariſe from a conſiderable plexus, which is derived from the intercoſtal.

In each Kidney, which in the adult is of a pretty firm texture, there are three ſubſtances to be diſtinguiſhed. The outer part is glandular or cortical, beyond this is the vaſcular or tubular ſubſtance, and the inner part is papillary or membranous.

It is in the cortical part of the Kidney that the ſecretion is carried on; the urine being here received from the minute extremities of the capillary arteries, is conveyed out of this cortical ſubſtance by an infinite number of very ſmall cylindrical canals or excretory veſſels, which conſtitute the tubular part. Theſe tubes, as they approach the inner ſubſtance of the Kidney, gradually unite together; and thus forming larger canals, at length terminate in ten or twelve little protuberances, called *papillæ*, the orifices of which may be ſeen without the aſſiſtance of glaſſes. Theſe papillæ open into a ſmall cavity or reſervoir called the *pelvis of the kidney*, and formed by a diſtinct membranous bag which embraces the papillæ. From this pelvis the urine is conveyed through a membranous canal which paſſes out from the hollow ſide of the kidney, a little below the blood veſſels, and is called *ureter*.

The ureters are each about as large as a common writing-pen. They are ſomewhat curved in their courſe from the Kidneys, like the letter *ſ*, and at length terminate in the poſterior and almoſt inferior part of the bladder, at ſome diſtance from each other. They paſs into the bladder in the ſame manner as the ductus choledochus communis paſſes into the inteſtinum duodenum, not by a direct paſſage, but by an oblique courſe between the two coats; ſo that the diſcharge of urine into the bladder is promoted, whilſt its return is prevented. Nor does this mode of ſtructure prevent the paſſage of fluids only from the bladder into the ureters, but likewiſe air: for air thrown into the bladder inflates it, and it continues to be diſtended if a ligature is paſſed round its neck; which ſeems to prove ſufficiently that it cannot paſs into the ureters.

SECT. XII.

FEMALE ORGANS OF GENERATION.

ANATOMICAL writers uſually divide the female organs of generation into *external* and *internal*. In the firſt diviſion they include the *mons veneris*, *labia pudendi*, *perinæum*, *clitoris*, *nymphæ*, and *carunculæ myrtiformes*; and in the latter, the *vagina*, with the *uterus* and its appendages.

The *mons veneris*, which is placed on the upper part of the ſymphyſis pubis, is internally compoſed of adipoſe membrane, which makes it ſoft and prominent: it divides into two parts called *labia pudendi*, which deſcending towards the rectum, from which they are divided by the perinæum, from what is called the *fourchette*. The perinæum is that fleſhy ſpace which extends about an inch and an half from the fourchette to the anus, and from thence about two inches to the coccyx.

The labia pudendi being ſeparated, we obſerve a ſulcus called *foſſa magna*; in the upper part of which is placed the clitoris, a ſmall round ſpongy body, in ſome meaſure reſembling the male penis, but impervious, compoſed of two corpora cavernoſa, ariſing from the tuberoſities of the oſſa iſchii; furniſhed with two pair of muſcles, the erectores clitorides, and the ſphincter or conſtrictor oſtii vaginæ; and terminating in a glans, which is covered with its prepuce. From the lower part, on each ſide of the foſſa, paſs the nymphæ, two membranous and ſpongy folds which ſeem deſtined for uſeful purpoſes in parturition, by tending to enlarge the volume of the vagina as the child's head paſſes through it. Between theſe, about the middle of the foſſa magna, we perceive the orifice of the vagina or os externum, cloſed by folds and wrinkles; and about half an inch above this, and about an inch below the clitoris, appears the meatus urinarius or orifice of the urethra, much ſhorter, though ſomewhat larger, than in men, with a little prominence at its lower edge, which facilitates the introduction of the catheter.

The os externum is ſurrounded internally by ſeveral membranous folds called *carunculæ myrtiformes*, which are partly the remains of a thin membrane called *hymen*, that covers the vagina in children. In general the hymen is ſufficiently open to admit the paſſage of the menſes, if it exiſts at the time of their appearance; ſometimes, however, it has been found perfectly cloſed.

The vagina, ſituated between the urethra and the rectum, is a membranous cavity, ſurrounded eſpecially at its external extremity with a ſpongy and vaſcular ſubſtance, which is covered by the ſphincter oſtii vaginæ. It terminates in the uterus, about half an inch above the os tincæ, and is wider and ſhorter in women who have had children than in virgins.

All theſe parts are plentifully ſupplied with blood-veſſels and nerves. Around the nymphæ there are ſebaceous follicles, which pour out a fluid to lubricate the inner ſurface of the vagina; and the meatus urinarius, like the urethra in the male ſubject, is conſtantly moiſtened by a mucus, which defends it againſt the acrimony of the urine.

The *uterus* is a hollow viſcus, ſituated in the hypogaſtric region, between the rectum and bladder.

The uterus, in its unimpregnated ſtate, reſembles a pear in ſhape, ſomewhat flattened, with its fundus or bottom part turned towards the abdomen, and its cervix or neck ſurrounded by the vagina. The entrance into its cavity forms a little protuberance, which has been compared to the mouth of a tench, and is therefore called *os tincæ*.

The ſubſtance of the uterus, which is of a conſiderable thickneſs, appears to be compoſed of muſcular and ſmall ligamentous fibres, ſmall branches of nerves, ſome lymphatics, and with arteries and veins innumerable. Its nerves are chiefly derived from the intercoſtal, and its arteries and veins from the hypogaſtric and ſpermatic. The membrane which lines its cervix, is a continuation of the inner membrane of the vagina; but the outer ſurface of the body of the uterus is covered with the peritonæum, which is reflected over it, and deſcends from thence to the inteſtinum rectum. This duplicature of the peritonæum, by paſſing off from the ſides of the uterus to the ſides of the pelvis, is there firmly connected, and forms what are called *ligamenta uteri lata*; which not only ſerve to ſupport the uterus, but to convey nerves and blood-veſſels to it.

The *ligamenta uteri rotunda* ariſe from the ſides of the fundus uteri, and paſſing along within the fore part of the ligamenta lata, deſcend through the abdominal rings, and terminate in the ſubſtance of the mons veneris. The ſubſtance of theſe ligaments is vaſcular, and although both they and the ligamenta lata admit the uterus in the virgin ſtate, to move only about an inch up and down, yet in the courſe of pregnancy they admit of conſiderable diſtenſion, and after parturition return to their former ſtate with ſurpriſing quickneſs.

On each ſide of the inner ſurface of the uterus, in the angle near the fundus, a ſmall orifice is to be diſcovered, which is the beginning of one of the tubæ fallopaniæ. Each of theſe tubes, which are two in number, paſſing through the ſubſtance of the uterus, is extended along the broad ligaments, till it reaches the edge of the pelvis, from whence it reflects back; and turning over behind the ligaments, about an inch of its extremity is ſeen hanging looſe in the pelvis, near the ovarium. Theſe extremities having a jagged appearance, are called *fimbriæ*, or *morſus diaboli*. Each tuba Fallopiana is uſually about three or four inches long. Their cavities are at firſt very ſmall, but becomes gradually larger, like a trumpet, as they approach the fimbriæ.

Near the fimbriæ of each tuba Fallopiana, about an inch from the uterus, is ſituated an oval body called *ovarium*, of about half the ſize of the male teſticle. Each of theſe ovaria is covered by a production of the peritonæum, and hangs looſe in the pelvis. They are of a flat and angular form, and appear to be compoſed of a white and cellular ſubſtance, in which we are able to diſcover ſeveral minute veſicles filled with a coagulable lymph, of an uncertain number, commonly exceeding 12 in each ovary. In the female of riper years, theſe veſicles become exceedingly turgid, and a kind of yellow coagulum is gradually formed within one of them, which increaſes for a certain time. In conception, one of theſe mature ova is ſuppoſed to be impregnated with the male ſemen, and to be ſqueezed out of its nidus into the Fallopian tube; after which the ruptured part forms a ſubſtance which in ſome animals is of a yellow colour, and is therefore called *corpus luteum*; and it is obſervable, that the number of theſe ſcars or fiſſures in the ovarium, conſtantly correſponds with the number of fœtuſes excluded by the mother.

SECT. XIII.

OF DIGESTION.

BY Digeſtion is to be underſtood, the changes the aliment undergoes for the formation of chyle: the changes are effected in the mouth, ſtomach, and ſmall inteſtines.

The mouth, of which every body has a general knowledge, is the cavity between the two jaws, formed anteriorly and laterially by the lips, teeth, and cheeks, and terminating poſteriorly in the throat.

The lips and cheeks are made up of fat and muſcles, covered by the cuticle, which is continued over the whole inner ſurface of the mouth, like a fine and delicate membrane. Beſide this membrane, the inſide of the mouth is furniſhed with a ſpongy and very vaſcular ſubſtance called the *gums* by means of which the teeth are ſecured in their ſockets. A ſimilar ſubſtance covers the roof of the mouth, and forms what is called the *velum pendulum palati*, which is fixed to the extremity of the arch formed by the oſſa maxillaria and oſſa palati, and terminates in a ſoft, ſmall, and conical body, named *uvula*; which appears, as it were, ſuſpended from the middle of the arch over the baſis of the tongue.

The velum pendulum palati performs the office of a valve between the cavity of the mouth and the pharynx, being moved by ſeveral muſcles.

The tongue is compoſed of ſeveral muſcles which enable it to perform a variety of motions for the articulation of the voice; for the purpoſes of maſtication; and for conveying the aliment into the pharynx. Its upper is covered with papillæ, which conſtitute the organ of taſte, and are eaſily to be diſtinguiſhed; it is covered by the ſame membrane that lines the inſide of the mouth, and which makes at its inferior part towards its baſis a reduplication called *frænum*.

Poſteriorly, under the velum palati, and at the baſis of the tongue, is the pharynx; which is the beginning of the œſophagus, ſtretched out every way, ſo as to reſemble the top of a funnel, through which the aliment paſſes into the ſtomach.

The mouth has a communication with the noſtrils at its poſterior and upper part; with the ears, by the Euſtachian tubes; with the lungs, by means of the larnyx; and with the ſtomach, by means of the œſophagus.

The pharynx is conſtantly moiſtened by a fluid, ſecreted by two conſiderable glands called the *tonſils*, one on each ſide of the velum palati. Theſe glands, from their ſuppoſed reſemblance to almonds, have likewiſe been called *amygdalus*.

The mouth is moiſtened by a conſiderable quantity of ſaliva. This fluid is derived from the *parotid glands*; a name which by its etymology points out their ſituation to be near the ears. They are two in number, one on each ſide under the os malæ: and they are of the conglomerate kind; being formed of many ſmaller glands, each of which ſends out a very ſmall excretory duct, which unites with the reſt, to form one common channel, that runs over the cheek, and piercing the buccinator muſcle, opens into the mouth on each ſide, by an orifice into which a briſtle may be eaſily introduced. Beſides theſe, the maxillary glands, which are placed near the inner ſurface of the angle of the lower jaw on each ſide; the ſublingual glands, which are ſituated at the root of the tongue; the glands of the palate, which are ſeated at the velum palati; and thoſe of the cheeks, lips, &c. together with many other leſs conſiderable ones, pour the ſaliva into the mouth through their ſeveral excretory ducts.

The ſaliva, like all other humours of the body, is found to be different in different people: but in general, it is a limpid and inſipid fluid, without ſmell in healthy ſubjects; and theſe properties would ſeem to prove, that it contains very few ſaline or inflammable particles.

The uſes of the ſaliva ſeem to be to moiſten and lubricate the mouth, and to aſſiſt in reducing the aliment into a ſoft pulp before it is conveyed into the ſtomach.

In the ſtomach, the gaſtric juice, mixes itſelf with the aliment, and helps to prepare it for its paſſage into the inteſtines; but when the ſtomach is perfectly empty, this ſame fluid irritates the coats of the ſtomach itſelf, and produces the ſenſation of hunger.

A certain proportion of liquid aliment is required to aſſiſt in the proceſs of digeſtion, and to afford that moiſture to the body, of which there is ſuch a conſtant diſſipation. Thirſt induces us to take this neceſſary ſupply of drink; and the ſeat of this ſenſation is in the tongue, fauces, and œſophagus, which from their great ſenſibility are required to be kept moiſt: for though the fauces are naturally moiſtened by the mucus and ſalival juices, yet the blood, when deprived of its watery part or rendered acrimonious by any natural cauſes, never fails particularly to affect theſe parts, and the whole alimentary canal, and to occaſion thirſt. This is the common effect of fevers and of hard labour, by both which too much of the watery part of the blood is diſſipated.

The aliment, after having been ſufficiently divided by the action of the teeth, and attenuated by the ſaliva, is received into the ſtomach, where it is deſtined to undergo a more conſiderable change.

The properties of the aliment not being much altered at its firſt entrance into the ſtomach, and before it is thoroughly blended with the gaſtric juice, is capable of irritating the inner coat of the ſtomach to a certain degree, and occaſions a contraction of its two orifices. In this membranous bag, ſurrounded by the abdominal viſcera, and with a certain degree of natural heat, the aliment undergoes a conſtant agitation by means of the abdominal muſcles and of the diaphragm, and likewiſe by a certain contraction or expanſion of the muſcular fibres of the ſtomach itſelf. By this motion, every part of the food is expoſed to the action of the gaſtric juice, which gradually divides and attenuates it, and prepares it for its paſſage into the inteſtines.

But the term of its reſidence in this bag is proportioned to the nature of the aliment, and to the ſtate of the ſtomach and its juices. The thinner and more perfectly digeſted parts of the food paſs by a little at a time into the duodenum, through the pylorus, the fibres of which relax to afford it a paſſage; and the groſſer and leſs digeſted particles remain in the ſtomach, till they acquire a ſufficient fluidity to paſs into the inteſtines, where the nature of the pulp is perfectly changed. The bile and pancreatic juice which flow into the duodenum, and the mucus, which is every where diſtilled from the ſurface of the inteſtines, mix themſelves with the alimentary pulp, which they ſtill farther attenuate and diſſolve, and into which they ſeem to infuſe new properties.

Two matters very different from each other in their nature and deſtination, are the reſult of this combination. One of theſe, which is compoſed of the liquid parts of the aliment, and of ſome of its more ſolid particles, extremely divided and mixed with the juices we have deſcribed, conſtitutes a very mild, ſweet, and whitiſh fluid, reſembling milk, and diſtinguiſhed by the name of chyle. This fluid is abſorbed by the lacteal veſſels, which convey it into the circulation, where, by being aſſimilated into the nature of blood, it affords that ſupply of nutrition, which the continual waſte of the body is found to require. The other, is the remains of the alimentary maſs deprived of all its nutritious particles, and containing only ſuch parts as were rejected by the abſorbing mouths of the lacteals. This groſſer part, called the *fæces*, paſſes on through the courſe of the inteſtines, to be voided at the anus.

SECT. XIV.

OF THE THORAX.

THE Thorax, or cheſt, is that cavity of the trunk which extends from the clavicles, or lower part of the neck, to the diaphragm, and includes the vital organs, which are the heart and lungs; and likewiſe the trachea and œſophagus. This cavity is formed by the ribs and vertebræ of the back, covered by a great number of muſcles, and by the common integuments, and anteriorly by two glandular bodies, called the *breaſts*. The ſpaces between the ribs are filled up by muſcular fibres, which, from their ſituation, are called *intercoſtal muſcles*.

SECT. XV.

OF THE BREASTS.

THE *breaſts* may be defined to be two large conglomerate glands, mixed with a good deal of adipoſe membrane. The glandular part is compoſed of an infinite number of minute arteries, veins, and nerves.

The arteries are derived from two different trunks; one of which is called the *internal*, and the other the *external*, *mammary artery*. The firſt of theſe ariſes from the ſubclavian, and the latter from the axillary.

The veins every where accompany the arteries, and are diſtinguiſhed by the ſame name. The nerves are chiefly from the vertebral pairs. Like all other conglomerate glands, the Breaſts are made up of a great many ſmall diſtinct glands, in which the milk is ſecreted from the ultimate branches of arteries. The excretory ducts of theſe ſeveral glands, gradually uniting as they approach the nipple, form the tubuli lactiferi, which are uſually more than a dozen in number, and open at its apex, but have little or no communication, as has been ſuppoſed, at the root of the nipple.

Theſe ducts, in their courſe from the glands, are ſurrounded by a ligamentary elaſtic ſubſtance, which terminates with them in the nipple. Both this ſubſtance, and the ducts which it contains, are capable of conſiderable extenſion and contraction; but in their natural ſtate are moderately corrugated, ſo as to prevent an involuntary flow of milk, unleſs the diſtending force be very great from the accumulation of too great a quantity.

The whole ſubſtance of the nipple is very ſpongy and elaſtic: its external ſurface is uneven, and full of ſmall tubercles. The nipple is ſurrounded with a diſk or circle of a different colour, called the *areola*; and on the inſide of the ſkin, under the areola, are many ſebaceous glands, which pour out a mucus to defend the areola and nipple: for the ſkin upon theſe parts is very thin; and the nervous papillæ, lying very bare, are much expoſed to irritation.

The Breaſts are formed for the ſecretion of milk, which is deſtined for the nouriſhment of the child for ſome time after its birth. This ſecretion begins to take place ſoon after delivery, and continues to flow for many months in very large quantities, if the woman ſuckles her child.

The operation of ſuction depends on the principles of the air-pump, and the flow of milk through the lactiferous tubes, is facilitated by their being ſtretched out.

The milk, examined chemically, appears to be compoſed of oil, mucilage, and water, and of a conſiderable quantity of ſugar. The generality of phyſiologiſts have ſuppoſed that, like the chyle, it frequently retains the properties of the aliment and medicines taken into the ſtomach; but from ſome late experiments, this ſuppoſition appears to be ill founded.

SECT. XVI.

OF THE PLEURA.

THE cavity of the thorax is every where lined by a membrane of a firm texture, called *pleura*. It is compoſed of two diſtinct portions or bags, which, by being applied to each other laterally, form a ſeptum called *mediaſtinum*; which divides the cavity into two parts, and is attached poſteriorly to the vertebræ of the back, and anteriorly to the ſternum. But the two laminæ of which this ſeptum is formed, do not every where adhere to each other; for, at the lower part of the thorax they are ſeparated, to afford a lodgment to the heart; and, at the upper part of the cavity, they receive between them the thymus.

The Pleura is plentifully ſupplied with arteries and veins from the internal mammary, and the intercoſtals. Its nerves, which are very inconſiderable, are derived chiefly from the dorſal and intercoſtal nerves.

The ſurface of the Pleura, like that of the peritonæum and other membranes lining cavities, is conſtantly bedewed with a ſerous moiſture, which prevents adheſions of the viſcera.

The mediaſtinum, by dividing the Breaſt into two cavities, obviates many inconveniences, to which we ſhould otherwiſe be liable. It prevents the two lobes of the lungs from compreſſing each other when we lie on one ſide; and, conſequently, contributes to the freedom of reſpiration, which is diſturbed by the leaſt preſſure of the lungs. If the point of a ſword penetrates between the ribs, into the cavity of the thorax, the lungs, on that ſide, ceaſe to perform their office; becauſe the air, being admitted through the wound, prevents the dilatation of that lobe; while the other lobe, which is ſeparated from the mediaſtinum, remains unhurt, and continues to perform its functions as uſual.

SECT. XVII.

OF THE THYMUS.

THE *thymus* is a glandular ſubſtance, the uſe of which is not perfectly aſcertained, its excretory duct not having yet been diſcovered. It is of an oblong figure, and is larger in the fœtus, and in young children, than in adults, being ſometimes nearly effaced in very old ſubjects. It is placed in the upper part of the thorax, between the laminæ of the mediaſtinum; but at firſt is not altogether contained within the cavity of the cheſt, being found to border upon the upper extremity of the ſternum.

SECT. XVIII.

OF THE LUNGS.

THE trachea, or windpipe, is a cartilaginous and membranous canal, through which the air paſſes into the lungs. Its upper part, which is called the *larynx*, is compoſed of five cartilages. For a further deſcription ſee MYOLOGY, Part III. Section X.

The glottis is interiorly covered by a very fine membrane, which is moiſtened by a conſtant ſupply of a watery fluid. From the larynx, the canal begins to take the name of *trachea*, or *aſperia arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tube. Each of theſe bronchi ramifies through the ſubſtance of that lobe of the Lungs, to which it is diſtributed, by an infinite number of branches, which are formed of cartilages ſeparated from each other, like thoſe of the trachea, by an intervening membranous and ligamentary ſubſtance. Each of theſe cartilages is of an angular figure; and as they become gradually leſs and leſs in their diameter, the lower ones are in ſome meaſure received into thoſe above them, when the Lungs, after being inflated, gradually collapſe, by the air being puſhed out from them in exſpiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at laſt become inviſible.

The trachea is furniſhed with fleſhy or muſcular fibres; ſome of which paſs through its whole extent longitudinally, while the others are carried round it in a circular direction; ſo that by the contraction or relaxation of theſe fibres, it is enabled to ſhorten or lengthen itſelf, and likewiſe to dilate or contract the diameter of its paſſage.

The trachea and branches, in all their ramifications, are furniſhed with a great number of ſmall glands, which are lodged in their cellular ſubſtance, and diſcharge a mucous fluid on the inner ſurface of theſe tubes.

The cartilages of the trachea, by keeping it conſtantly open, afford a free paſſage to the air, which we are obliged to be inceſſantly reſpiring; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air, in a greater or leſs quantity, and with more or leſs velocity, as may be required in ſinging or in declamation. This membranous ſtructure of the trachea poſteriorly, ſeems likewiſe to aſſiſt in the deſcent of the food, by preventing that impediment to its paſſage down the œſophagus, which might be expected if the cartilages were complete rings.

The trachea receives its arteries from the carotid and ſubclavian arteries, and its veins paſs into the jugulars. Its nerves ariſe from the recurrent branch of the eighth pair, and from the cervical plexus.

The Lungs fill the greater part of the cavity of the breaſt. They are of a ſoft and ſpongy texture, and are divided into two lobes, which are ſeparated from each other by the mediaſtinum, and are externally covered by a production of the pleura. Each of theſe is divided into two or three leſſer lobes; and we commonly find three in the right ſide of the cavity, and two in the left.

To diſcover the ſtructure of the Lungs, it is required to follow the ramifications of the bronchi, which were deſcribed in the laſt ſection. Theſe becoming gradually more and more minute, at length terminate in the cellular ſpaces or veſicles, which make up the greateſt part of the ſubſtance of the Lungs, and readily communicate with each other.

The Lungs ſeem to poſſeſs but little ſenſibility. Their nerves, which are ſmall, and few in number, are derived from the intercoſtal and eighth pair. This laſt pair, having reached the thorax, ſends off a branch on each ſide of the trachea, called the *recurrent*, which reaſcends at the back of the trachea, to which it furniſhes branches in its aſcent, as well as to the œſophagus, but it is chiefly diſtributed to the larynx and its muſcles. By dividing the recurrent and ſuperior laryngeal nerves at their origin, an animal is deprived of its voice.

There are two ſeries of arteries which carry blood to the Lungs: theſe are the arteriæ bronchiales, and the pulmonary artery.

The arteriæ bronchiales begin uſually by two branches; one of which commonly ariſes from the right intercoſtal, and the other from the trunk of the aorta: but ſometimes there are three of theſe arteries, and in ſome ſubjects only one. The uſe of theſe arteries is to ſerve for the nouriſhment of the Lungs, and their ramifications are ſeen creeping every where on the branches of the bronchi. The blood is brought back from them by the bronchial vein into the vena azygos.

The pulmonary artery and vein are not intended for the nouriſhment of the Lungs; but the blood, in its paſſage through them, is deſtined to undergo ſome changes, or to acquire certain eſſential properties, from the action of the air, which it has loſt in its circulation through the other parts of the body. The pulmonary artery receives the blood from the right ventricle of the heart, and dividing into two branches, accompanies the bronchi every where, by its ramifications through the Lungs; and the blood is afterwards conveyed back by the pulmonary vein, which gradually forming a conſiderable trunk, goes to empty itſelf into the left ventricle of the heart; ſo that the quantity of blood which enters into the Lungs, is perhaps greater than that which is ſent in the ſame proportion of time, through all the other parts of the body.

SECT. XIX.

OF RESPIRATION.

RESPIRATION conſtitutes one of thoſe functions which are properly termed *vital*, as being eſſential to life; for to live and to breathe are in fact ſynonymous terms. It conſiſts in an alternate contraction and dilatation of the thorax, by firſt inſpiring air into the lungs, and then expelling it from them in exſpiration.

Till within theſe few years phyſiologiſts were entirely ignorant of the uſe of reſpiration. It was at length diſcovered in part by the illuſtrious Dr. Prieſtley. He found that the air exſpired by animals was phlogiſticated; and that the air was fitter for reſpiration, or for ſupporting animal life, in proportion as it was freer from the phlogiſtic principle. It had long been obſerved, that the blood in paſſing through the lungs acquired a more florid colour. He therefore ſuſpected, that it was owing to its having imparted phlogiſton to the air: and he ſatisfied himſelf of the truth of this idea by experiments, which ſhowed, that the craſſamentum of extravaſated blood, phlogiſticated air in proportion as it loſt its dark colour. He farther found, that blood thus reddened had a ſtrong attraction for phlogiſton; inſomuch, that it was capable of taking it from phlogiſticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial ſyſtem, imbibes a conſiderable quantity of phlogiſton, which is diſcharged from it to the air in the lungs.

The blood in this ſtate circulating through the body, imbibes phlogiſton, and of courſe gives out its fire; part only of which is abſorbed by the parts furniſhing the phlogiſton, the remainder, as in combuſtion, becoming ſenſible; and is therefore the cauſe of the heat of the body, or what is called animal heat.

In confirmation of this doctrine it may be obſerved, that the venous blood contains leſs fire than the arterial; combuſtible bodies leſs than incombuſtible ones; and that air contains leſs of this principle, according as it is rendered, by combination with phlogiſton, leſs fit for reſtoration.

SECT. XX.

OF THE PERICARDIUM, AND OF THE HEART.

THE two membranous bags of the pleura, which were deſcribed as forming the mediaſtinum, recede one from the other, ſo as to afford a lodgment to a firm membranous ſac, in which the heart is ſecurely lodged; this ſac, which is the *pericardium*, appears to be compoſed of two tunics, united to each other by cellular membrane. The outer coat is a production of the mediaſtinum; the inner coat, which is extremely thin, is reflected over the auricles and ventricles of the heart, in the ſame manner as the tunica conjunctiva, after lining the eye lids, is reflected over the eye.

This bag adheres to the tendinous part of the diaphragm, and contains a coagulable lymph, the *liquor pericardii*, which ſerves to lubricate the heart and facilitate its motions; and ſeems to be ſecreted and abſorbed in the ſame manner as it is in the other cavities of the body.

The arteries of the pericardium are derived from the phrenic, and its veins paſs into veins of the ſame name; its nerves are likewiſe branches of the phrenic.

The ſize of the pericardium is adapted to that of the heart, being uſually large enough to contain it looſely. As its cavity does not extend to the ſternum, the lungs cover it in inſpiration; and as it every where inveſts the heart, it effectually ſecures it from being injured by lymph, pus, or any other fluid, extravaſated into the cavities of the thorax.

The heart is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left. Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*. Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres ſeem to originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner.

The heart includes two cavities or *ventricles*, which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left*, *ventricle*; though perhaps, with reſpect to their ſituation, it would be more proper to diſtinguiſh them into the *anterior* and *poſterior ventricles*.

The heart is exteriorly covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres which are deſcribed as paſſing in different directions; ſome as being extended longitudinally from the baſis to the apex; others, as taking an oblique or ſpiral courſe; and a third ſort as being placed in a tranſverſe direction. Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy columnæ in the two cavities, and are attached to the valves of the auricles. Valvulæ ſemilunares of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return. In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the ventricle, only permit the blood to paſs one way, which is into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; ſo that the other valves which may be ſaid to belong to the veins, are placed in each ventricle, where the auricle opens into it. The valves in the right ventricle are uſually three in number, and are named valvulæ tricuſpides; but in the left ventricle we commonly obſerve only two, and theſe are the valvulæ mitrales. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the tricuſpides and the mitrales are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy columnæ.

By the contraction of either ventricle the blood is driven into the artery which communicates with that ventricle: and theſe tendinous ſtrings being gradually relaxed as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery. The right ventricle is not quite ſo long, though ſomewhat larger, than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

The heart receives its nerves from the par vagum and the intercoſtals. The arteries which ſerve for its nouriſhment are two in number, and ariſe from the aorta. They ſurround in ſome meaſure the baſis of the heart, and from this courſe are called the coronary arteries. From theſe arteries the blood is returned by veins of the ſame name into the auricles, and even into the ventricles.

The muſcular bags called the auricles are ſituated at the baſis of the heart, at the ſides of each other: and, correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into right and left. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their name of auricles.

SECT. XXI.

OF THE ACTION OF THE HEART, AURICLES AND ARTERIES.

THE heart, at the time it contracts, drives the blood from its ventricles into the Arteries; and the Arteries being thus filled and diſtended, are naturally inclined to contract the moment the heart begins to dilate, and ceaſes to ſupply them with blood. Theſe alternate motions of contraction and dilatation of the heart and arteries, are diſtinguiſhed by the names of *ſyſtole* and *diaſtole*. When the heart is in a ſtate of contraction or ſyſtole, the arteries are at that inſtant diſtended with blood, and in their diaſtole; and it is in this ſtate we feel their pulſatory motion, which we call the *pulſe*. When the heart dilates, and the Arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its ſyſtole, the blood cannot paſs from the veins into the ventricles, but is detained in the Auricles.

Although both the ventricles of the heart contract at the ſame time, yet the blood paſſes from one to the other. In the ſame moment, for inſtance, that the left ventricle drives the blood into the aorta, the right ventricle impels it into the pulmonary Artery, which is diſtributed through all the ſubſtance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary veins, at the ſame time that the blood is returned by the cavas, into the right ventricle, from all the other parts of the body.

This ſeems to be the mode of action of the heart and its veſſels: but the cauſe of this action has, like all other intricate and intereſting ſubjects, been differently explained. It ſeems to depend on the ſtimulus made on the different parts of the heart by the blood itſelf, which by its quantity and heat, or other properties, is perhaps capable of firſt exciting that motion, which is afterwards continued through life, independent of the will, by a regular return of blood to the Auricles, in a quantity proportioned to that which is thrown into the Arteries.

The heart poſſeſſes the *vis inſita*, or principle of irritability, in a much greater degree than any other muſcle of the body. The pulſe is quicker in young than in old ſubjects, becauſe the former are *cæt. par.* more irritable than the latter. Upon the ſame principle we may explain, why the pulſe is conſtantly quicker in weak than in robuſt perſons.

After what has been obſerved of the ſtructure and action of the heart and its auricles, and likewiſe of the arteries and veins, there ſeem to be but very few arguments required to demonſtrate the circulation of the blood, which has long ſince been eſtabliſhed as a medical truth. This circulation may be defined to be a perpetual motion of the blood, in conſequence of the action of the heart and arteries, which impel it through all the parts of the body, from whence it is brought back by the veins to the heart.

A very ſatisfactory proof of this circulation, and a proof eaſy to be underſtood, may be deduced from the different effects of preſſure on an artery and a vein. If a ligature, for inſtance, is paſſed round an artery, the veſſel ſwells conſiderably between the ligature and the heart; whereas if we tie up a vein, it only becomes filled between the extremity and the ligature, and this is what we every day obſerve in bleeding. The ligature we paſs round the arm on theſe occaſions,

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Views of the Human Viscera _ See System of Anatomy.

Fig. 5. The Heart in Situ, as it appears when the Veſsels are filled with injection.

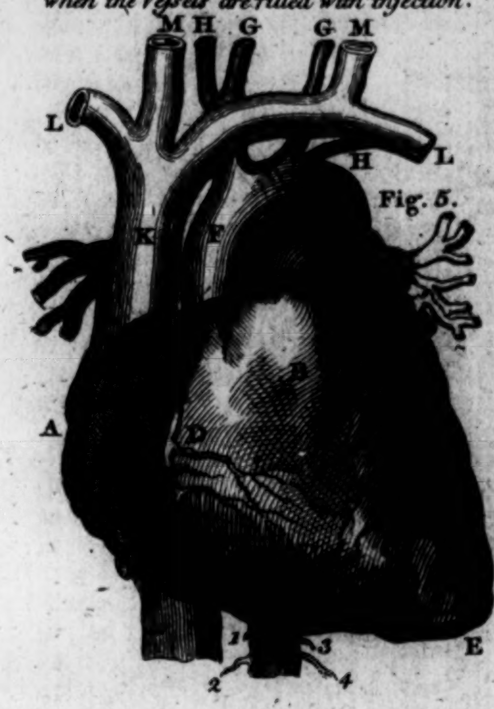


Fig. 7. Blood Veſsels of the Liver, uniting to form vena portæ.

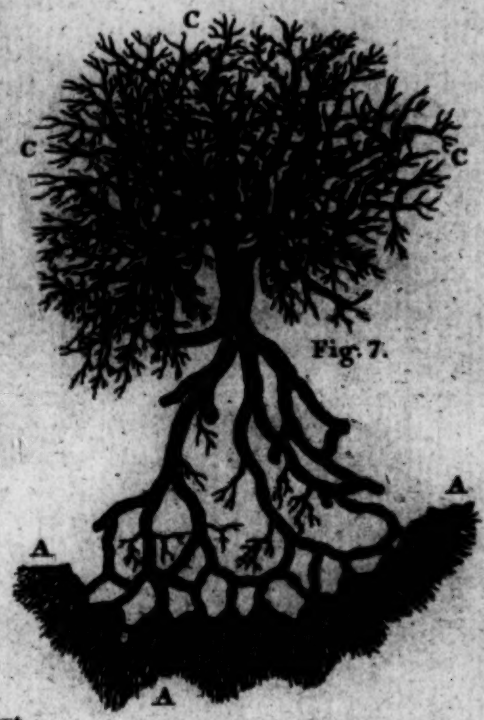


Fig. 1. A Section of the Kidney, shewing its secretions and the Tubuli uriniferi.

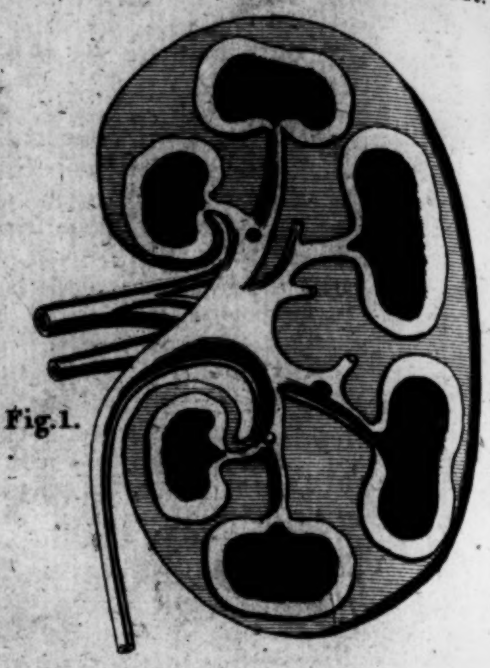


Fig. 2. The Lungs with the Heart, and its Pericardium.

Fig. 2.

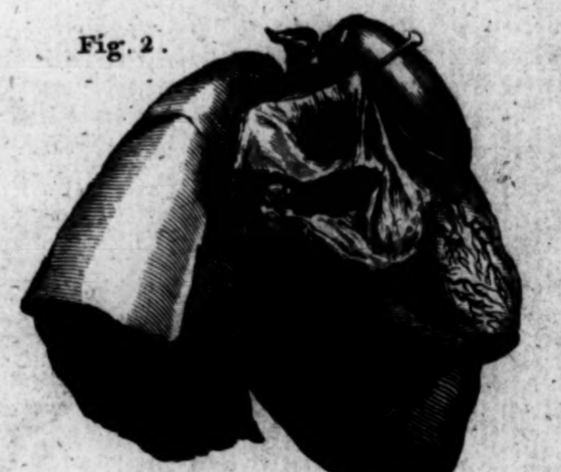


Fig. 6. A posterior View of the Stomach when inflated, representing its Veſsels & Omentum.

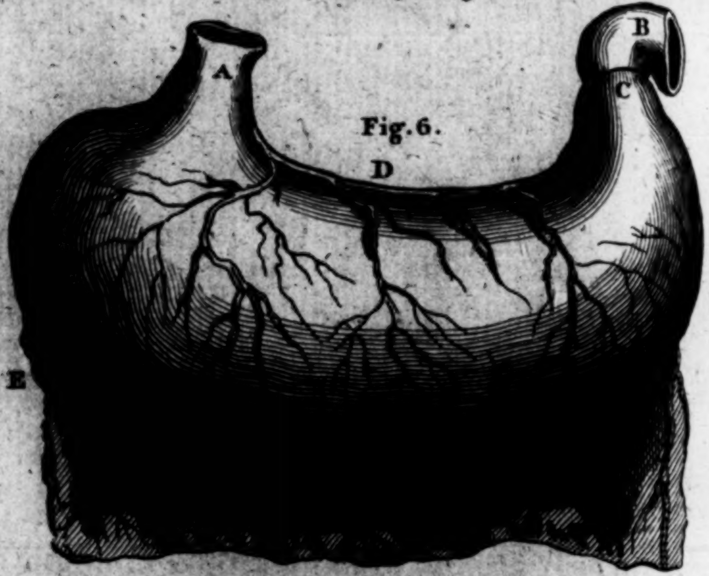


Fig. 4. The Body below the Diaphragm with the Intestines removed, to shew the remaining Viscera & the Thoracic Duct.

Fig. 4.

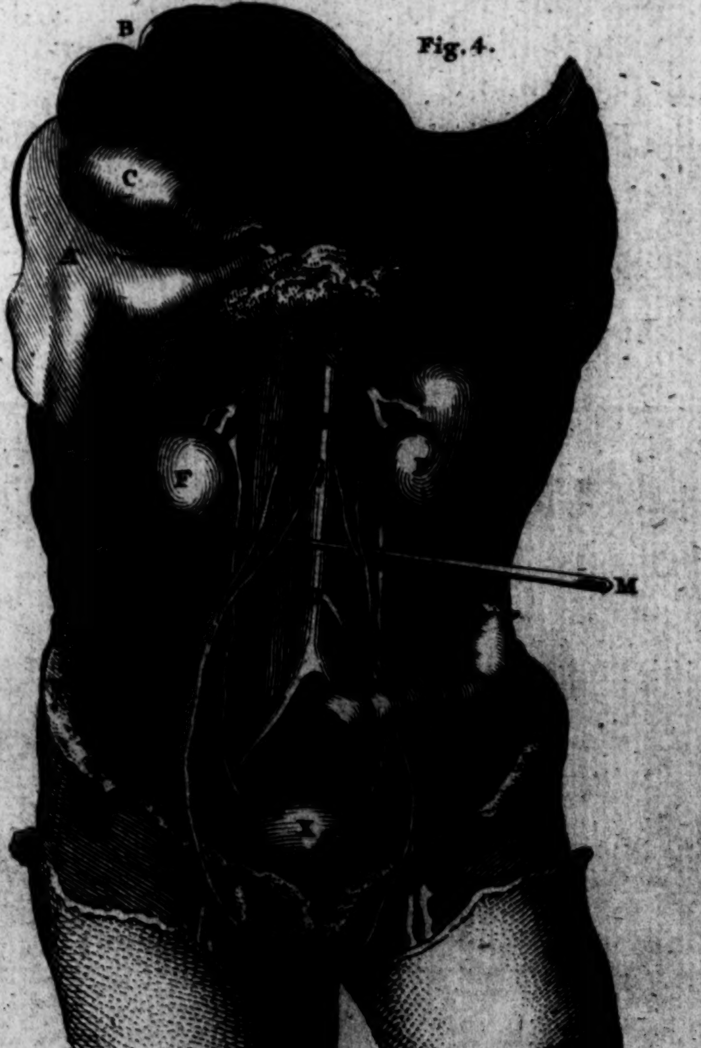
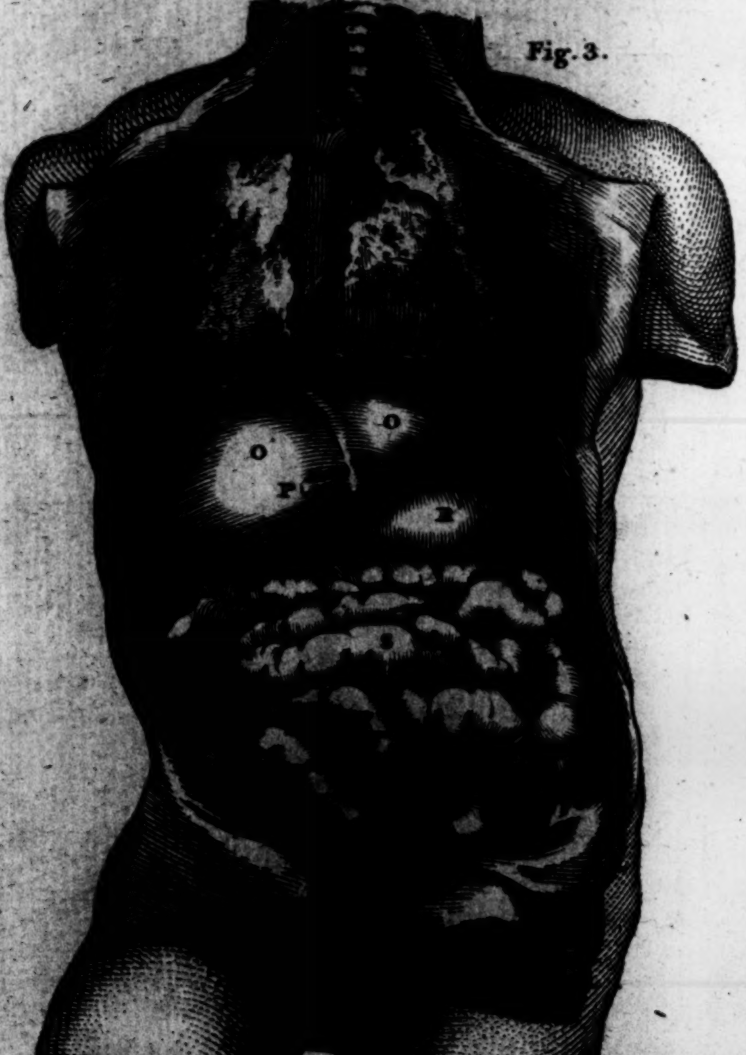


Fig. 3. The Body laid open to shew the Thoracic & Abdominal Viscera in Situ, nothing being removed but the Omentum

Fig. 3.



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occaſions, compreſſes the ſupercial veins; and the return of the blood through them being impeded, they become diſtended. When the ligature is too looſe, the veins are not ſufficiently compreſſed, and the blood continues its progreſs towards the heart; and, on the contrary, when it is made too tight, the arteries themſelves become compreſſed; and the flow of the blood through them being impeded, the veins cannot be diſtended.

Another phænomenon, which effectually proves the circulation, is the loſs of blood that every living animal ſuſtains by opening only a ſingle artery of a moderate ſize; for it continues to flow from the wounded veſſel till the equilibrium is deſtroyed, which is eſſential to life. This truth was not unknown to the ancients; and it ſeems ſtrange that it did not lead them to a knowledge of the circulation, as it ſufficiently proves, that all the other veſſels muſt communicate with that which is opened. Galen, who lived more than 600 years ago, drew this concluſion from it; and if we farther obſerve, that he deſcribes (after Eraſiſtratus, who flouriſhed about 450 years before him) the ſeveral valves of the heart, and determines their diſpoſition and uſes, it will appear wonderful, that a period of more than 1000 years ſhould afterwards elapſe before the true courſe of the blood was aſcertained. This diſcovery, for which we are indebted to the immortal Harvey, has thrown new lights on phyſiology and the doctrine of diſeaſes, and conſtitutes one of the moſt important periods of anatomical hiſtory.

Explanation of the PLATE *on the* VISCERA.

PLATE III. FIGURE III.

Fig. 3. The Body laid open to ſhew the Thoracic and Abdominal Viſcera in Situ, nothing being removed but the Omentum.

A, Larynx. B, The internal jugular vein. C, The termination of the thoracic duct at the angle, between the left ſubclavian and jugular veins. D, The ſubclavian vein. E, Cava deſcendens. F, The right auricle of the heart. G, The right ventricle. H, Part of the left ventricle. I, Aorta aſcendens. K, Arteria pulmonalis. L, The right lobe of the lungs, part of which is cut off to ſhew the great blood-veſſels. M, The left lobe of the lungs. N, The diaphragm. O, The liver. P, The ligamentum rotundum. Q, The gall-bladder. R, The ſtomach preſſed by the liver towards the left ſide. S, The ſmall guts. T, The ſpleen.

PLATE III. FIGURE IV.

An Internal View of the Body below the Diaphragm, with the Inteſtines removed to ſhew the remaining Viſcera, and the Thoracic Duct.

A A, The under ſide of the liver. B, Ligamentum rotundum. C, The gall bladder. D, The pancreas. E, The ſpleen. FF, The kidneys. GG, The emulgent veins. H, The Thoracic duct. I, Aorta deſcendens. K, Vena cava aſcendens. L L, Spermatic plexus, going over Poupart's ligament to the teſticles. M, A probe under the ſpermatic veſſels, and the arteria meſenterica inferior, and over the ureters. N, The ureter. O, Inferior meſſenteric artery. P P, Ureters going down to the bladder. Q, The iliac veſſels. R, Sigmoid flexure of the colon going down to form the rectum. S, The rectum inteſtinum. T T, The anterior ſpine of the os ileum. U U, The iliac vein and artery, going under Poupart's ligaments to the thigh. X, The bladder of urine. Y, Oſſa pubes.

Explanation of the PLATE *on* FEMALE ORGANS *of* GENERATION.

FIGURE I.

An anterior View of the Utterus, Fallopian Tubes and Vagina.

A, Fundus utteri. B, Cervix utteri. C, Os Tincæ. D D, The Fallopian tubes, one of which is opened to ſhew the paſſage. E, Morſus Diaboli. F F, Duplicature of the peretonæum or broad ligament; behind this are the ovarii, (faintly ſeen) two oviform bodies, by the ancients called teſticles. GG, The round ligaments. H, Vagina cut open to ſhew the rugus appearance. I, The orifice of urethra, round it are marked a few of the excretory ducts, which belong to a like number of glands in the vaginal coat. K, Clitoris.

FIGURE II.

An Anterior View of the Bladder, Urethra, and Pudendum, or external Parts of Generation.

A, The upper and anterior ſurface of the bladder, or what comes in immediate contact with the viſceræ of the abdomen. B B, The ureters. CCC, The inner ſurface of the bladder. D, The neck of the bladder. E, Inner ſurface of the urethra. F, The orifice of the urethra. G, Orifice of the vagina. H H, Pudendi Labia.

FIGURE III.

A Side View of the Contents of the Pelves; the Parts were firſt diſtended, and then expoſed to the Froſt, till frozen into a ſolid Maſs, and a lateral Section made to ſhow their Cavities and relative Situation.

A, The upper and anterior ſurface of the bladder. B, The cavity of the bladder. C, The cavity of the urethra. D, Coats of the bladder and vagina. E, The cavity of vagina. F, Coats of the vagina and rectum. G, Cavity of rectum. H, Rectum tied. I, The uterus. K K, The Fallopian tubes, or the two paſſages of the uterus into the general cavity of the Pelvis. L L, Fembriæ, or Morſus Diaboli. M, One of the ovaries ſeen. N N, The broad ligament. OO, Fat and integuments, &c. P, The Pudendum.

FIGURE IV.

A Back View from the ſame Preparation, to ſhew their relative Situation and Angles of Reflexion of the Peretonæal Coat. When theſe Parts are in the Body, in order to obtain this View, the Subject muſt be laid on her Back, the Abdominal Viſceræ removed; and then ſtanding acroſs the Body, with your Back to the Subjects Head, and looking down into the Pelves, you ſee theſe Viſceræ in the following Order: Firſt, the Rectum; then Utterus; and laſtly, the Bladder.

A, The bladder. B, The utterus. C C, The Fallopian tubes. D D, The Fimbriæ, or morſus diaboli. E E, The ovaries. F F, The broad ligament. G, a portion of the rectum tied.

FIGURE V.

A View of the Utterus, and its Cavity, in the Virgin State; a Longitudinal Section, or that Part of it cut away, which looks towards the Pelves; the remaining Half is here exhibited.

A A A, The ſubſtance of the utterus. B, The entrance of the Fallopian tube. C, The other Fallopian tube ſeen from behind. D D, The cavity of the utterus, the loweſt, D, is placed on what is called the peniform rugæ of the utterus. E, The os tincæ. F F, Portions of the broad ligament. GG, The round ligament.

PART VI.

NEUROLOGY,

AND THE ORGANS OF SENSE.

SECT. I.

OF THE BRAIN AND ITS INTEGUMENTS.

THE Brain is every where ſurrounded by two membranes, the dura and pia mater. The firſt of theſe lines the interior ſurface of the cranium, to which it every where adheres ſtrongly, but more particularly at the ſutures, and at the many foramina through which veſſels paſs betweeen it and the pericranium. The dura mater is perfectly ſmooth and inelaſtic, and its inner ſurface is conſtantly bedewed with a fine pellucid fluid, which every where ſeparates it from the pia mater. The dura mater ſends off ſeveral conſiderable proceſſes, which divide the brain into ſeparate portions and prevent them from compreſſing each other. Of theſe proceſſes there is one ſuperior and longitudinal, called the *falx*, or *falciform proceſs*, from its reſemblance to a ſcythe. It ariſes from the ſpine of the os frontis, near the cryſta galli, and extending along in the direction of the ſagittal ſuture, to beyond the lamboidal ſuture, divides the brain into two hemiſpheres. A little below the lamboidal ſuture, it divides into two broad wings or expanſions called the tranſverſe or lateral proceſſes, which prevents the lobes of the cerebrum from preſſing on the cerebellum. Beſides theſe there is a fourth, which is ſituated under the tranſverſe proceſſes, and being continued to the ſpine of the occiput, divides the cerebellum into two lobes.

The blood, after being diſtributed through the cavity of the cranium by means of the arteries, is returned, as in the other parts of the body, by veins which all paſs on to certain channels, ſituated behind theſe ſeveral proceſſes.

Theſe canals or ſinuſes communicate with each other, and empty themſelves into the internal jugular veins, which convey the blood into the vena cava. They are in fact triangular veins, running through the ſubſtance of the dura mater, and, like the proceſſes, are diſtinguiſhed into longitudinal and lateral; and where theſe three meet, we obſerve they form the torcular Herophili. Herophilus, who firſt deſcribed it, having ſuppoſed that the blood at the union of theſe three veins, is, as it were, in a preſs.

Theſe ſinuſes or veins, by being conveyed through a thick denſe membrane, firmly ſuſpended, as the dura mater is, within the cranium, are leſs liable to rupture; at the ſame time they are well ſupported, and by running every where along the inner ſurface of the bones they are prevented from preſſing on the ſubſtance of the brain. To prevent too great a dilation of them, we find filaments (called chordæ Williſii, from their having been firſt noticed by Willis) ſtretched acroſs their cavities; and the oblique manner in which the veins from the brain run through the ſubſtance of the brain into theſe channels, ſerves the purpoſe of a valve, which prevents the blood from turning back into the ſmaller and weaker veſſels of the brain.

The pia mater is a much ſofter and finer membrane than the dura mater; being exceedingly delicate, tranſparent, and vaſcular. It inveſts every part of the brain, and ſends off an infinite number of elongations, which inſinuate themſelves between the convolutions, and even into the ſubſtance of the brain. This membrane is compoſed of two laminæ; of which the exterior one is named tunica arachnoidea, from its thinneſs, which is equal to that of a ſpider's web. Theſe two laminæ are intimately adherent to each other at the upper part of the brain, but are eaſily ſeparable at the baſis of the brain, and through the whole length of the medulla ſpinalis. The external layer, or tunica arachnoidea, appears to be ſpread uniformly over the ſurface of the brain, but without entering into its furrows as the inner layer does; the latter being found to inſinuate itſelf between the convolutions, and even into the interior cavities of the brain. The blood-veſſels of the brain are diſtributed through it in their way to that organ, and are therefore divided into very minute ramifications, before they penetrate the ſubſtance of the brain.

There are ſeveral parts included under the general denomination of brain. One of theſe, which is of the ſofteſt conſiſtence, and fills the greateſt part of the cavity of the cranium, is the cerebrum, or brain, properly ſo called. Another portion, which is ſeated in the inferior and poſterior part of the head, is the cerebellum; and a third, which derives its origin from both theſe, is the medulla oblongata.

SECT. II.

THE CEREBRUM.

THE Cerebrum is a medullary maſs of a moderate conſiſtence, filling up exactly all the upper part of the cavity of the cranium, and divided into two hemiſpheres by the falx of the dura mater. Each of theſe hemiſpheres is uſually diſtinguiſhed into an interior, a middle and a poſterior lobe. The firſt of theſe is lodged on the orbital proceſſes of the os frontis; the middle lobes lie in the middle foſſæ of the baſis of the cranium, and the poſterior lobes are placed on the tranſverſe ſeptum of the os occipitis, immediately over the cerebellum, from which they are ſeparated by the lateral proceſſes of the dura mater.

The Cerebrum appears to be compoſed of two diſtinct ſubſtances. Of theſe, the exterior one, which is of a greyiſh or aſh-colour, is called the cortex, and is ſomewhat ſofter than the other, which is very white, and is called medulla, or ſubſtantia alba.

After having removed the falx, and ſeparated the two hemiſpheres from each other, we perceive a white convex body, the corpus calloſum, which is a portion of the medullary ſubſtance, uniting the two hemiſpheres to each other, and not inveſted by the cortex. By making an horizontal inciſion in the brain, on a level with this corpus calloſum, we diſcover two oblong cavities, named the anterior or lateral ventricles, one in each hemiſphere. Theſe two ventricles, which communicate with each other by a hole immediately under the plexus choroides, are ſeparated laterally by a very fine medullary partition, called ſeptum lucidum, from its thinneſs and tranſparency. The lower edge of this ſeptum is fixed to the fornix, which is a kind of medullary arch (as its name implies) ſituated under corpus-calloſum, and nearly of a triangular ſhape. Anteriorly the fornix ſends off two medullary chords, called its anterior crura: which ſeem to be united to each other by a portion of medullary ſubſtance, named commiſſura anterior cerebri. Theſe crura diverging from one another, are loſt at the outer ſide of the lower and fore-part of the third ventricle. Poſteriorly the fornix is formed into two other crura, which unite with two medullary protuberances called pedes hippocampi, and ſometimes cornua ammonis, that extend along the back part of the lateral ventricles. The concave edge of the pedes hippocampi is covered by a medullary lamina, called corpus fimbriatum.

Neither the edges of the fornix, nor its poſterior crura, can be well diſtinguiſhed, till we have removed the plexus choroides. This is a production of the pia mater, which is ſpread over the lateral ventricles. Its looſe edges are collected, ſo as to appear like a vaſcular band on each ſide.

When we have removed this plexus, we diſcover ſeveral other protuberances included in the lateral ventricles. Theſe are the corpora ſtriata, the thalami nervorum opticorum, the tubercula quadrugemina, and the pineal gland.

The corpora ſtriata are two curved oblong eminences, that extend along the anterior part of the lateral ventricles. They derive their name from their ſtriated appearance, which is owing to an intermixture of the cortical and medullary ſubſtances of the brain.

The thalami nervorum opticorum, are ſo called, becauſe the optic nerves ariſe chiefly from them, and they are likewiſe compoſed both of the cortex and medulla. They are ſeparated from the corpora ſtriata only by a kind of medullary chord, the geminum centrum ſemi-circulare. The thalami are nearly of an oval ſhape, and are ſituated at the bottom of the upper cavity of the lateral ventricles. They are cloſely united, and at their convex part ſeem to become one body.

Anteriorly, in the ſpace between the thalami, we obſerve an orifice by which the lateral ventricles communicate, and another leads down from this, under the different appellations of foramen commune anterius, vulva, iter ad infundibulum, but more properly iter ad tertium ventriculum; and the ſeparation of the thalami from each other poſteriorly, forms another opening or interſtice called anus. This has been ſuppoſed to communicate with the third ventricle; but it does not, the bottom of it being ſhut up by the pia mater. The back-part of the anus is formed by a kind of medullary band, which connects the thalami to each other, and is called commiſſura poſterior cerebri.

Behind the thalami and commiſſura poſterior, we obſerve a ſmall, ſoft, greyiſh, and oval body, about the ſize of a pea. This is the glandula pinealis; it is deſcribed by Galen under the name of conarion, and has been rendered famous by Deſcartes, who ſuppoſed it to be the ſeat of the ſoul. Galen ſeems formerly to have entertained the ſame opinion. Some modern writers have, with as little reaſon, imagined that the ſoul is placed in the corpus calloſum.

The pineal gland reſts upon four remarkable eminences, diſpoſed in pairs, and ſeated immediately below it. Theſe tubercles, which by the ancients were called teſtes and nates, have, ſince the time of Winſlow, been more commonly named tubercula quadrigemina.

Under the thalami we obſerve another cavity, the third ventricle, which terminates anteriorly in a ſmall medullary canal, the infundibulum, that leads to the glandula pituitaria. It has been doubted, whether the infundibulum is really hollow; but ſome late experiments on this part of the brain, by Profeſſor Murray of Upſal, clearly prove it to be a medullary canal, ſurrounded by both laminæ of the pia mater. After freezing the brain, this channel was found filled with ice.

From the poſterior part of the third ventricle, we ſee a ſmall groove or channel, deſcending obliquely backwards. This channel, which is called the aqueduct of Silvius, though it was known to the antients, opens into another cavity of the brain, placed between the cerebellum and medulla oblongata, and called the fourth ventricle.

SECT. III.

THE CEREBELLUM.

THE Cerebellum, which is divided into two lobes, is commonly ſuppoſed to be of a firmer texture than the cerebrum; but the truth is, that in the greater number of ſubjects, there appears to be no ſenſible difference in the conſiſtence of theſe two parts. It has more of the cortical than of the medullary ſubſtance in its compoſition.

The furrow that divides the two lobes of the cerebellum leads anteriorly to a proceſs, compoſed of medullary and cortical ſubſtances, covered by the pia mater; and which, from its being divided into numerous furrows, reſembling the rings of the earth-worm, is named proceſſus vermiformis. This proceſs forms a kind of ring in its courſe between the lobes.

The ſurface of the cerebellum does not afford thoſe circumvolutions which appear in the cerebrum; but inſtead of theſe, we obſerve a great number of minute furrows, running parallel to each other, and nearly in a tranſverſe direction. The pia mater inſinuates itſelf into theſe furrows.

When we cut into the ſubſtance of the cerebellum, from above downwards, we find the medullary part running in a kind of ramifying courſe, and exhibiting an appearance that has gotten the name of arbor vitæ. Theſe ramifications unite to form a medullary trunk; the middle, anterior, and moſt conſiderable part of which forms two proceſſes, the crura cerebelli, which unite with the crura cerebri, to form the medulla oblongata. The reſt furniſhes two other proceſſes, which loſe themſelves under the nates, and thus unite the lobes of the cerebellum to the poſterior part of the cerebrum. Under the nates we obſerve a tranſverſe medullary line, or linea alba, running from one of theſe proceſſes to the other; and between them we find a very thin medullary lamina, covered with the pia mater, which the generality of anatomiſts have (though ſeemingly without reaſon) conſidered as a valve formed for cloſing the communication between the fourth ventricle and the aquæductus Sylvii. Vieuſſens named it valvula major cerebri.

SECT. IV.

THE MEDULLA OBLONGATA.

THE medulla oblongata is ſituated in the middle, lower, and poſterior part of the cranium, and may be conſidered as a production or continuation of the whole medullary ſubſtance of the cerebrum and cerebellum, being formed by the union of two conſiderable medullary proceſſes of the cerebrum, called crura cerebri, with two other ſmaller ones from the cerebellum, which were juſt now ſpoken of under the name of crura cerebelli.

The crura cerebri ariſe from the middle and lower part of each hemiſphere. They are ſeparated from each other at their origin, but are united below, where they terminate in a middle protuberance, the pons Varolii, ſo called, becauſe Varolius, compared it to a bridge. This name, however, can convey no idea of its real appearance. It is, in fact, nothing more than a medullary protuberance, nearly of a ſemi-ſpherical ſhape, which unites the crura cerebri to thoſe of the cerebellum.

Between the crura cerebri, and near the anterior edge of the pons Varolii, are two tubercles, compoſed externally of medullary, and internally of cineritious, ſubſtance, to which Euſtachius firſt gave the name of eminentiæ mamillares.

Along the middle of the poſterior ſurface of the medulla oblongata, where it forms the anterior part of the fourth ventricle, we obſerve a kind of furrow which runs downwards and terminates in a point. About an inch above the lower extremity of this fiſſure, ſeveral medullary filaments are to be ſeen running towards it on each ſide in an oblique direction, ſo as to give it the appearance of a writing-pen; hence it is called calamus ſcriptorius.

From the poſterior part of the pons Varolii, the medulla oblongata deſcends obliquely backwards; at its fore-part, immediately behind the pons Varolii, we obſerve two pair of eminences, which were deſcribed by Euſtachius, but received no particular appellation till the time of Vieuſſens, who gave them the names of corpora olivaria and corpora pyramidalia. The former are the outermoſt, being placed one on each ſide. They are nearly of an oval ſhape, and are compoſed of medulla, with ſtreaks of cortical ſubſtance. Between theſe are the corpora pyramidalia, each of which terminates in a point. In the human ſubject theſe four eminences are ſometimes not eaſily diſtinguiſhed.

SECT. V.

MEDULLA SPINALIS.

THE medulla ſpinalis, or ſpinal marrow, which is the name given to the medullary chord that is extended down the vertebral canal, from the great foramen of the occipital bone to the bottom of the laſt lumbar vertebra, is a continuation of the medulla oblongata. Like the other parts of the brain, it is inveſted by the dura and pia mater. The firſt of theſe, in its paſſage out of the cranium, adheres to the foramen of the os occipitis. Its connection with the ligamentary ſubſtance that lines the cavity of the ſpine, is only by means of cellular membrane; but between the ſeveral vertebræ, where the nerves paſs out of the ſpine, it ſends off prolongations, which adhere ſtrongly to the vertebral ligaments. Here, as in the cranium, the dura mater has its ſinuſes or large veins. Theſe are two in number, and are ſeen running on each ſide of the medullary column, from the foramen magnum of the os occipitis to the lower part of the os ſacrum. They communicate together by ramifying branches at each vertebra, and terminate in the vertebral, intercoſtal, and ſacral veins.

The pia mater is connected with the dura mater by means of a thin tranſparent ſubſtance, which from its indentations between the ſpinal nerves has obtained the name of ligamentum denticulatum. It is ſomewhat firmer than the tunica arochnoidea, but in other reſpects reſembles that membrane. Its uſe is to ſupport the ſpinal marrow, that it may not affect the medulla oblongata by its weight.

The ſpinal marrow itſelf is externally of a white colour; but upon cutting into it we find its middle-part compoſed of a darker coloured maſs, reſembling the cortex of the brain. When the marrow has reached the firſt lumbar vertebra, it becomes extremely narrow, and at length terminates in an oblong protuberance; from the extremity of which the pia mater ſends off a prolongation or ligament, reſembling a nerve, that perforates the dura mater, and is fixed to the os coccygis.

The medulla ſpinalis gives riſe to 30 or 31 pair of nerves, but they are not all of the ſame ſize, nor do they all run in the ſame direction. The upper ones are thinner than the reſt, and are placed almoſt tranſverſely: as we deſcend we find them running more and more obliquely downwards, till at length their courſe is almoſt perpendicular, ſo that the lowermoſt nerves exhibit an appearance that is called cauda equina, from its reſemblance to a horſe's tail.

The arteries that ramify through the different parts of the brain, are derived from the internal carotid and from the vertebral arteries. The medulla ſpinalis is ſupplied by the anterior and poſterior ſpinal arteries, and likewiſe receives branches from the cervical, the inferior and ſuperior intercoſtal, the lumbar, and the ſacral arteries.

SECT. VI.

ON THE NERVES WHICH GO OFF FROM THE BRAIN, AND SPINAL MARROW.

THE nerves are medullary chords, differing from each other in ſize, colour, and conſiſtence, and deriving their origin from the medulla oblongata and medulla ſpinalis. There are 39, and ſometimes 40, pair of the nerves; nine of which originate from the medulla oblongata, and 30 or 31 from the medulla ſpinalis. They appear to be perfectly inelaſtic, and likewiſe to poſſeſs no irritability. If we irritate muſcular fibres, they immediately contract; but nothing of this ſort happens if we irritate a nerve. They carry with them a covering from the pia mater; but derive no tunic from the dura mater, as hath been generally, though erroneouſly ſuppoſed, ever ſince the time of Galen; the outer covering of the nerves being in fact nothing more than cellular membrane. This covering is very thick where the nerve is expoſed to the action of muſcles; but where it runs through a bony canal, or is ſecure from preſſure, the cellular tunic is extremely thin, or altogether wanting. We have inſtances of this in the portio mollis of the auditory nerve, and in the nerves of the heart.

By elevating, carefully and gently, the brain from the baſis of the cranium, we find the firſt nine pair ariſing in the following order: 1. The nervi olfactorii, diſtributed through the pituitary membrane, which conſtitutes the organ of ſmell. 2. The optici, which go to the eyes, where they receive the impreſſions of viſible objects. 3. The oculorum motores, ſo called becauſe they are diſtributed to the muſcles of the eye. 4. The pathetici, diſtributed to the ſuperior oblique muſcles of the eyes, the motion of which is expreſſive of certain paſſions of the ſoul. 5. The nerves of this pair ſoon divide into three principal branches, and each of theſe has a different name. Its upper diviſion is the opthalamicus, which is diſtributed to various parts of the eyes, eye-lids, fore-head, noſe, and integuments of the face. The ſecond is called maxillaris ſuperior, and the third maxillaris inferior; both which names allude to their diſtribution. 6. The abductores; each of theſe nerves is diſtributed to the abductor muſcle of the eye, ſo called, becauſe it helps to draw the globe of the eye from the noſe. 7, The auditorii, which are diſtributed through the organs of hearing. 8, The par vagum, which derives its name from the great number of parts, to which it gives branches both in the thorax and abdomen. 9. The linguales, or hypogloſſi, which are diſtributed to the tongue, and appear to contribute both to the organ of taſte and to the motions of the tongue.

It has already been obſerved, that the ſpinal marrow ſends off 30 or 31 pair of nerves; theſe are chiefly diſtributed to the exterior parts of the trunk and to the extremities. They are commonly diſtinguiſhed into the cervical, dorſal, lumbar, and ſacral nerves. The cervical, which paſs out from between the ſeveral vertebræ of the neck, are eight in number; the dorſal, twelve; the lumbar, five; and the ſacral, five or ſix; the number of the latter depending on the number of holes in the os ſacrum. Each ſpinal nerve at its origin is compoſed of two faſciculi of medullary fibres. One of theſe faſciculi ariſes from the anterior, and the other from the poſterior, ſurface of the medulla. Theſe faſciculi are ſeparated by the ligamentum denticulatum; after which we find them contiguous to one another. They then perforate the dura mater, and unite to form a conſiderable knot or ganglion. Each of theſe ganglions ſends off two branches; one anterior, and the other poſterior. The anterior branches communicate with each other at their coming out of the ſpine, and likewiſe ſend off one, and ſometimes more branches, to aſſiſt in the formation of the intercoſtal nerve.

Explanation of the PLATES *on the* BRAIN.

FIGURE I.

The Baſis of the Brain, ſeen from before.

A, A, Its anterior lobes. B, B, Its middle lobes. C, C, Poſterior lobes. D, D, Cerebellum. E, E, Corpora pyramidalia. F, F, Corpora olivaria. G, G, Pons varolii. H, H, Medulla oblongata, with the origin of the nerves. I, Medulla ſpinales at its beginning. K, Olfactory nerves. L, L, Second pair, or the optic. M, M, Third pair, or the pathetic. N, N, Fourth pair. O, O, Fifth pair. P, P, Sixth pair. Q, Q, Seventh pair, or auditory, its porteo dura, and mollis. R, R, Eighth pair, or par vagum. S, S, Ninth pair, or lingual. T, T, Vertebral arteries. U, Baſilary artery. V, V, Internal carotids. W, W, Circulus arterioſus Williſii.

FIGURE II.

Exhibits an Horizonal Section of the Brain, the upper Part of the Two Hemiſpheres being removed to ſhew the two Lateral Ventricles and their Contents.

A, A, Medulla of the brain. B, B, Its cortical ſubſtance. C, Part of the cerebellum. D, Corpus calloſum. E, E, Corpora ſtriata. F, F, Thalami nervorum opticorum. G, Fornix. H, H, Plexus choroides. I, Pineal gland. K, K, Anterior cornua of the ventricles. L, L, Poſterior ditto.

FIGURE III.

Exhibits the Baſis of the Cranium, lined by the Dura Mater, where is ſeen the Beginning of many Nerves, Blood Veſſels, &c.

A, A, Tentorium cerebelli. B, Longitudinal ſinus of dura mater. C, Falciform proceſs. D, D, Lateral ſinuſſes. E, E, Arteries of the dura mater. F, F, Carotid arteries. G G, Opthalmic arteries. H, Criſta galli. I, I, Frontal ſinus. K, K, Fifth pair of nerves. L, L, Fourth pair. M, M, Third pair. N, N, Origin of the intercoſtal nerve. O, O, Seventh pair of nerves. P, P, Eighth pair. Q, Q, Ninth pair. R, Glandula lachrymalis. S, S, Optic nerve. T, T, Sixth pair of nerves. U, Foramen magnum occipitale.

FIGURE IV.

A Poſterior View of the Spinal Marrow.

A, The dura matral coat of the ſpinal marrow. B, Ligamentum denticulatum. C, C, The pia matral coat. D, D, Its eight cervical nerves. E, E, Its twelve dorſal. F, F, Its five lumbar nerves. G, G, Its five ſacral nerves.

ON THE MORE DISTANT DISTRIBUTION OF THE NERVES.

And Explanation of the PLATE *on that Subject.*

FIGURE I.

Repreſents the inferior Part of the Brain; the anterior Part of the whole Spine, including the Medulla Spinalis; with the Origin and large Portions of all the Nerves.

A, A, The anterior lobes of the cerebrum. B, B, The lateral lobes of the cerebrum. C, C, The two lobes of the cerebellum. D, Tuber annulare. E, The paſſage from the third ventricle to the infundibulum. F, The medulla oblongata, which ſends off the medulla ſpinalis through the ſpine. G, G, That part of the os occipitis which is placed above (H,H) the tranſverſe proceſſes of the firſt cervical vertebra. I, I, &c. The ſeven cervical vertebræ, with their intermediate cartilages. K, K, &c. The twelve dorſal vertebræ, with their intermediate cartilages. L, L, &c. The five lumbar vertebræ, with their intermediate cartilages. M, The os ſacrum. N, The os coccygis.

NERVES. 1 1, The firſt pair of nerves, named olfactory, which go to the noſe. 2 2, The ſecond pair, named optic, which go to form the tunica retina of the eye. 3 3, The third pair, named motor oculi, ſupply moſt of the muſcles of the eye-ball. 4 4, The fourth pair, named pathetic, which are wholly ſpent upon the muſculus trochlearis of the eye. 5 5, The fifth pair divides into three branches. The firſt, named opthalmic, goes to the orbit, ſupplies the lachrymal gland, and ſends branches out to the forehead and noſe. The ſecond, named ſuperior maxillary, ſupplies the teeth of the upper jaw, and ſome of the muſcles of the lips. The third, named inferior maxillary, is ſpent upon the muſcles and teeth of the lower jaw, tongue, and muſcles of the lips. 6 6, The ſixth pair, which, after ſending off the beginning of the intercoſtal or great ſympathetic, is ſpent upon the abductor oculi. 7 7, The ſeventh pair, named auditory, divides into two branches. The largeſt, named portio mollis, is ſpent upon the internal ear. The ſmalleſt, portio dura, joins to the fifth pair within the internal ear, by a reflected branch from the ſecond of the fifth; and within the tympanum, by a branch from the third of the fifth, named chorda tympani.

The eighth pair, named par vagum, which accompanies the intercoſtal, and is ſpent upon the tongue, larynx, pharynx, lungs, and abdominal viſcera. 9 9, The ninth pair, which are ſpent upon the tongue. 10 10, &c. The intercoſtal, or great ſympathetic, which is ſeen from the ſixth pair to the bottom of the pelvis on each ſide of the ſpine, and joining with all the nerves of the ſpine; in its progreſs ſupplying the heart, and, with the par vagum, the contents of the abdomen and pelvis. 11 11, The acceſſorius, which is ſpent upon the ſternocleido-maſtoidæus and trapezius muſcles. 12 12, The firſt cervical nerves. 13 13, The ſecond cervical nerves; both ſpent upon the muſcles that lie on the neck, and teguments of the neck and head. 14 14, The third cervical nerves, which, after ſending off (15 15, &c.) the phrenic nerves to the diaphragm, ſupply the muſcles and teguments that lie on the ſide of the neck and top of the ſhoulder. 16 16, The brachial plexus, formed by the fourth, fifth, ſixth, ſeventh cervicals, and firſt dorſal nerves, which ſupply the muſcles and teguments of the ſuperior extremity. 17 17, The twelve dorſal, or proper intercoſtal nerves, which are ſpent upon the intercoſtal muſcles and ſome of the large muſcles which lie upon the thorax. 18 18, The five lumbar pairs of nerves, which ſupply the lumbar and abdominal muſcles, and ſome of the teguments and muſcles of the inferior extremity, making the anterior crural, and obturator nerves. 19 19, The ſacro-ſciatic, or poſterior crural nerve, formed by the two inferior lumbar, and three ſuperior of the os ſacrum. This large nerve ſupplies the greateſt part of the muſcles and teguments of the inferior extremity. 20 20, The ſtomachic plexus, formed by the eighth pair. 21 21, Branches of the ſolar, or cæliac plexus, formed by the eighth pair and intercoſtals, which ſupply the ſtomach and chylopoietic viſcera. 22 22, Branches of the ſuperior and inferior meſenteric plexuſes, formed by the eighth pair and intercoſtals, which ſupply the chylopoietic viſcera, with part of the organs of urine and generation. 23 23, Nerves which accompany the ſpermatic cord. 24 24, The hypogaſtric plexus, which ſupplies the organs of urine and generation within the pelvis.

OF THE SENSES.

THE External Senſes are five in number, viz. Touch, Taſte, Smelling, Hearing, and Viſion.

SECT. VII.

OF TOUCH.

THE ſenſe of touch may be defined to be the faculty of diſtinguiſhing certain properties of bodies by the feel. In a general acceptation, this definition might perhaps not improperly be extended to every part of the body poſſeſſed of ſenſibility; but it is commonly confined to the nervous papillæ of the cutis, or true ſkin.

The cutis is compoſed of fibres cloſely compacted together, as we may obſerve in leather, which is the prepared ſkin of animals. Theſe fibres form a thick net-work, which every where admits the filaments of nerves, and an infinite number of blood-veſſels and lymphatics.

The cutis, when the epidermis is taken off, is found to have, throughout its whole ſurface, innumerable papillæ, which appear like very minute granulations, and ſeem to be calculated to receive the impreſſions of the touch, being the moſt eaſily obſerved where the ſenſe of feeling is the moſt delicate, as in the palms of the hands, and on the fingers.

Theſe papillæ are ſuppoſed, by many anatomical writers, to be continuations of the pulpy ſubſtance of nerves, whoſe coats have terminated in the cellular texture of the ſkin. The great ſenſibility of theſe papillæ evidently proves them to be exceedingly nervous. Theſe papillæ being deſcribed, the uſes of the epidermis, and the reticulum mucoſum which covers them, will be more eaſily underſtood; the latter ſerving to keep them conſtantly moiſt, while the former protects them from the external air, and modifies their too great ſenſibility.

The exterior properties of bodies, ſuch as their ſolidity, moiſture, inequality, ſmoothneſs, dryneſs, or fluidity, and likewiſe their degree of heat, ſeem all to be capable of making different impreſſions on the papillæ, and conſequently of exciting different ideas in the ſenſorium commune. But the organ of touch, like all the other ſenſes, is not equally delicate in every part of the body, or in every ſubject; being in ſome much more exquiſite than in others.

SECT. VIII.

OF THE TASTE.

THE ſenſe of taſte is ſeated chiefly in the tongue.

On the upper ſurface of this organ we may obſerve a great number of papillæ, which, on account of their difference in ſize and ſhape, are commonly divided into three claſſes. The largeſt are ſituated towards the baſis of the tongue. Their number commonly varies from ſeven to nine, and they ſeem to be mucous follicles. Thoſe of the ſecond claſs are ſomewhat ſmaller, and of a cylindrical ſhape. They are moſt numerous about the middle of the tongue. Thoſe of the third claſs are very minute, and of a conical ſhape. They are very numerous on the apex and edges of the tongue, and have been ſuppoſed to be formed by the extremities of its nerves.

We obſerve a line, the linea linguæ mediana, running along the middle of the tongue, and dividing it as it were into two portions. Towards the baſis of the tongue, we meet with a little cavity, named by Morgagni foramen cæcum, which ſeems to be nothing more than a common termination of ſome of the excretory ducts of mucous glands ſituated within the ſubſtance of the tongue.

We have already obſerved, that this organ is every where covered by the cuticle, which, by forming a reduplication, called the frænum, at its under part, ſerves to prevent the too great motion of the tongue, and to fix it in its ſituation. But, beſides this attachment, the tongue is connected by means of its muſcles and membranous ligaments, to the lower jaw, the os hyoides, and the ſtyloid proceſſes.

The principal arteries of the tongue are the linguales, which ariſe from the external carotid. Its veins empty themſelves into the external jugulars. Its nerves ariſe from the fifth, eighth, and ninth pair.

The variety of taſtes ſeems to be occaſioned by the different impreſſions made on the papillæ by the food. The different ſtate of the papillæ with reſpect to their moiſture, their figure, or their covering, ſeems to produce a conſiderable difference in the taſte, not only in different people, but in the ſame ſubject, in ſickneſs and in health. The great uſe of the taſte ſeems to be to enable us to diſtinguiſh wholeſome and ſalutary food from that which is unhealthy; and we obſerve, that many quadrupeds, by having their papillæ very large and long, have the faculty of diſtinguiſhing flavours with infinite accuracy.

SECT. IX.

OF SMELLING.

THE ſenſe of ſmelling, like the ſenſe of taſte, ſeems intended to direct us to a proper choice of aliment, and is chiefly ſeated in the noſe, which is diſtinguiſhed into its external and internal parts. The ſituation and figure of the former of theſe do not ſeem to require a definition. It is compoſed of bones and cartilages, covered by muſcular fibres, and by the common integuments. The bones make up the upper portion, and the cartilages the lower one. The ſeptum narium, like the noſe, is likewiſe in part bony, and in part cartilaginous. Theſe bones and their connection were deſcribed in the Oſteology.

The internal part of the noſe, beſides the oſſa ſpongioſa, has ſix cavities or ſinuſes, the maxillary, the frontal, and the ſphenoid on each ſide, which were all deſcribed with the bones of the head. They all open into the noſtrils; and the noſe likewiſe communicates with the mouth, larynx, and pharynx, poſteriorly behind the velum palati.

All theſe ſeveral parts, which are included in the internal diviſion of the noſe, viz. the inner ſurface of the noſtrils, the lamellæ of the oſſa ſpongioſa, and the ſinuſes, are lined by a thick and very vaſcular membrane, which, though not unknown to the ancients, was firſt well deſcribed by Schneider, and is therefore now commonly named membrana pituitaria Schneideri. This membrane is truly the organ of ſmelling; but its real ſtructure does not yet ſeem to be perfectly underſtood. It appears to be a continuation of the cuticle, which lines the inner ſurface of the mouth. In ſome parts of the noſe it is ſmooth and firm, and in others it is looſe and ſpongy. It is conſtantly moiſtened by a mucous ſecretion; the finer parts of which are carried off by the air we breathe, and the remainder, by being retained in the ſinuſes, acquires conſiderable conſiſtence. The manner in which this mucus is ſecreted has not yet been ſatisfactorily aſcertained; but it ſeems to be by means of mucous follicles.

Its arteries are branches of the internal maxillary and internal carotid. Its veins empty themſelves into the internal jugulars. The firſt pair of nerves, the olfactory, are ſpread over every part of it, and it likewiſe receives branches from the fifth pair.

After what has been ſaid of the pituitary membrane, it will not be difficult to conceive how the air we draw in at the noſtrils, being impregnated with the effluvia of bodies, excites in us that kind of ſenſation we call ſmelling. As theſe effluvia, from their being exceedingly light and volatile, cannot be capable in a ſmall quantity of making any great impreſſion on the extremities of the olfactory nerves, it was neceſſary to give conſiderable extent to the pituitary membrane, that by this means a greater number of odoriferous particles might be admitted at the ſame time. When we wiſh to take in much of the effluvia of any thing, we naturally cloſe the mouth, that all the air we inſpire may paſs through the noſtrils; and at the ſame time, by means of the muſcles of the noſe, the noſtrils are dilated, and a greater quantity of air is drawn into them.

In many quadrupeds, the ſenſe of ſmelling is much more extenſive and delicate than it is in the human ſubject; and in the human ſubject it ſeems to be more perfect the leſs it is vitiated by a variety of ſmells. It is not always in the ſame ſtate of perfection, being naturally affected by every change of the pituitary membrane, and of the lymph with which that membrane is moiſtened.

SECT. X.

OF HEARING.

BEFORE we undertake to explain the manner in which we are enabled to receive the impreſſions of ſound, it will be neceſſary to deſcribe the ear, which is the organ of Hearing. It is commonly diſtinguiſhed into external and internal. The former of theſe diviſions includes all that we are able to diſcover without diſſection, and the meatus auditorius, as far as the tympanum; and the latter, all the other parts of the ear.

The external ear is a cartilaginous funnel, covered by the common integuments, and attached, by means of its ligaments and muſcles, to the temporal bone. Although capable only of a very obſcure motion, it is found to have ſeveral muſcles. Different parts of it are diſtinguiſhed by different names; all its cartilaginous part is called ala or wing, to diſtinguiſh it from the ſoft and pendent part below, called the lobe. Its outer circle or border is called helix, and the ſemicircle within this, antihelix. The moveable cartilage placed immediately before the meatus auditorius, which it may be made to cloſe exactly, is named tragus; and an eminence oppoſite to this at the extremity of the antihelix, is called antitragus. The concha is a conſiderable cavity formed by extremities of the helix and antihelix. The meatus auditorius, which at its opening is cartilaginous, is lined with a very thin membrane, which is a continuation of the cuticle from the ſurface of the ear.

In this canal we find a yellow wax, which is ſecreted by a number of minute glands or follicles, each of which has an excretory duct. This ſecretion, which is at firſt of an oily conſiſtence, defends the membrane of the tympanum from the injuries of the air; and by its bitterneſs, prevents minute inſects from entering into the ear. But when from neglect or diſeaſe it accumulates in too great a quantity, it ſometimes occaſions deafneſs. The inner extremity of the meatus is cloſed by a very thin tranſparent membrane, the membrana tympani, which is ſet in a bony circle like the head of a drum. In the laſt century Rivinus, profeſſor at Leipſic, fancied he had diſcovered a hole in this membrane, ſurrounded by a ſphincter, and affording a paſſage to the air, between the external and internal ear. Cowper, Heiſter, and ſome other anatomiſts, have admitted this ſuppoſed foramen, which certainly does not exiſt. Whenever there is any opening in the membrana tympani, it may be conſidered as accidental. Under the membrana tympani runs a branch of the fifth pair of nerves, called chorda tympani; and beyond this membrane is the cavity of the tympanum, which is about ſeven or eight lines wide, and half ſo many in depth; it is ſemiſpherical, and every where lined by a very fine membrane. There are four openings to be obſerved in this cavity. It communicates with the mouth by means of the Euſtachian tube. This canal, which is in part bony and in part cartilaginous, begins by a very narrow opening at the anterior and almoſt ſuperior part of the tympanum, increaſing in ſize as it advances towards the palate of the mouth, where it terminates by an oval opening. This tube is every where lined by the ſame membrane that covers the inſide of the mouth. Oppoſite to this is a paſſage, which leads to the ſinuoſities of the maſtoid proceſs; and the two other openings, which are in the internal proceſs of the os petroſum, are the feneſtra ovalis, and feneſtra rotunda, both of which are covered by a very fine membrane.

There are three diſtinct bones in the cavity of the tympanum; and theſe are the malleus, incus, and ſtapes. Beſides theſe there is a fourth, which is the os orbiculare, conſidered by ſome anatomiſts as a proceſs of the ſtapes, which is neceſſarily broken off by the violence we are obliged to uſe in getting at theſe bones; but when accurately conſidered, it ſeems to be a diſtinct bone.

The malleus is ſuppoſed to reſemble a hammer, being larger at one extremity, which is its head, than it is at the other, which is its handle. The latter is attached to the membrana tympani, and the head of the bone is articulated with the incus.

The incus, as it is called from its ſhape, though it ſeems to have leſs reſemblance to an anvil than to one of the dentes molares with its roots widely ſeparated from each other, is diſtinguiſhed into its body and its legs. One of its legs is placed at the entry of the canal which leads to the maſtoid proceſs; and the other, which is ſomewhat longer, is articulated with the ſtapes, or rather with the os orbiculare, which is placed between them.

The third bone is very properly named ſtapes, being perfectly ſhaped like a ſtirrup. Its baſis is fixed into the feneſtra ovalis, and its upper part is articulated with the os orbiculare. What is called the feneſtra rotunda, though perhaps improperly, as it is more oval than round, is obſerved a little above the other, in an eminence formed by the os petroſum, and is cloſed by a continuation of the membrane that lines the inner ſurface of the tympanum. The ſtapes and malleus are each of them furniſhed with a little muſcle, the ſtapedeus and tenſor tympani. The firſt of theſe, which is the ſmalleſt in the body, ariſes from a little cavern in the poſterior and upper part of the cavity of the tympanum; and its tendon, after paſſing through a hole in the ſame cavern, is inſerted at the back part of the head of the ſtapes. This muſcle, by drawing the ſtapes obliquely upwards, aſſiſts in ſtretching the membrana tympani. The tenſor tympani, or internus mallei, as it is called by ſome writers, ariſes from the cartilaginous extremity of the Euſtachian tube, and is inſerted into the back part of the handle of the malleus, which it ſerves to pull inwards, and of courſe helps to ſtretch the membrana tympani.

The labyrinth is the only part of the ear which remains to be deſcribed. It is ſituated in the os petroſum, and is ſeparated from the tympanum by a partition which is every where bony, except at the two feneſtræ. It is compoſed of three parts; and theſe are the veſtibulum, the ſemicircular canals, and the cochlea.

The veſtibulum is an irregular cavity, much ſmaller than the tympanum, ſituated nearly in the centre of the os petroſum, between the tympanum, the cochlea, and the ſemicircular canals. It is open on the ſide of the tympanum by means of the feneſtra ovalis, and communicates with the upper portion of the cochlea by an oblong foramen, which is under the feneſtra ovalis, from which it is ſeparated only by a very thin partition.

Each of the three ſemicircular canals forms above half a circle of nearly a line in diameter, and running each in a different direction, they are diſtinguiſhed into vertical, oblique, and horizontal. Theſe three canals open by both their extremities into the veſtibulum; but the vertical and the oblique being united together at one of their extremities, there are only five orifices to be ſeen in the veſtibulum.

The cochlea is a canal which takes a ſpiral courſe, not unlike the ſhell of a ſnail. From its baſis to its apex it makes two turns and a half; and is divided into two canals by a very thin lamina or ſeptum, which is in part bony and in part membranous, in ſuch a manner that theſe two canals only communicate with each other at the point. One of them opens into the veſtibulum, and the other is covered by the membrane that cloſes the feneſtra rotunda. The bony lamella which ſeparates the two canals is exceedingly thin, and fills about two thirds of the diameter of the canal. The reſt of the ſeptum is compoſed of a moſt delicate membrane, which lines the whole inner ſurface of the cochlea, and ſeems to form this diviſion in the ſame manner as the two membranous bags of the pleura, by being applied to each other, form the mediaſtinum.

Every part of the labyrinth is furniſhed with a very delicate perioſteum, and filled with a watery fluid, ſecreted as in other cavities. This fluid tranſmits to the nerves the vibrations it receives from the membrane cloſing the feneſtra rotunda, and from the baſis of the ſtapes, where it reſts on the feneſtrum ovale.

The arteries of the external ear come from the temporal and other branches of the external carotid, and its veins paſs into the jugular. The internal ear receives branches of arteries from the baſilary and carotids, and its veins empty themſelves into the ſinuſes of the dura mater, and into the internal jugular.

The portio mollis of the ſeventh pair is diſtributed through the cochlea, the veſtibulum, and the ſemi-circular canals; and and the portio dura ſends off a branch to the tympanum, and other branches to the external ear and parts near it.

The ſenſe of hearing, in producing which all the parts we have deſcribed aſſiſt, is occaſioned by a certain modulation of the air collected by the funnel-like ſhape of the external ear, and conveyed through the meatus auditorius to the membrana tympani. That ſound is propagated by means of the air, is very eaſily proved by ringing a bell under the receiver of an air-pump;

the ſound it affords being found to diminiſh gradually as the air becomes exhauſted, till at length it ceaſes to be heard at all. Sound moves through the air with infinite velocity; but the degree of its motion ſeems to depend on the ſtate of the air, as it conſtantly moves faſter in a denſe and dry, than it does in a moiſt and rarefied air. See Acoustics.

That the air vibrating on the membrana tympana communicates its vibration to the different parts of the labyrinth, and by means of the fluid contained in this cavity effects the auditory nerve ſo as to produce ſound, ſeems to be very probable; but the ſituation, the minuteneſs, and the variety of the parts which compoſe the ear, do not permit much to be advanced with certainty concerning their mode of action.

Some of theſe parts ſeem to conſtitute the immediate organ of hearing, and theſe are all the parts of the veſtibulum: but there are others which ſeem intended for the perfection of this ſenſe, without being abſolutely eſſential to it. It has happened, for inſtance, that the membrana tympani, and the little bones of the ear, have been deſtroyed by diſeaſe, without depriving the patient of the ſenſe of hearing.

Sound is more or leſs loud in proportion to the ſtrength of the vibration; and the variety of ſounds ſeems to depend on the difference of this vibration; for the more quick and frequent it is, the more acute will be the ſound, and vice verſa.

Before we conclude this article, it will be right to explain certain phenomena, which will be found to have a relation to the organ of hearing.

Every body has, in conſequence of particular ſounds, occaſionally felt that diſagreeable ſenſation which is uſually called ſetting the teeth on edge: and the cauſe of this ſenſation may be traced to the communication which the portio dura of the auditory nerve has with the branches of the fifth pair that are diſtributed to the teeth, being properly occaſioned by the violent tremour produced in the membrana tympani by theſe very acute ſounds. Upon the ſame principle we may explain the ſtrong idea of ſound which a perſon who has holds a vibrating ſtring between his teeth.

SECT. XI.

OF VISION.

THE eyes, which conſtitute the organ of viſion, are ſituated in two bony cavities named orbits, where they are ſurrounded by ſeveral parts, which are either intended to protect them from external injury, or to aſſiſt in their motion.

The globe of the eye is immediately covered by two eye-lids or palpebræ, which are compoſed of muſcular fibres covered by the common integuments, and lined by a very fine and ſmooth membrane, which is from thence extended over part of the globe of the eye, and is called tunica conjunctiva. Each eye-lid is cartilaginous at its edge; and this border, which is called tarſus, is furniſhed with a row of hairs named cilia or eye-laſhes.

The cilia ſerve to protect the eye from inſects and minute bodies floating in the air, and likewiſe to moderate the action of the rays of light in their paſſage to the retina. At the roots of theſe hairs there are ſebaceous follicles, firſt noticed by Meibomius, which diſcharge a glutinous liniment. Sometimes the fluid they ſecrete has too much viſcidity, and the eye-lids become glued to each other.

The upper border of the orbit is covered by the eye-brows or ſupercilia, which by means of their two muſcles are capable of being brought towards each other, or of being carried upwards. They have been conſidered as ſerving to protect the eyes, but they are probably intended more for ornament than utility.

The orbits, in which the eyes are placed, are furniſhed with a good deal of fat, which affords a ſoft bed on which the eye performs its ſeveral motions. The inner angle of each orbit, or that part of it which is near the noſe, is called canthus major, or the great angle; and the outer angle, which is on the oppoſite ſide of the eye, is the canthus minor, or little angle.

The little reddiſh body which we obſerve in the great angle of the eye-lids, and which is called caruncula lachrymalis, is ſuppoſed to be of a glandular ſtructure, and, like the follicles of the eye-lids, to ſecrete an oily humour. But its ſtructure and uſe do not ſeem to have been hitherto accurately determined. The ſurface of the eye is conſtantly moiſtened by a very fine limpid fluid called the tears, which is chiefly, and perhaps wholly, derived from a large gland of the conglomerate kind, ſituated in a ſmall depreſſion of the os frontis near the outer angle of the eye. Its excretory ducts pierce the tunica conjunctiva juſt above the cartilaginous borders of the upper eye-lids. When the tears were ſuppoſed to be ſecreted by the caruncule, this gland was called glanula innominata; but now that its ſtructure and uſes are aſcertained, it very properly has the name of glandula lachrymalis. The tears poured out by the ducts of this gland are, in a natural and healthy ſtate, inceſſantly ſpread over the ſurface of the eye, to keep it clear and tranſparent, by means of the eye-lids, and as conſtantly paſs out at the oppoſite corner of the eye or inner angle, through two minute orifices, the puncta lachrymalia; being determined into theſe little openings by a republication of the tunica conjunctiva, ſhaped like a creſent, the two points of which anſwer to the puncta. This republication is named membrana, or valvula ſemilunaris. Each of theſe puncta is the begining of a ſmall excretory tube, through which the tears paſs into a little pouch or reſervoir, the ſacculus lachrymalis, which lies in an excavation formed partly by the naſal proceſs of the os maxillare ſuperius, and partly by the os unguis. The lower part of this ſac forms a duct called the ductus ad naſum, which is continued through a bony channel, and opens into the noſe, through which the tears are occaſionally diſcharged.

The motions of the eye are performed by ſix muſcles; four of which are ſtraight and two oblique. The ſtraight muſcles are diſtinguiſhed by the names of elevator, depreſſor, adductor, and abductor, from their ſeveral uſes in elevating and depreſſing the eye, drawing it towards the noſe, or carrying it from the noſe towards the temple. All theſe four muſcles ariſe from the bottom of the orbit, and are inſerted by flat tendons into the globe of the eye. The oblique muſcles are intended for the more compound motions of the eye. The firſt of theſe muſcles, the obliquus ſuperior, does not, like the other four muſcles we have deſcribed, ariſe from the bottom of the orbit, but from the edge of the foramen that tranſmits the optic nerve, which ſeparates the origin of this muſcle from that of the others. From this beginning it paſſes in a ſtraight line towards a very ſmall cartilaginous ring, the ſituation of which is marked in the ſkeleton by a little hollow in the internal orbitar proceſs of the os frontis. The tendon of the muſcle, after paſſing through this ring, is inſerted into the upper part of the globe of the eye, which it ſerves to draw forwards, at the ſame time turning the pupil downwards.

The obliquus inferior ariſes from the edge of the orbit, under the opening of the ductus lachrymalis; and is inſerted ſomewhat poſteriorly into the outer ſide of the globe, ſerving to draw the eye forwards and turn the pupil upwards. When either of theſe two muſcles acts ſeparately, the eye is moved on its axis; but when they act together, it is compreſſed both above and below. The eye itſelf, which is now to be deſcribed, with its tunics, humours, and component parts, is nearly of a ſpherical figure. Of its tunics, the conjunctiva has been already deſcribed as a partial covering, reflected from the inner ſurface of the eye-lids over the anterior portion of the eye. What has been named albuginea cannot properly be conſidered as a coat of the eye, being in fact nothing more than the tendons of the ſtraight muſcles ſpread over ſome parts of the ſclerotica.

The immediate tunics of the eye, which are to be demonſtrated when its partial coverings, and all the other parts with which it is ſurrounded, are removed, are the ſclerotica, cornea, choroides, and retina.

The ſclerotica, which is the exterior coat, is every where white and opaque, and is joined at its anterior edge to another, which has more convexity than any other part of the globe, and being exceedingly tranſparent, is called cornea. Theſe two parts are perfectly different in their ſtructure; ſo that ſome anatomiſts ſuppoſe them to be as diſtinct from each other as a glaſs of a watch is from the caſe into which it is fixed. The ſclerotica is of a compact fibrous ſtructure; the cornea, on the other hand, is compoſed of a great number of laminæ united by cellular membrane. By macerating them in boiling water, they do not ſeparate from each other, as ſome writers have aſſerted; but the cornea ſoon ſoftens, and becomes of a glutinous conſiſtence.

The ancients ſuppoſed the ſclerotica to be a continuation of the dura mater. Morgagni and ſome other modern writers are of the ſame opinion; but this point is diſputed by Winſlow, Haller, Zinn, and others. The truth ſeems to be, that the ſclerotica, though not a production of the dura mater, adheres intimately to that membrane.

The choroides is ſo called becauſe it is finiſhed with a great number of veſſels. It has likewiſe been named avea, on account of its reſemblance to a grape.

The choroides adhere intimately to the ſclerotica round the edge of the cornea; and at the place of this union we may obſerve a little whitiſh areola, named ligamentum ciliare, though it is not of a ligamentous nature.

They who ſuppoſe the choroides to be compoſed of two laminæ, deſcribe the external one as terminating in the ligamentum ciliare, and the internal one as extending farther to form the iris, which is the circle we are able to diſtinguiſh through the cornea: but this part is of a very different ſtructure from the choroides; ſo that ſome late writers have perhaps not improperly conſidered the iris as a diſtinct membrane. It derives its name from the variety of its colours, and is perforated in its middle. This perforation, which is called the pupil or ſight of the eye, is cloſed in the fœtus by a very thin vaſcular membrane. This membrana pupillaris commonly diſappears about the ſeventh month.

On the under ſide of the iris we obſerve many minute fibres, called ciliary proceſſes, which paſs in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are ſuppoſed to depend on the action of theſe proceſſes. Some have conſidered them as muſcular, but they are not of an irritable nature; others have ſuppoſed them to be filaments of nerves: but their real ſtructure has never yet been clearly aſcertained.

Beſides theſe ciliary proceſſes, anatomiſts uſually ſpeak of the circular fibres of the iris, but no ſuch ſeem to exiſt.

The poſterior ſurface of the iris, the ciliary proceſſes, and part of the tunica choroides, are covered by a black mucus, for the purpoſes of accurate and diſtinct viſion; but the manner in which it is ſecreted, has not been determined.

Immediately under the tunica choroides we find the third and inner coat, called the retina, which ſeems to be merely an expanſion of the pulpy ſubſtance of the optic nerve, extending to the borders of the cryſtalline humour.

The greateſt part of the globe of the eye, within theſe ſeveral tunics, is filled by a very tranſparent and gelatinous humour of conſiderable conſiſtence, which, from its ſuppoſed reſemblance to fuſed glaſs, is called the vitreous humour. It is inveſted by a very fine and delicate membrane, called tunica vitrea, and ſometimes arachnoides. It is ſuppoſed to be compoſed of two laminæ; one of which dips into its ſubſtance, and by dividing the humour into cells adds to its firmneſs. The fore-part of the vitreous humour is a little hollowed, to receive a very white and tranſparent ſubſtance of a firm texture, and of a lenticular and ſomewhat convex ſhape, named the cryſtalline humour. It is included in a capſula, which ſeems to be formed by a ſeparation of the two laminæ of the tunica vitrea.

The fore-part of the eye is filled by a very thin and tranſparent fluid, named the aqueous humour, which occupies all the ſpace between the cryſtalline and the prominent cornea. That part of the choroides which is called the iris, and which comes forward to form the pupil, appears to be ſuſpended as it were in this humour, and has occaſioned this portion of the eye to be diſtinguiſhed into two parts. One of theſe, which is the little ſpace between the anterior ſurface of the cryſtalline and the iris, is called the poſterior chamber; and the other, which is the ſpace between the iris and the cornea, is called the anterior chamber of the eye. Both theſe ſpaces are completely filled with the aqueous humour.

The eye receives its arteries from the internal carotid through the foramina optica; and its veins paſs through the foramina lacera, and empty themſelves into the lateral ſinuſes. Some of the ramifications of theſe veſſels appear on the inner ſurface of the iris, where they are ſeen to make every minute convolutions, which are ſufficiently remarkable to be diſtinguiſhed by the name of circulus arterioſus, though perhaps improperly, as they are chiefly branches of veins.

The optic nerve paſſes in at the poſterior part of the eye, in a conſiderable trunk, to be expanded for the purpoſes of viſion, of which it is now univerſally ſuppoſed to be the immediate ſeat.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in ſuch a manner as to form at the bottom of the eye a diſtinct image of the object we look at; and the point where theſe rays meet is called the focus of the eye. On the retina, as in a camera obſcura, the object is painted in an inverted poſition; and it is only by habit that we are enabled to judge of its true ſituation, and likewiſe of its diſtance and magnitude.

In order to paint objects diſtinctly on the retina, the cornea is required to have ſuch a degree of convexity, that the rays of light may be collected at a certain point, ſo as to terminate exactly on the retina. If the cornea is too prominent, the rays, by diverging too ſoon, will be united before they reach the retina, as is the caſe with near-ſighted people or myopes; and on the contrary, if it is not ſufficiently convex, the rays will not be perfectly united when they reach the backpart of the eye; and this happens to long-ſighted people or preſbi, being found conſtantly to take place as we approach to old age, when the eye gradually flattens. Theſe defects are to be ſupplied by means of glaſſes. He who has too prominent an eye, will find his viſion improved by means of a concave glaſs; and upon the ſame principles, a convex glaſs will be found uſeful to a perſon whoſe eye is naturally too flat.

Explanation of the PLATE *on the* ORGANS OF SENSE.

FIGURE VI.

A View of the poſterior Part of the external Ear, meatus auditorius, Tympanum, with its ſmall Bones, and Euſtachian Tube of the right Side.

a, The back part of the meatus, with the ſmall ceruminous glands. b, The incus. c, Malleus. d, Stapes. e, Os orbicularis. f, The chorda tympani. g, Membrana tympani. h, The euſtachian tube. i, Its mouth from the fauces.

FIGURE VII.

An enlarged View of the Labyrinth of the Ear, ſituated in the petrous Portion of the Temporal Bone, as well as of the Cavity of the Tympanum, and Meatus Auditorius Externus, &c.

A, Meatus auditorius externus. B, Cavity of the tympanum. C, Cells of the maſtoid proceſs. D, Euſtachian tube. E, Cochlea. F F F, Three ſemicircular canals. G, The veſtibulum, into which the three ſemicircular canals terminate, as well as the ſuperior ſcala of the cochlea. H, Superior ſcala of the cochlea. I, Inferior ſcala of the cochlea.

FIGURE VIII.

Repreſents the Parts of the External Ear, with the Parotid Gland and its Duct.

a a, The helix. b, the antihelix. c, The antitragus. d, The tragus. e, The lobe of the ear. f, The cavitas innominata. g, The ſcapha. h, The concha. i i, The parotid gland. k, A lymphatic gland, which is often found before the tragus. l, The duct of the parotid gland. m, Its opening into the mouth.

FIGURE IX.

A View of the Tongue, with its Papillæ, or Terminations of the Guſtatory Nerves, which are the immediate Organs of Taſte.

A, Apex of the tongue. B, Baſis of the tongue. C, Foramen cœcum, a common excretory duct to ſeveral mucous glands in the baſis of the tongue. D, The largeſt and moſt poſterior papillæ are called cupidatæ, and reſemble muſhrooms in their figure. E, Papillæ lenticulares, ſituated in the middle of the tongue, which appear to be perforated like the end of a thimble when magnified. FFF, Papillæ villoſæ, ſituated at the end and ſides of the tongue.

FIGURE X.

Repreſents the Nerves and Muſcles of the Right Eye, after Part of the Bones of the Orbit have been cut away.

A, The eye-ball. B, The lachrymal gland. C, Muſculus abductor oculi. D, Attollens. E, Levator palpebræ ſuperioris. F, Depreſſor oculi. G, Adductor. H, Obliquus ſuperior, with its pulley. I, Its inſertion into the ſclerotic coat. K, Part of the obliquus inferior. L, The anterior part of the os frontis cut. M, The criſta galli of the ethmoid bone. N, The poſterior part of the ſphenoid bone. O, Tranſverſe ſpinous proceſs of the ſphenoid bone. P, The carotid artery, denuded where it paſſes through the bones. Q, The carotid artery within the cranium. R, The ocular artery.

NERVES. a a, The optic nerve. b, The third pair. c, Its joining with a branch of the firſt branch of the fifth pair, to form l, the lenticular ganglion, which ſends off the ciliary nerves, d. e e, The fourth pair. f, The trunk of the fifth pair. g, The firſt branch of the fifth pair, named ophthalmic. h, The frontal branch of it. i, Its ciliary branches, along with which the naſal twig is ſent to the noſe. k, Its branch to the lachrymal gland. l, The lenticular ganglion. m, The ſecond branch of the fifth pair, named ſuperior maxillary. n, The third branch of the fifth pair, named inferior maxillary. o, The ſixth pair of nerves, which ſends off p, The beginning of the great ſympathetic. q, The remainder of the ſixth pair, ſpent on c, The abductor oculi.

FIGURE XI.

Shews the Figure of the Eye-ball, and its ſeveral Coats.

A, Tunica ſclerotica externally. B, Cornea tranſparens. C, Tunica choroidea. D, Tunica retina internally. E, Optic nerve.

FIGURE XII.

Shews the Eye-ball with its Muſcles.

a, The optic nerve. b, Muſculus trochlearis. c, Part of the os frontis, to which the trochlea or pulley is fixed, through which d, The tendons of the trochlearis paſſes. e, Attollens oculi. f, Adductor oculi. g, Abductor oculi. h, Obliquus inferior. i, Part of the ſuperior maxillary bone to which it is fixed. k, The eye-ball.

FIGURE XIII.

Exhibits a Section of a Frozen Eye into two equal Parts.

A, Tunica ſclerotica. B B, Tunica choroidea, its two laminæ. C, Retina. D, Cornea. E, Aqueous humour, its two chambers are ſeparated by the iris, into anterior and poſterior chambers. F, Cryſtalline humour. G, Vitreous humour. H, Ciliary proceſſes. I, The iris. K, The pupil, a hole in the center of the iris.

FIGURE XIV.

Shews the Iris after the Cornea is removed, where it is dividing the Ball of the Eye into two Parts.

A A, The vaſa vorticoſa which are ſeen in the iris. B B, Its connection with the tunica ſclerotica. C, The pupil.

Explanation of the PLATE *on the* VISCERA.

FIGURE V.

A View of the Heart in Situ.

In this preparation the Heart and its veſſels are filled with what is called injection, (a compound of bees wax and tallow coloured with vermillion, king's yellow, or any other pigment) to ſhew the different diameters of the cavities of the Heart and veſſels. The Heart, therefore, and its veſſels, appear in the print larger than they ever can in the natural ſtate in the living body; becauſe, in the living body they are only half full; alſo to obtain this view, the perecardium is removed, the cellular membrane and air veſicles of the lungs diſſected off to ſhew more clearly the exit of the large blood veſſels from the heart, &c.

A, The right auricle. B, The right ventricle. C, A portion of the left ventricle ſeen. D, The right coronary, artery, and vein; theſe are the veſſels with their correſponding ones on the other ſide, which ſupply the ſubſtance of the heart with blood. E, The apex of the heart; it is this point which we feel pulſating between the 5th and 6th ribs of the left ſide in violent exertions. F, Aorta aſcendens. G, G, The right and left carotid arteries. H, H, The two ſubclavian arteries. I, Aorta deſcendens. 1, 2, 3, 4, &c. Small arteries going off to the intervertebral ſpaces. K, Vena cava deſcendens. L, L, The right and left ſubclavian veins. M, M, The right and left jugular veins.

FIGURE VI.

Shews the Stomach, with the Omentum hanging from it before the Inteſtines.

A, Cardia, or upper orifice. B, Pylarus, or lower orifice. C, Valvula pylori. D, Leſſer curvature. E, Greater curvature to which the omentum is attached. F, Anterior ſide of the ſtomach.

FIGURE VII.

Shews the Veins of the Inteſtines and other Abdominal Viſcera, uniting to form Vena Portæ, which is ramified through the Liver.

A, A, A, Extreme branches of the meſenteric vein. B, The great meſenteric vein about to enter the liver. C, C, C, Its extreme branches forming vena portæ.

In this Syſtem I have introduced Eight Anatomical Tables of the Human Body, containing the principal Parts of the Skeleton and Muſcles, repreſented in the large Tables of Albinus, to which are added conciſe explanations by Mr. John Innes, late Diſſector to Dr. Monro, two of which is deſcribed in Oſteology, Part II. Section XIV. *and the remaining Six in the following Section. For practitioners and thoſe uninformed in this art, I could not preſent them with better tables, being abridged of that multiplicity of references which abound in the original tables of Albinus. Having preſented the public with Innes's Abridgements of Albinus, I ſhall make the following extract from his work.*

JOHN HALL.

" The tables of Albinus, though accurate and complete, are not, perhaps, on account of their ſize, the prolixity of the deſcriptions, and the number of references, ſo fully ſuited to the purpoſes of private diſſection as could be wiſhed. To remedy this inconvenience, I have copied eight of Albinus's tables on a ſmaller ſcale. The two firſt contain a fore and back view of the ſkeleton; and the other ſix are repreſentations of the muſcles. To each plate I have prefixed an explanation; and I have avoided, as much as was conſiſtent with perſpicuity, loading the figures with an unneceſſary quantity of referring letters. For this purpoſe I have throughout made uſe of one alphabet only. To prevent the defacing of the muſcles, and to enable the learner to diſtinguiſh them without the aſſiſtance of references, the figures are only lettered on one ſide. If this work be of uſe in facilitating Anatomical knowledge, it will give the greateſt pleaſure to, Gentlemen, Your humble ſervant,

JOHN INNES."

EXPLANATION OF THE FIRST PLATE ON MYOLOGY.

FIGURE I.

This Table repreſents the firſt Layer of Muſcles ſituated on the anterior Part of the whole Body, immediately under the common Teguments, and tendinous Faſciae.

MUSCLES SITUATED ON THE HEAD AND NECK.

a, The anterior fleſhy belly of the occipito-frontalis ſituated on os frontis. Above *a*, the tendinous aponeuroſis of the occipito-frontalis, covering the upper part of the parietal bones. *b*, Attollens aurem. Under it, the tendinous aponeuroſis covering the temporal muſcle. Anterior auris between *c* and the ear. *c*, Orbicularis palpebrarum. Its tendon is ſeen at the inner canthus, fixed to the naſal proceſs of the ſuperior maxillary bone. Levator labii ſuperioris alaeque naſi. Seen divided into two portions running down along the ſide of the noſe, and on the out ſide of it the levator anguli oris. Next this, the zygomaticus minor. Further outwards, zygomaticus major. On the ala and tip of the noſe, the compreſſor naris. *d*, Depreſſor anguli oris. And beneath it, a portion of the depreſſor labii inferioris. *e*, Orbicularis oris. *f*, Platyſma-myoides. Behind *f*, the ſterno-cleido-maſtoidæus is ſeen through the platyſma-myoides.

TRUNK.

a, Pectoralis major. The upper part of it is covered by the origin of the platyſma-myoides. *b*, Serratus magnus. The other portions reſemble this. *c*, Latiſſimus dorſi. *d*, Obliquus externus deſcendens. *e*, Linea ſemilunaris. *f*, Linea alba. Below *f*, umbilicus. Between *e* and *f*, the rectus abdominis; and, at the inferior part of the linea alba, oppoſite to *g*, the pyramydales appear through the tendons of the oblique muſcles. *g*, Ring of the external oblique muſcle; with the ſpermatic cord, paſſing through it, and covered by the cremaſter muſcle.

SUPERIOR EXTREMITY.

a, Deltoides. Above the clavicle, a portion of the trapezius is ſeen. *b*, Biceps flexor cubiti. At the bending of the arm are ſeen its tendon going towards the radius, and the part, from which the tendinous aponeuroſis that covers the fore-arm, cut off. On the inſide of the biceps, part of the triceps extenſor cubiti, and, on the outſide, part of the brachialis internus. *c*, Supinator radii longus. *d*, Pronator teres. *e*, Palmaris longus. *f*, Palmaris brevis. On the palm of the hand, the aponeuroſis palmaris is ſeen extended from the annular ligament at the wriſt to the roots of the metacarpal bones of the four fingers. *g*, Flexor carpi radialis. *h*, Part of the flexor ſublimus perforatus. *i*, Inſertion of the flexor carpi ulnaris. *k*, Abductor pollicis.

INFERIOR EXTREMITY.

r, Tenſor vaginae femoris, the vagina or tendinous faſcia being cut off. On the outſide of it, a portion of the glutaeus maximus. *b*, Part of the iliacus internus. On the inſide of it, between *b* and *c*, part of the pſoas magnus. *c*, Pectinalis. *d*, Triceps longus. *e*, Gracilis. *f*, Sartorius. *g*, Rectus cruris. Its tendon is ſeen inſerted into the patella, from which a ſtrong tendon is ſent to be fixed to the tubercle of the tibia. *h*, Vaſtus externus. *i*, Vaſtus internus. *k*, Tibialis anticus. *l*, Peronæus longus. On the outſide of it, a portion of the ſolæus. *m*, Extenſor longus digitorum pedis, with the peronæus tertius, and extenſor proprius pollicis pedis. *n*, Gaſtrocnemius externus, ſeu Gemellus. *o*, Solæus. *p*, Ligamentum tarſi annulare. *q*, Abductor pollicis pedis.

FIGURE II.

This Table repreſents a back View of the Muſcles, which are immediately ſituated below the common Integuments.

HEAD AND NECK.

a, Part of the occipito-frontalis muſcle, with its aponeuroſis. *b*, Attollens aurem. *c*, Anterior auris. *d*, Retrahentes auris.

TRUNK.

a, Trapezius, ſeu cucularis. *b*, Its tendinous joining with its fellow in the nape of the neck, which is called ligamentum nuchae, ſeu colli. *c*, The fleſhy belly of the latiſſimns dorſi. *d*, The tendon of the latiſſimus dorſi, which ariſes in common with the ſerratus poſticus inferior. *e*, Part of the obliquus exteruus abdominis.

SUPERIOR EXTREMITY.

a, Deltoides. *b*, Infra ſpinatus, with a portion of the teres minor and major below it. *c*, Triceps extenſor cubiti. Its tendon is ſeen inſerted into the head of the ulna, called olecranon; and on the inſide of it, the anconæus. *d*, Extenſor carpi radialis longior, covered by a portion of the ſupinator radii longus; and under it, a portion of the extenſor carpi radialis brevior. *e*, Extenſor digitorum communis manus, which ſplits into four tendons, and paſs, with the indicator, under the ligamentum carpi annulare externum, at the extremities of the metacarpal bones, under ligaments proper to themſelves, and are loſt in a broad tendon, which covers the back of the four fingers. *f*, Extenſor oſſis metacarpi pollicis manus. *g*, Extenſor primi internodii pollicis manus. *h*, Extenſor ſecundi internodii pollicis manus. *i*, Extenſor carpi ulnaris. *k*, Part of the flexor carpi ulnaris. Under it, part of the flexor profundus perforatus. And on the inſide, part of the flexor ſublimus perforatus, which are more diſtinctly ſeen on the right fore-arm. Likewiſe, on the right hand, are ſeen part of the abductor pollicis manus, abductor minimi digiti manus, and the aponeuroſis palmaris.

INFERIOR EXTREMITY.

a, Glutæus maximus. *b*, Part of the glutæus medius. *c*, Part of the tenſor vaginæ femoris. *d*, Vaſtus externus. *e*, The long head of the biceps flexor cruris. And beneath it, *f*, Part of the ſhort head. *g*, Semitendinoſus. And beneath it, on each ſide, a portion of the ſemimembranoſus is ſeen. *h*, Gracilis. On the outſide of it, a portion of the adductor magnus is ſeen. *i*, A ſmall part of the vaſtus internus. *k*, Gaſtrocnemius externus, ſeu gemellus. And within its outer head, a portion of the plantaris. *l*, Solæus ſeu gaſtrocnemius internus. *m*, Tendo-achillis, with the plantaris. *n*, Peronæus longus. *o*, Peronæus brevis, between it and the tendo-achillis, a portion of the flexor longus digitorum pedis. *p*, Tendons of the extenſor longus digitorum pedis, with the peronæus tertius paſſing under the ligamentum tarſi annulare; and the flexor brevis digitorum pedis is ſeen beneath them. *q*, Abductor minimi digiti pedis, and above it the tendons of the peronæus longus and brevis, paſſing under proper ligaments of their own.

Myology–See System of Anatomy.

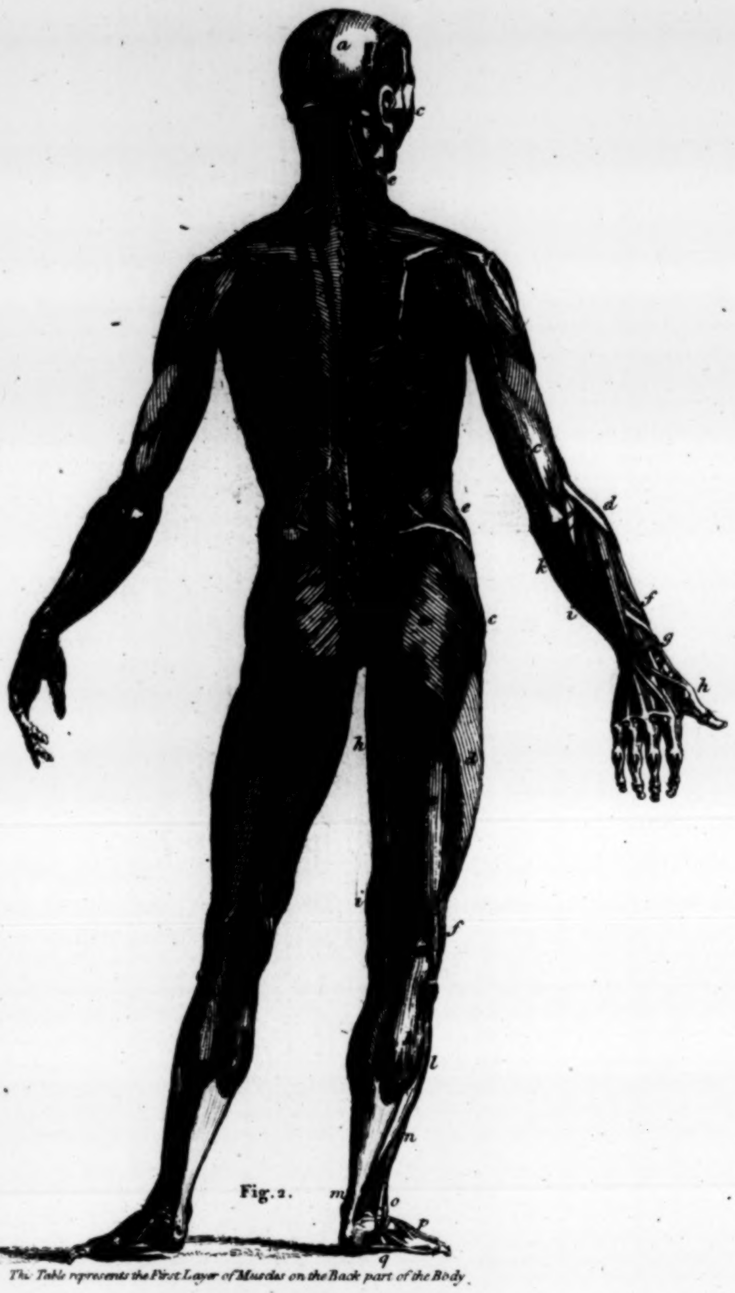
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Fig. 2.

This Table represents the First Layer of Muscles on the Back part of the Body.

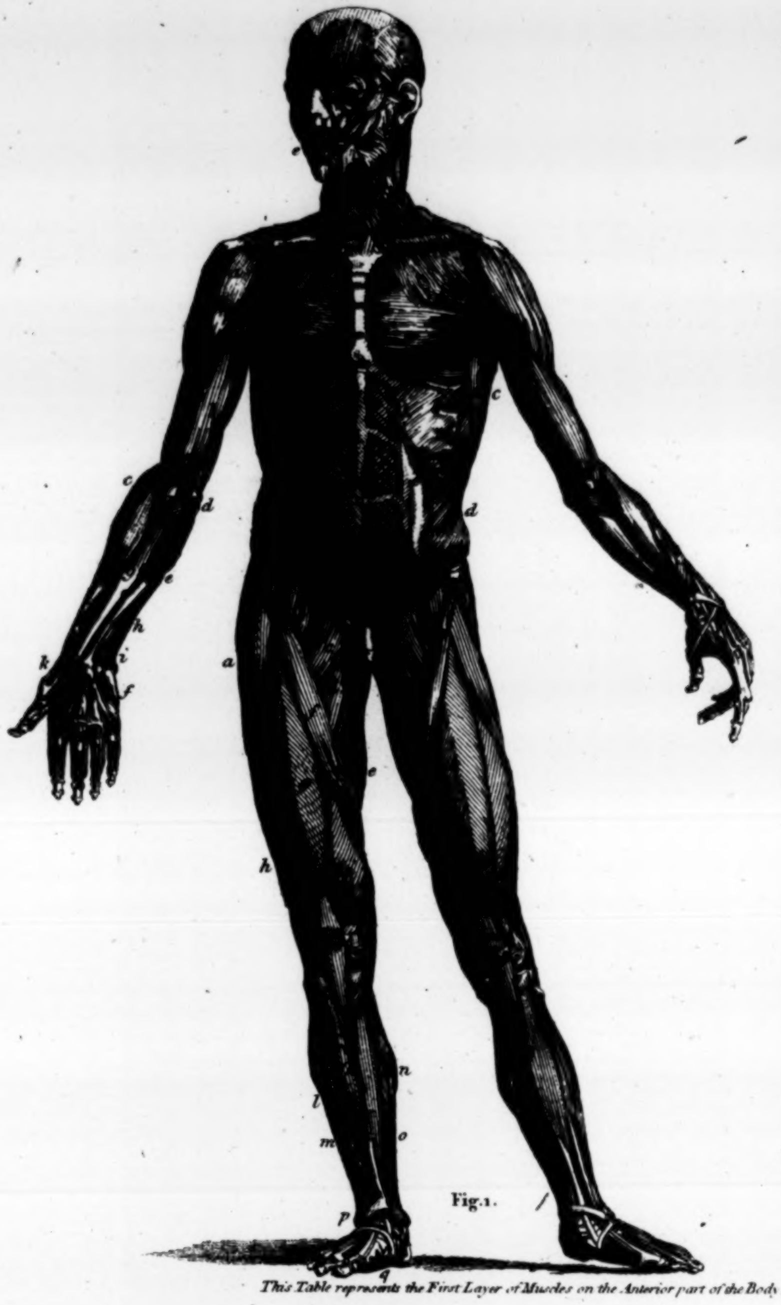
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Fig. 1.

This Table represents the First Layer of Muscles on the Anterior part of the Body.

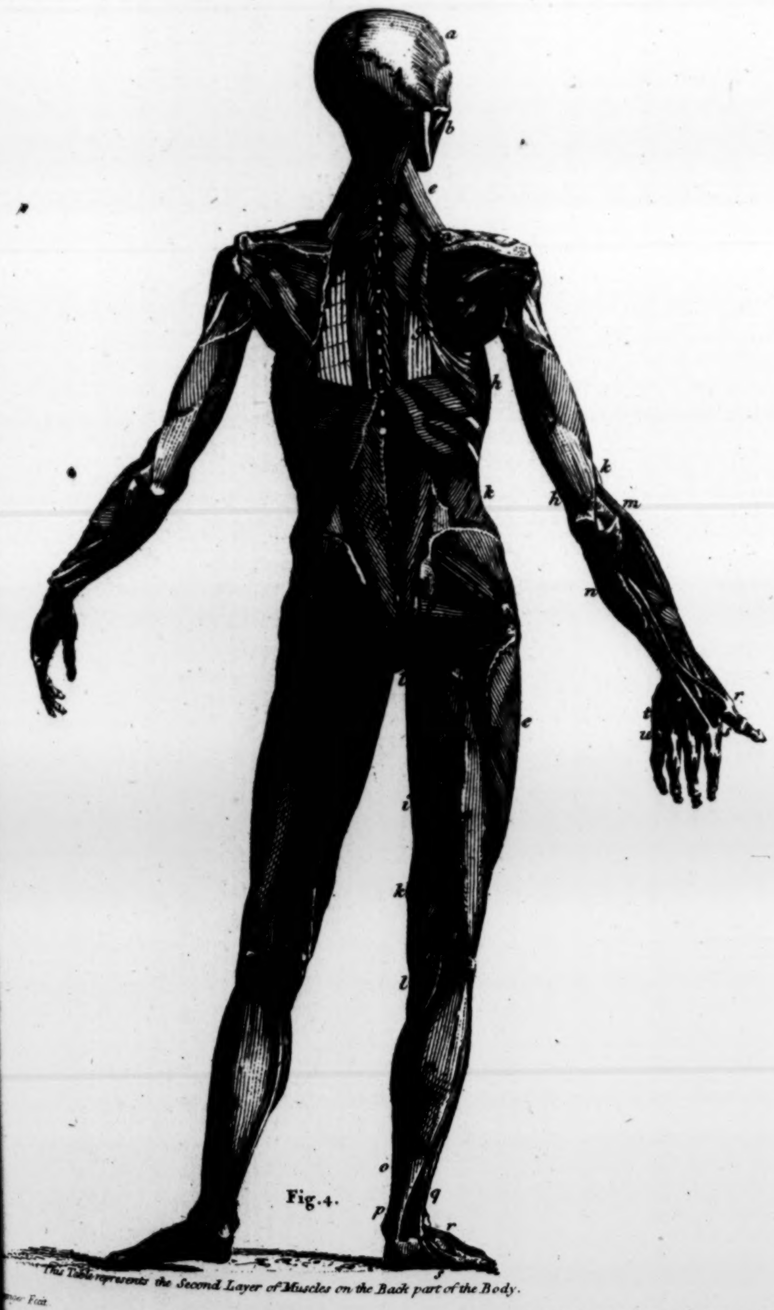
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Fig. 4.

This Table represents the Second Layer of Muscles on the Back part of the Body.

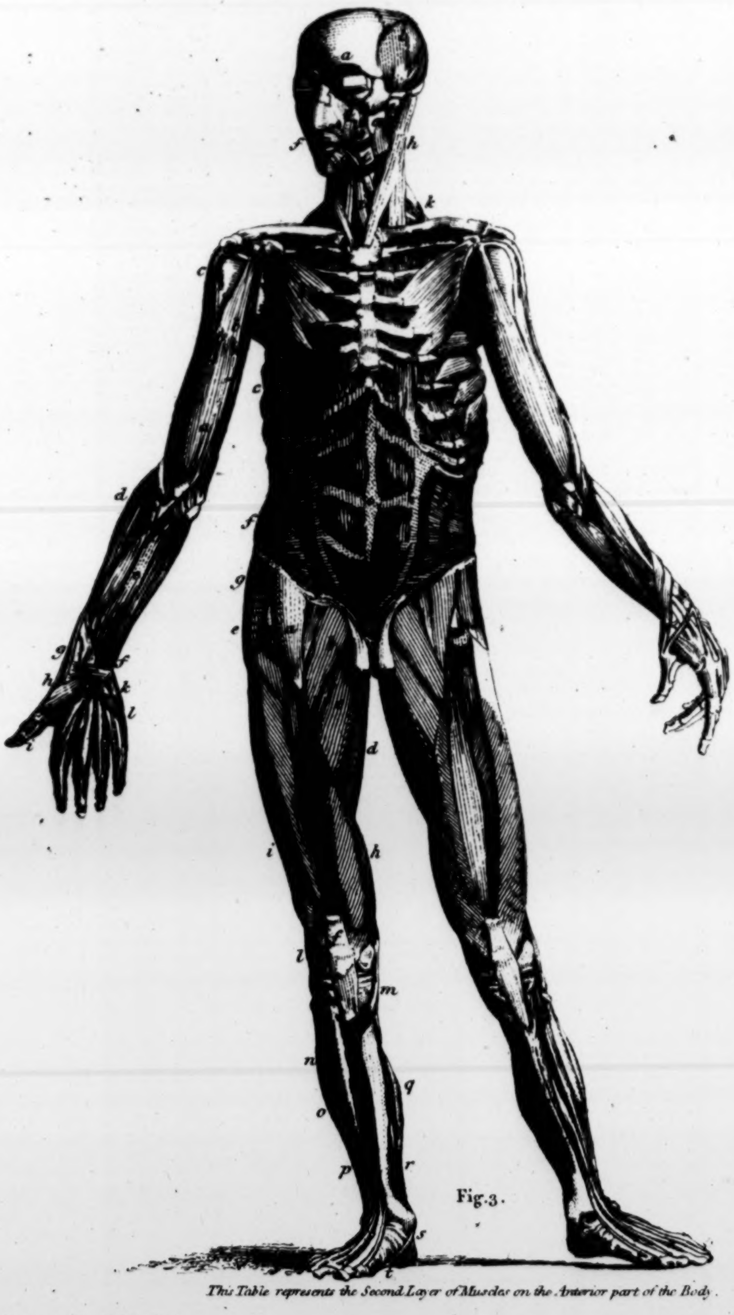
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Fig. 3.

This Table represents the Second Layer of Muscles on the Anterior part of the Body.

Fecit.

Published as the Act directs, by C. Cooke, No. 17, Paternoster Row, Feb. 5th 1789.

Warren sculp.

BRITISH 18 MR 63 MUSEUM

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Myology – See System of Anatomy.

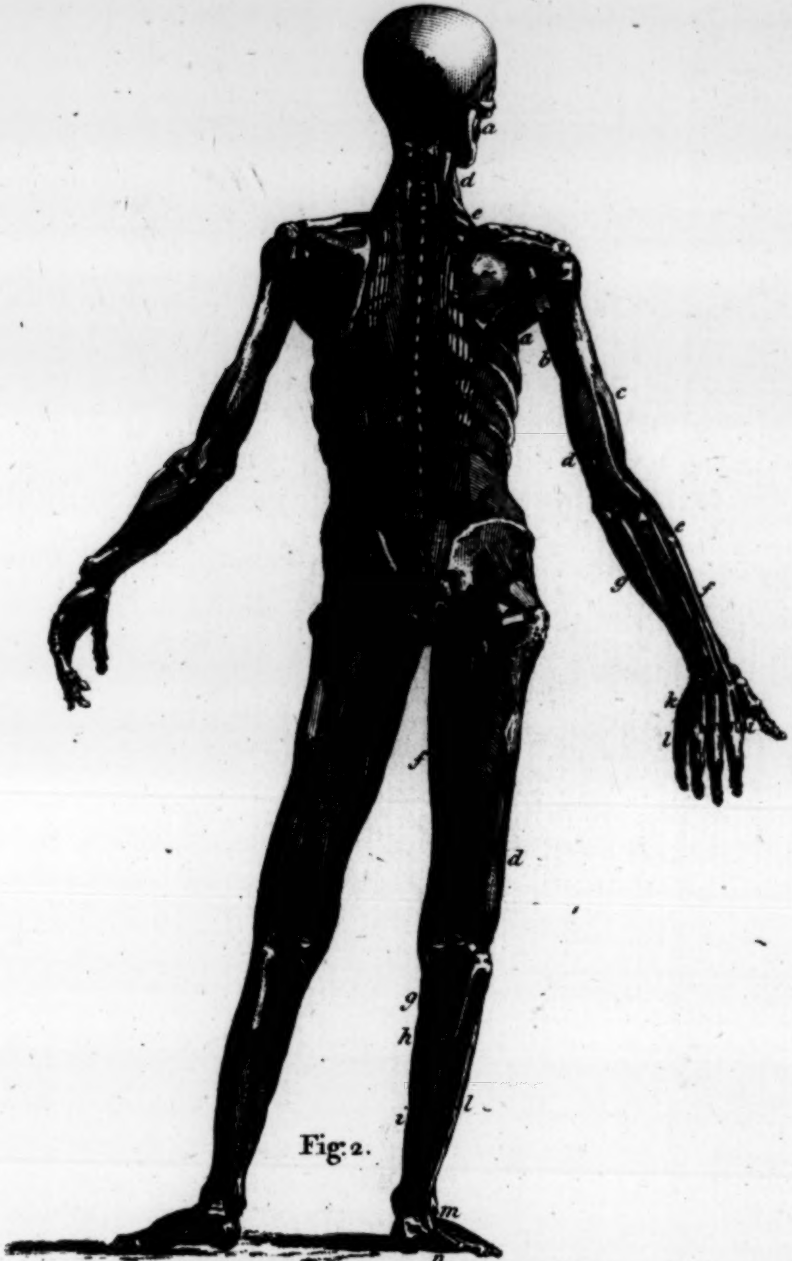
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Fig. 2.

This Table represents the Third Layer of Muscles, on the Posterior part of the Body.

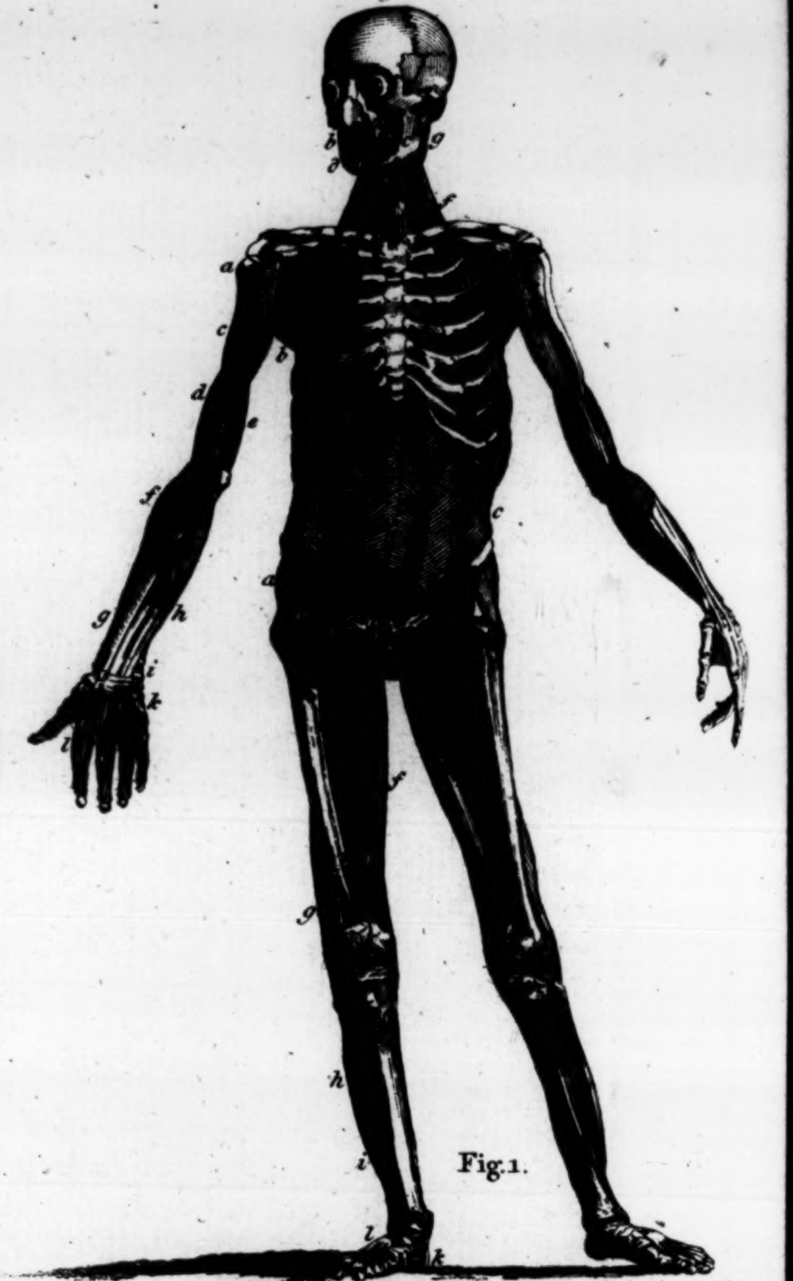
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Fig. 1.

This Table represents the Third Layer of Muscles, on the Anterior part of the Body.

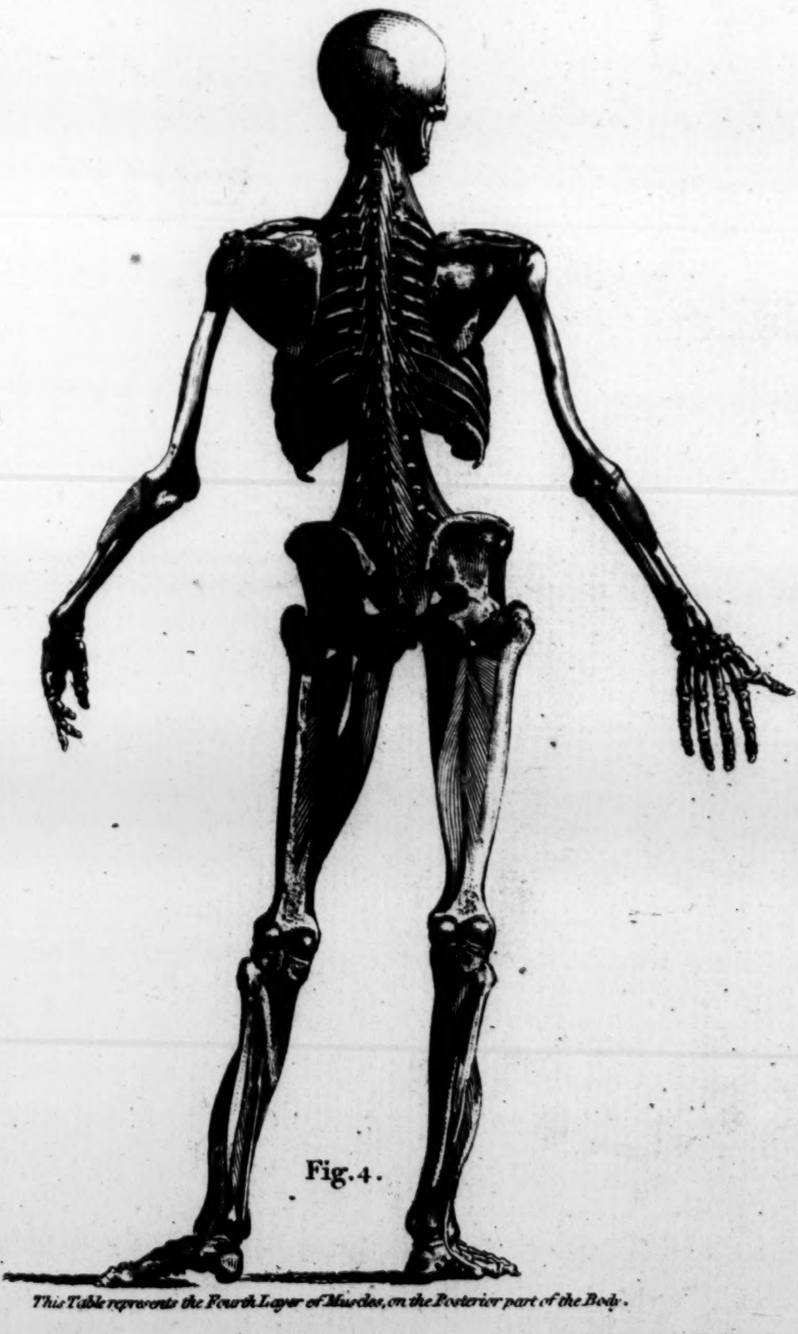


Fig. 4.

This Table represents the Fourth Layer of Muscles, on the Posterior part of the Body.

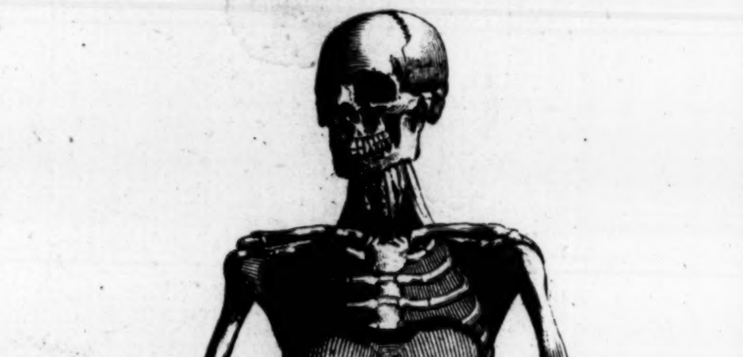


Fig. 3.

This Table represents the Fourth Layer of Muscles, on the Anterior part of the Body.

Published as the Act directs, by C. Cooke Nº 17 Paternoster Row, April 9 1789.

BRITISH 18 MK 63 MUSEUM

Plate 3.

Carious Sculls infected with the Venereal Disease,
See System of Anatomy.

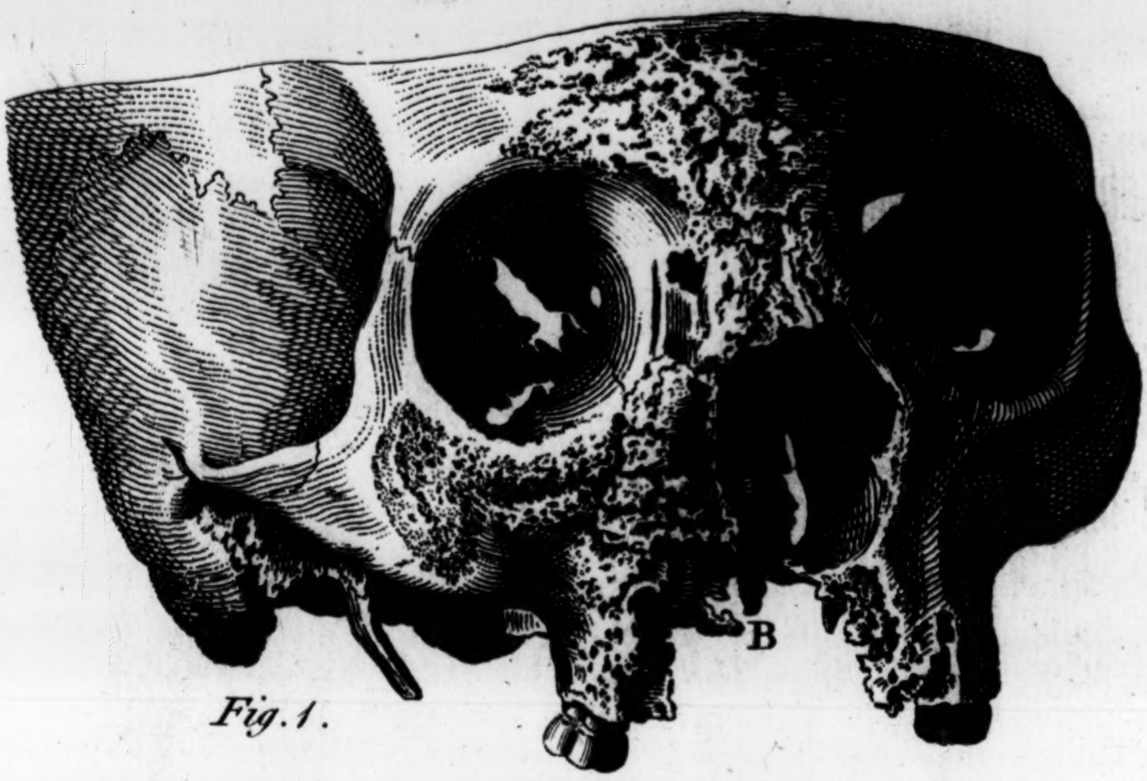
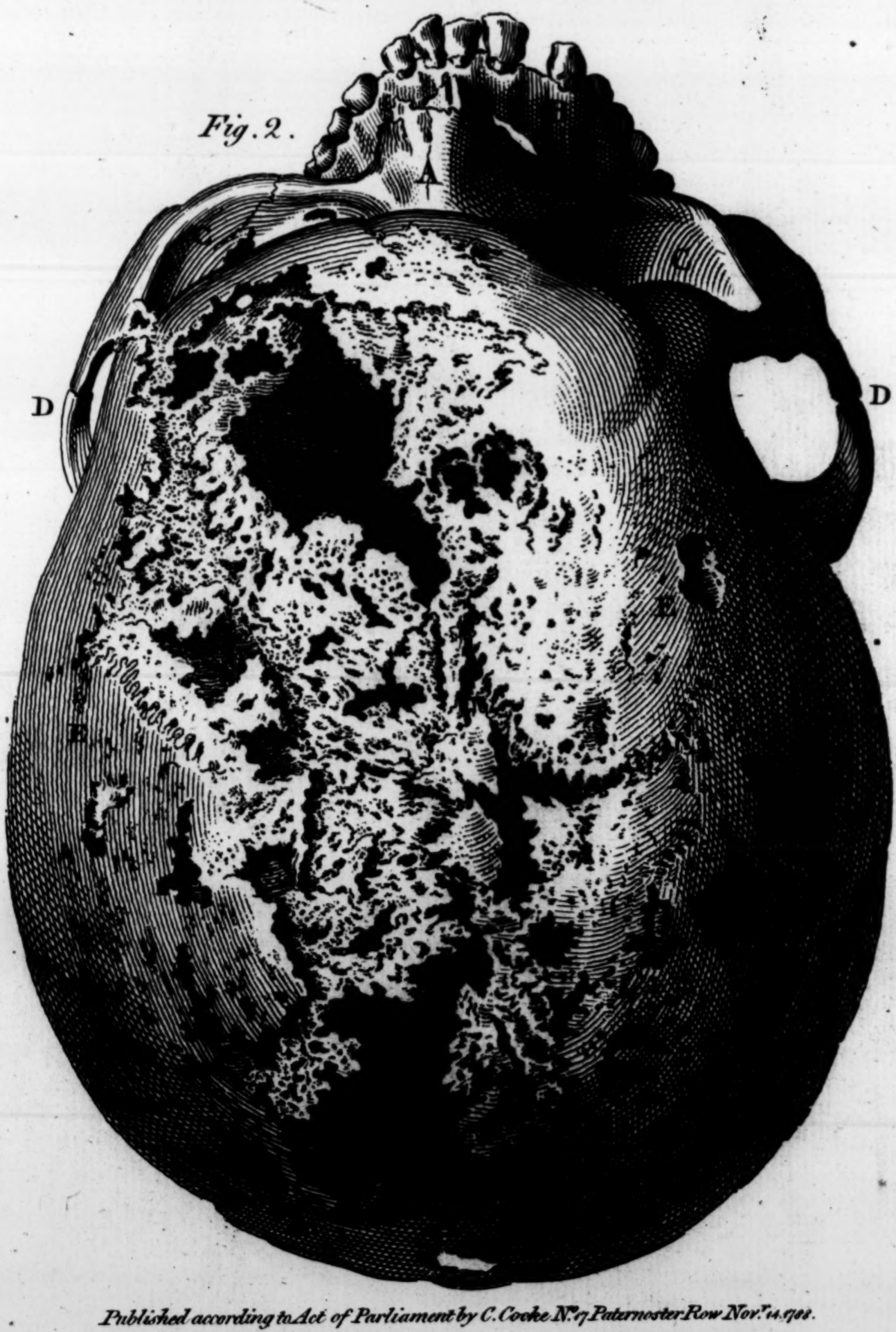


Fig. 1.

Fig. 2.



C Grignion sculp.

Published according to Act of Parliament by C. Cooke No. 17 Paternoster Row Novr. 14. 1788.

FIGURE III.

This Table repreſents the Second Layer of Muſcles on the anterior Part of the whole Body.

MUSCLES SITUATED ON THE HEAD AND NECK.

a, Corrugator ſupercilii. *b*, Temporalis. *c*, Maſſeter. *d*, Levator anguli oris. *e*, Buccinator. *f*, Orbicularis oris. Oppoſite to the right ala niſi, the portion of this muſcle which Albinus names Naſalis labii ſuperioris. *g*, Depreſſor labii inferioris. *h*, Sterno-cleido-maſtoidæus, which is ſeen below, ariſing from the ſternum and clavicle, by two heads. *i*, Sterno-hyoidæus. On the outſide of it, the omo-hyoidæus. Further out, a portion of the hyo-thyroidæus. *k*, Levator ſcapulæ.

TRUNK.

a, Subclavius. *b*, Pectoralis minor. *c*, Serratus magnus. *d*, Rectus abdominis, divided into ſeveral fleſhy portions by its tendinous interſections. *e*, Pyramidalis. *f*, Obliquus aſcendens internus. *g*, Spermatic cord, with the origin of the cremaſter muſcle.

SUPERIOR EXTREMITY.

a, Biceps flexor cubiti. *b*, Short head of the biceps. Beneath the upper part of it, a portion of the coracobrachialis. Beneath the under part, a portion of the brachialis internus. *c*, Long head of the biceps. At the bending of the arm, the tendon of the biceps, and the place where the tendinous aponeuroſis was cut from it, are ſeen. *d*, Extenſor carpi radialis longior. Beneath it a portion of the extenſor carpi radialis brevior. *e*, Flexor ſublimus perforatus. *f*, Inſertion of the extenſor carpi ulnaris. *g*, Extenſors of the thumb. *h*, Opponens pollicis. On the inſide of it, a portion of the flexor pollicis brevis. *i*, Tendon of the flexor longus pollicis manus, after paſſing through the flexor brevis pollicis manus. *k*, Abductor minimi digiti manus. *l*, Flexor parvus minimi digiti manus. *m*, Ligamentum carpi annulare.

INFERIOR EXTREMITY.

a, Iliacus internus. Between *a* and *b*, part of the pſoas magnus. *b*, Pectinalis, *c*, Triceps longus. *d*, Gracilis. *e*, Rectus cruris cut off near its origin. *f*, Tendon of the rectus cruris cut off above the patella, from which a ſtrong tendon is ſent to be inſerted into the tubercle of the tibia. *g*, Portion of the glutæus medius. On the inſide of it, part of the glutæus minimus. *h*, Vaſtus internus. *i*, Vaſtus externus. *k*, Cruræus. *l*, Inſertion of the biceps flexor cruris into the fibula. *m*, Tendons of the gracilis and ſemitendinoſus inſerted into the tibia. *n*, Solæus. *o*, Peronæus longus. *p*, Extenſor longus digitorum, with the peronæus tertius on the outſide, and extenſor pollicis proprius on the inſide. *q*, Solæus. *r*, Flexor longus digitorum. *ſ*, Tendons of the tibialis poſticus and flexor longus digitorum pedis. *t*, Flexor brevis digitorum pedis.

FIGURE IV.

This Table repreſents the ſecond Layer of the Muſcles on the back Part of the Body.

HEAD AND NECK.

a, Temporalis; its tendon is ſeen paſſing below zygoma. *b*, Maſſeter. *c*, Splenius capitis et colli. *d*, Portion of the complexus. *e*, Levator ſcapulae, ſeu muſculus patientiae.

TRUNK.

a, Rhomboides major. *b*, Rhomboides minor. And immediately above it the upper edge of the ſerratus poſticus ſuperior is ſeen. *c*, The ſerratus poſticus ſuperior on the right ſide. *d*, Serratus poſticus inferior. *e*, Part of the ſpinalis dorſi. *f*, Part of the longiſſimus dorſi. *g*, Part of the ſacrolumbalis. *h*, Serratus magnus. *i*, The broad tendon, by which the latiſſimus dorſi begins, and from which the tendon of the ſerratus poſticus inferior is inſeparable. *k*, Part of the obliquus internus aſcendens abdominis. *l*, The ſpincter ani, fixed to the point of the os coccigis; at the ſide of which the coccygaeus, a portion of the levator ani are ſeen, and lower down, oppoſite to *l*, part of the tranſverſalis penis.

SUPERIOR EXTREMITY.

a, Supra ſpinatus. *b*, Infra ſpinatus. *c*, Teres minor. *d*, Teres major. *e*, Triceps extenſor cubiti. *f*, Its head, called longus. *g*, The bervis. And, *h*, A ſmall portion of the third head, named brachialis externus. *i*, The tendon of the triceps, inſerted into the olecranon. *k*, Part of the brachialis internus. *l*, Anconaeus, which ſeems to be continued from that part of the brachialis externus immediately above it. *m*, Extenſor carpi radialis longior; and beneath it the brevior; both are ſeen at the wriſt, inſerted into the metacarpal bones of the fore and middle fingers. *n*, Flexor carpi ulnaris. *o*, Part of the ſupinator radii brevis. *p*, Extenſor oſſis metacarpi pollices manus. *q*, Extenſor primi internodii pollicis manus. *r*, Extenſor ſecundi internodii pollicis manus. *ſ*, Indicator, inſerted into the root of the firſt joint of the fore-finger. *t*, One of the three external interoſſei manus. The other two are diſtinctly ſeen without letters. *u*, One of the tendons of the extenſors of the fingers cut; and the ſame is ſeen in each of the other three fingers, joining with the tendons and aponeuroſes of the interoſſei and lumbricales, and ſpread upon the back of the fingers.

N. B. On the right hand, part of the flexors of the fingers, the abductor pollicis, and minimi digiti, are ſeen.

INFERIOR EXTREMITY.

a, Glutæus medius. *b*, Pyriformis. *c*, The two muſcles called Gemini, between which the tendon of the obturator internus paſſes over the tuberoſity of the os iſchium; and its fleſhy belly is ſeen within the pelvis, partly covered by the coccygæus and levator ani. *d*, Quadratus femoris. *e*, Vaſtus externus. *f*, *f*, Parts of the triceps magnus. *g*, Long head of the triceps flexor cruris; and beneath it part of the ſhort head is ſeen. *h*, Semitendinoſus, and beneath it parts of the ſemimembranoſus are ſeen on each ſide of it. *i*, Gracilis. *k*, A ſmall portion of the vaſtus internus. *l*, Poplitæus. *m*, the fleſhy belly of the plantaris; and its long ſlender tendon is ſeen paſſing over the inſide of the ſolæus. *n*, Solæus. *o*, The place where the tendon of the gemellus was cut off; but the fleſh of the ſolæus runs further down. *p*, Tendo-achillis, with the plantaris. *q*, Peronæus longus, paſſing at the outer angle to the ſole of the foot; beneath it, the peronæus brevis to the root of the metatarſal bone of the little toe; and between it and the tendo-achillis, a portion of the flexor longus digitorum pedis. *r*, Tendons of the extenſor longus dictorum pedis, with the peronæus tertius; and beneath theſe, the extenſor brevis dictorum pedis. *ſ*, Flexor brevis minimi digiti pedis.

EXPLANATION OF THE SECOND PLATE ON MYOLOGY.

FIGURE I.

This Table repreſents the third Layer of Muſcles, with ſome of the Ligaments, Cartilages, and naked Bones on the anterior Part of the whole Body.

a, Depreſſor labii ſuperioris alæque naſi. *b*, Orbicularis oris, afeer moſt of the muſcles, which are fixed to it, and aſſiſt to form it, have been taken away. *c*, Buccinator. Above *c*, part of the pterygoidæus externus is ſeen paſſing behind the coronoid proceſs of the lower jaw. *d*, Levator labii inferiors. *e*, Sterno-thyroidæus. Immediately above, and ſeemingly the continuation of it, the Hyo-thyroidæus. *f*, Scalenus medius. Contiguous to it, on the inſide, Scalenus anticus. Above it, a portion of the Trachelo-maſtoidæus. Between the ſcalenus anticus, and ſterno-thyroidæus, and hyo-thyroidæus, the rectus capitis anterius major, and longus colli.

TRUNK.

a, Third row of external intercoſtal muſcles. The reſt appear in the ſame manner between the other ribs. *b*, Third row of internal intercoſtal muſcles. The reſt appear between the other ribs. *c*, Tranſverſalis abdominis. *d*, The place from which the inferior part of the tendon of the tranſverſalis, that paſſes before the rectus and pyramidalis muſcles, is cut off. Between theſe portions of each ſide, the peritonæum is laid bare, and the ligaments of the bladder which were formerly the umbilical arteries and urachus. Between this portion and os pubis, the ſpermatic cord is ſeen cut. *e*, The inferior edge of the upper part of the tendon of the tranſverſalis, which paſſes behind the rectus, and immediately adheres to the peritonæum. *f*, The anterior lamella of the internal oblique, which joined the tendon of the external to paſs over the rectus. Between *f* and *g*, the poſterior lamella of the internal oblique, joining with the tendon of the tranſverſalis, to paſs behind the rectus, *g*, the place at the linea alba, from which the tendon of the external oblique, aud interior lamella of the internal, were cut off. At *g*, Umbilicus.

SUPERIOR EXTREMITY.

a, Subſcapularis. *q*, Teres minor. *c*, Coraco-brachialis. The part from which the ſhort head of the biceps flexor cubiti was cut off from it, is ſeen at its upper end. *d*, Brachialis internus. *e*, Brachialis externus, or third head of the triceps. *f*, Extenſor carpi radialis longior, and with it the extenſor carpi radialis brevior. Both theſe are diſtinctly ſeen in the right hand. Between the tendon of the brachialis internus, and extenſor radialis, the ſupinator radii brevis is ſeen. *g*, Flexor longus pollices manus, with the fleſhy portion of it, which ariſes from the internal condyle of the os humeri. *h*, Flexor profundus perforans, which ſplits into four tendons, which paſs under the ligamentum carpi annulare. *i*, Pronator quadratus. *k*, Adductor minimi digiti manus. *l*, One of the lumbricales. The other three appear in the ſame manner, along the tendons of the flexor profundus. Behind theſe, the internal interoſſei are ſeen.

INFERIOR EXTREMITY.

a, Glutæus minimus. *b*, Iliacus internus. On the inſide of it, betwetn *b* and *c*, the pſoas magnus. *c*, Obturator externus. *d*, Adductor brevis femoris. *e*, Adductor magnus femoris. *f*, Gracilis, which is Seen inſerted into the inſide of the head of the tibia. *g*, The ſhort head of the biceps flexor cruris. *h* Peronæus longus. *i*, Peronæus brevis. Between theſe two peronæi and tibia, the tibialis poſticus is ſeen. *k*, Tendon of the tibialis poſticus, coveriug the tendon of the flexor longus digitorum pedis. *l*, Extenſor brevis digitorum pedis.

FIGURE II.

This Table repreſents the third Layer of Muſcles on the poſterior Part of the Body, with ſome of the Ligaments and naked Bones.

MUSCLES ON THE HEAD AND NECK.

a, Part of the buccinator. *b*, Complexus. *c*, Trachelo-maſtoidæus; on the outſide of it the tranſverſalis colli. *d*, Scalenus medius. *e*, Scalenus poſticus.

TRUNK.

a, Spinalis dorſi; and beneath it the multifidus ſpinæ. *b*, Longiſſimus dorſi, which ſends off a fleſhy ſlip to the trachelo-maſtoidæus. *c*, Sacro-lumbalis, with the cervicalis deſcendens ſent off from it along the ſide of the neck, and outſide of the tranſverſalis colli. *d*, Semiſpinalis dorſi. *e*, Tranſverſalis abominis.

N. B. The ſpaces between the ſpinous proceſſes of the vertebræ have muſcular faſciculi between them, particularly thoſe of the neck, and are named interſpinales colli, dorſi, and lumborum; but thoſe of the back ſeem to be tendinous and ligamentous.

SUPERIOR EXTREMITY.

a, Teres major. *b*, Part of the coraco-brachialis. *c*, Part of the brachialis internus. *d*, The third head of the triceps extenſor cubiti, called brachialis externus, after the longus and brevis have been cut off. *e*, Extenſor radialis longior. *f*, Extenſor radialis brevior. *g*, Part of the flexor profundus perforans. *h*, Supinator radii brevis. *i*, Part of the adductor pollicis manus. *k*, One of the three external interoſſei; the other two may be eaſily diſtinguiſhed without letters. *l*, Tendons of the extenſors of the fingers, joining with thoſe of the lumbricales and interoſſei, which form a tendinous expanſion on the back of the four fingers.

N. B. On the right hand, part of the flexors of the fingers and thumb; part of the adductor pollicis, and the whole of the adductor minimi digiti, are ſeen.

INFERIOR EXTREMITY.

a, Glutæus minimus. *b*, Obturator internus, its fleſhy belly is ſeen within the pelvis. Beneath *b*, the tendon of the obturator externus. *c*, Semimembranoſus. *d*, The ſhort head of the biceps flexor cruris. *e*, Triceps magnus. *f*, Gracilis. In the ham, the origins of the two heads of the gaſtrocnemius externus and plantaris, are ſeen. *g*, Poplitæus. *h*, Tibialis poſticus. *i*, Flexor longus digitorum pedis. *k*, Flexor pollicis longus. *l*, Peronæus longus, running down to be inſerted into the metatarſal bone of the little toe. Beneath it, the peronæus brevis, paſſing to the ſole of the foot. *m*, Extenſor brevis digitorum pedis. *n*, Part of the flexor longus digitorum pedis.

FIGURE III.

Diaphragm ſeen within the Abdomen, where it forms a conſiderable Concavity.

A A, Its ſuperior radiated portion. B B, Its two cruræ or inferior portion. C, Centrum tendinoſum. D, Opening by which the inferior vena cava paſſes to the heart. E, The ſlit through which the oeſophagus paſſes to the ſtomach. F. The aorta and thoracic duct paſſing into the thorax between its two cruræ.

FIGURE IV.

Shews the Pteregoid and ſome other Internal Muſcles.

A, Pteregoideus externus. B, Pteregoideus internus. C, Lower jaw. D, Occiput. E, Cervical vertibræ.

FIGURE V.

Shews the Poſterior Muſcles of the Pharynx.

A, Os occipitis. B, Œſophagus. C, Intermediate muſcles.

FIGURE VI, VII, VIII.

Shews the Poſterior Part of the Pharynx in different Views, after the Removal of ſome of the Muſcles.

FIGURE IX, X, XI, XII.

Exhibits a Poſterior View of the Pharynx and Larynx, after the Removal of all the Poſterior Muſcles of the Pharynx.

FIGURE XIII, XIV, XV, XVI, XVII.

Exhibit the three Laminæ of Muſcles which are found in the Sole of the Foot, as well as the Tendons of the Flexor Muſcles of the Toes, which are ſituated on the Leg, to give a more clear View of the Muſcles on this Part of the Body, than can be ſeen in the whole Figures.

Fig. 13. The tendons and muſcles on the ſole of the foot, immediately under the integuments.

Fig. 14. The firſt order of muſcles after removing the tendinous expanſion.

Fig. 15. The ſecond order of muſcles.

Fig. 16. The third order of muſcles removed, which ſhew the tendons of the flexors.

Fig. 17. The fourth order of muſcles removed, ſhewing the tendon of tibralis porticus, &c.

The Drawings in this Syſtem have been done under my Direction by Mr. Birnie, of Greſſe ſtreet, Anatomical Draftſman to the late Dr. William Hunter of Windmill ſtreet, whoſe productions accompany moſt of the preſent Anatomical Publications of any conſequence.

The Engravings in this Syſtem are nearly all finiſhed; thoſe which I have ſeen, I will venture to aſſert infinitely ſurpaſs any I have ever ſeen in any Periodical Publication whatever, both with reſpect to truth *of Drawing, and* beauty *of Engraving.*

In order to ſhew the compariſon between the Human and Brute Skeleton, I have ſupplied Mr. Cooke, the publiſher of this Work, with a Skeleton of a Bear and Monkey, a repreſentation of which will be introduced in this Work, and brought under the head of Comparative ANATOMY.

TO THE FACULTY IN GENERAL, AND TO STUDENTS OF ANATOMY IN PARTICULAR.

THE foregoing compendium of Anatomy I have compiled, as I thought would be moſt conducive to the improvement of thoſe who ſhould honour it with an attentive peruſal; at the ſame time having in view the generality of thoſe numerous readers who have diſtinguiſhed the NEW ROYAL ENCYCLOPŒDIA with their patronage.

It is ſo arranged, that where an examination of dead bodies can be obtained, the mode of ſuch examination will be found moſt advantageouſly pointed out; and the zealous ſtudent may proceed by the ſhorteſt way, to confirm his mind in Anatomical knowledge; thereby ſaving much time in the examination of authors, and collection of the ſyſtem; which is no where to be found in a ſimilar mode of arrangement, to that of the preſent conciſe plan.

According to this order, I have, for ſeveral years, diſſected bodies, and demonſtrated their ſtructure, in two regular courſes of lectures that have been given during each winter. In which courſes I have moſt ardently ſtrove to concentrate real Anatomical knowledge, by bringing together every thing eſſential, and expunging every thing merely hypothetical; wiſhing moſt fervently to adopt my mode of teaching, to the generality of ſtudents that viſit this metropolis; and to give real information to them, rather than diſplay my own abilities in theoretical diſquiſitions.

The late Dr. Hunter taught Anatomy in this way, till within a few years of his death; and may be ſaid to have raiſed his fame, to its highly diſtinguiſhed eminence, by thus diſpenſing knowledge in the eaſieſt manner! To the great diſadvantage of many ſtudents, in the latter part of his life, he doubled the length of his courſe, which increaſed it in extent far beyond any other courſe of Anatomy given in Europe. A lecture continuing two hours a day for eight months, might allow the communication of an immenſity of knowledge, and eſpecially when confined to the demonſtration of one ſcience, many elevated medical characters have thought this mode of teaching Anatomy too profuſe, and ill adapted to the inſtruction of the generality of ſtudents! Students in Anatomy very ſeldom want ſo minute a diſplay of the ſcience, eſpecially thoſe who come to town in the middle of the winter, and who muſt then neceſſarily begin in the middle of a courſe.

Dr. Hunter felt the force of theſe arguments, and could not deny them. I have heard him acknowledge, that there might be ſome ſtudents whom this alteration would materially affect. From this alteration in Dr. Hunter's plan, I was induced to teach Anatomy; and as the ſame plan has been continued ſince his death, I think it a ſervice to the public, to perſevere, to afford an opportunity to ſtudents of ſeeing the human body fully demonſtrated twice in each winter; that thoſe who come to town at Chriſtmas, may ſtill go through a complete courſe of Anatomy.

The following is the arrangement of my plan of teaching:—

Firſt, To give two courſes in the winter, each conſiſting of about one hundred lectures.

Secondly, The firſt courſe to begin early in October, and continue till after the middle of January; and then the ſecond courſe to commence and conclude by the end of May.

Thirdly, To omit nothing material in Anatomy, Phyſiology, or Surgery, in this courſe; but at the ſame time to avoid all unneceſſary prolixity.

Fourthly, To give opportunities for the diſſection of bodies, during the winter, the better to confirm thoſe ideas that may be obtained from the lectures.

☞ *For terms of attendance, ſee the Wrappers to No.* 19, *of this Work.*

Broad ſtreet, No. 41, *Golden Square,* JOHN HALL.

I ſhould conſider myſelf highly remiſs, was I to omit this Opportunity of making my public Acknowledgments to Dr. Birch, *of Eſſex Street, Strand,* Dr. Oldroyd, *of Red-Lion Street, Clerkenwell, and* Dr. Baker, *of Saliſbury Square, Fleet Street, for th eliberal Aſſiſtance they have contributed in this Syſtem, by the Loan of Books, Drawings, and Prints. I therefore beg Leave to ſubſcribe myſelf their*

Very much obliged,

Pater-noſter Row. *And devoted humble Servant,*

C. COOKE.

The Diaphragm, and Muscles of the Foot, Pharynx &c.
See the System of Anatomy.

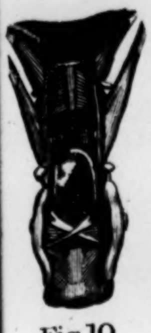
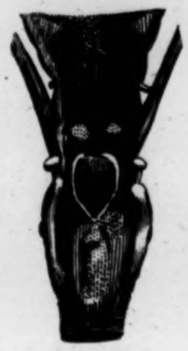


Fig. 10.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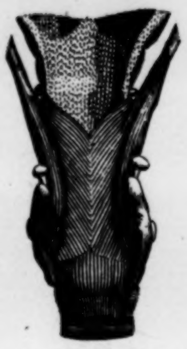
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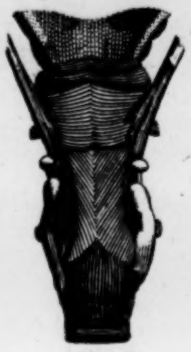
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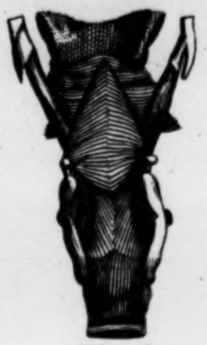
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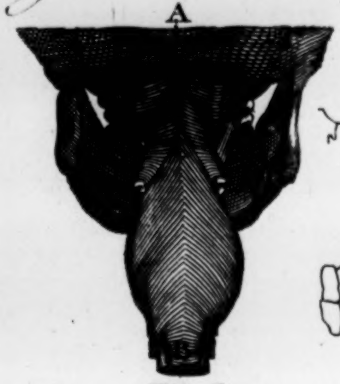

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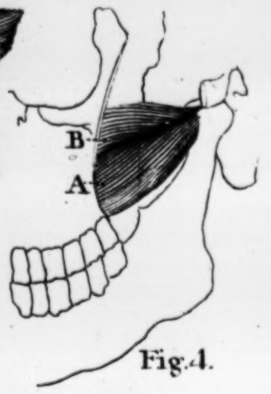

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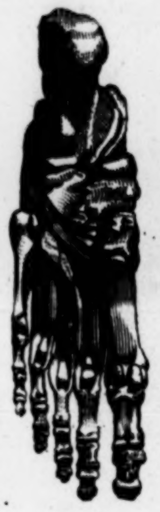
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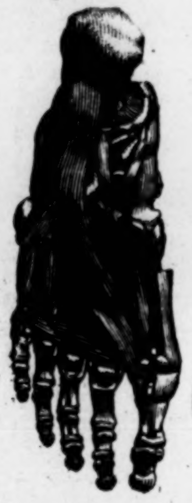
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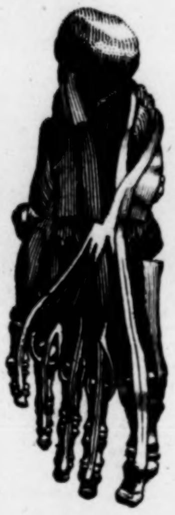
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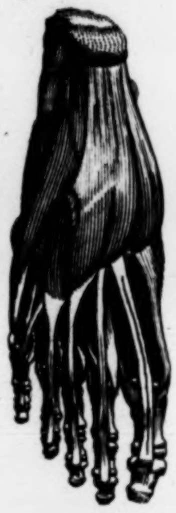
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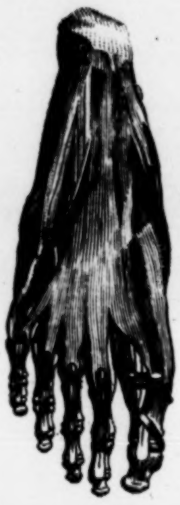
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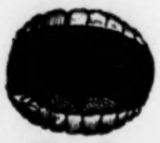
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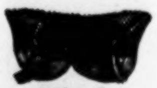
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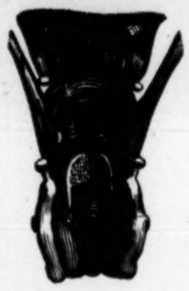
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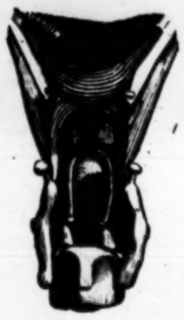
Fig. 11.

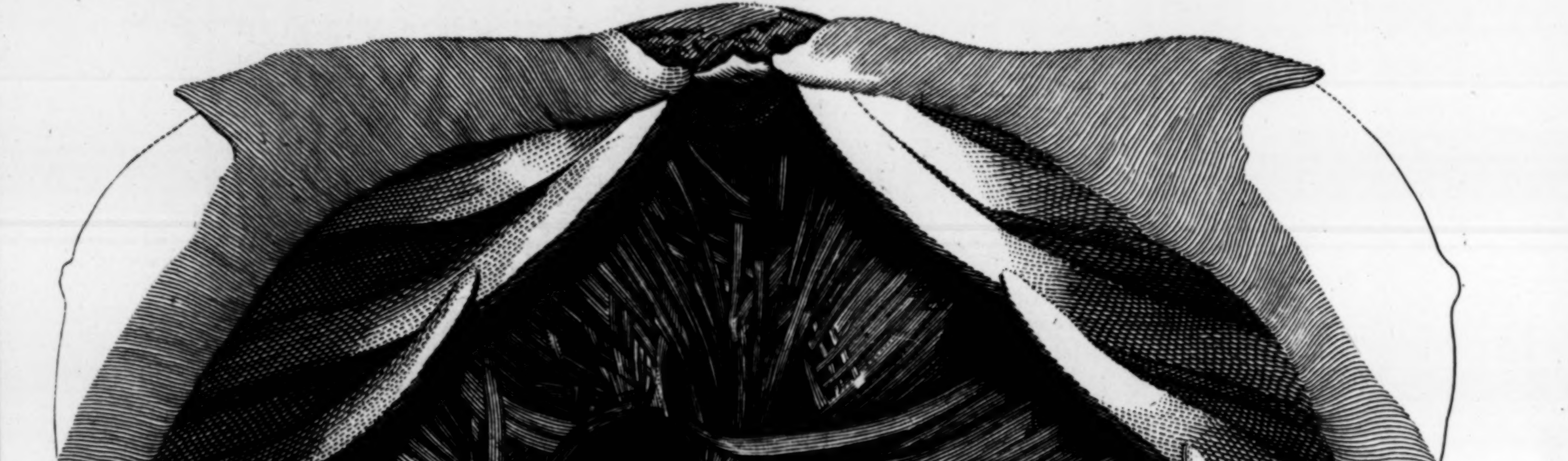
Fig. 3. *The Diaphragm*

Engraved for the Royal Encyclopædia, & Published as the Act directs, by C. Cooke, No. 17, Paternoster Row, Aug. 12th 1791.

P. Rothwell sculp.

BRITISH 18 MR 63 MUSEUM

ANATRON, or NATRON, in natural hiſtory, implies a kind of ſalt petre found in Egypt, reſembling ſal-ammoniac in taſte. This word alſo imports the ſalt ſcum of glaſs in its ſtate of fuſion. It likewiſe denotes the nitrous juice condenſed in vaults, arches, and other ſubterraneous places.

ANATROPE, in medical definition, implies a diſorder of the ſtomach, which occaſions a vomiting and loſs of appetite.

ANAUDIA, in natural hiſtory, implies an incapacity of ſpeech, i. e. dumbneſs.

ANAX, in mythology, denotes a hero, or demi-god.

ANAXIMANDRIANS, in the hiſtory of philoſophy, the followers of Anaximander; the moſt ancient of the philoſophical atheiſts, who admitted of no other ſubſtance in nature but matter.

ANBERKEND, in the eaſtern language, a celebrated book of the Brachmans, wherein the Indian philoſophy and religion are contained. The anbertkend is divided into 50 beths, or diſcourſes, each of which conſiſts of ten chapters. It has been tranſlated from the original Indian into Arabic, under the title of Morat al Maani, q. d. the marrow of intelligence.

ANBURY, or AMBURY, among farriers, implies a kind of ſpongy wort, or wen, full of blood, growing upon any part of a horſe.

ANCESTORS, thoſe from whom a perſon is deſcended in a ſtraight line. The word is derived from the Latin *anceſſor*, contracted from *anteceſſor*, q. d. goer before.

ANCESTREL, in law, implies any thing which deſcends by a regular line from ones anceſtors.

ANCHILOPS, *αγκυλη*, contraction, and *ωψ*, eye; in medicine denotes an abſceſs, or collection of matter, between the great angle of the eye and the noſe: and if ſuffered to remain too long, it degenerates, the ſtagnating humours corrupt, and an ulcer is produced. When the tumor is broke, and the tears flow involuntarily, whilſt the os lacrymale is not carious, it is an ægylops; but when the ulcer is of a long ſtanding, deep, fetid, and the os lacrymale becomes carious, it is a fiſtula. The cure is by reſtriction and exciſion, tying it at the root on the glandula lacrymalis, and, when ready, cutting it off.

ANCHOR, *Anchora*, Lat. from *αγκυρα*, Greek, a heavy, ſtrong, crooked inſtrument of iron, dropped from a ſhip into the bottom of the water, to retain her in a convenient ſtation in a harbour, road, or river.

The ancient anchors were of ſtone; and ſometimes of wood, to which a great quantity of lead was uſually fixed. In ſome places, baſkets full of ſtones, and ſacks filled with ſand, were employed for the ſame uſe. All theſe were let down by cords into the ſea, and by their weight ſtayed the courſe of the ſhip. Afterwards they were compoſed of iron, and furniſhed with teeth, which, being faſtened to the bottom of the ſea, preſerved the veſſel immoveable; whence *οδοντης* and *dentes* are frequently taken for anchors in the Greek and Latin poets.

At firſt the iron anchor had only one tooth, whence anchors were called *ετεροςομοι*; but in a ſhort time the ſecond was added by Eupalamus, or Anacharſis, the Scythian philoſopher. The anchors with two teeth were called *αμφιβολοι*, or *αμφιςομοι*; and from ancient monuments appear to have been much the ſame with thoſe uſed in our days, only the tranſverſe piece of wood upon their handles (the ſtock) is wanting in all of them.

Modern anchors are contrived ſo as to ſink into the ground as ſoon as they reach it, and to hold a great ſtrain before they can be looſened or diſlodged from their ſtation. They are compoſed of a ſhank, a ſtock, a ring, and two arms with their flukes. The ſtock, which is a long piece of timber fixed acroſs the ſhank, ſerves to guide the flukes in a direction perpendicular to the ſurface of the ground; ſo that one of them ſinks into it by its own weight as ſoon as it falls, and is ſtill preſerved ſteadily in that poſition by the ſtock, which, together with the ſhank, lies flat on the bottom. In this ſituation it muſt neceſſarily ſuſtain a great effort before it can be dragged through the earth horizontally. And this can only be effected by the violence of the wind and tide, increaſed by the turbulence of the ſea, and acting upon the ſhip, ſo as to ſtretch the cable to its utmoſt tenſion, which may diſlodge the anchor from its bed, more eſpecially if the ground be ſoft, oozy, or rocky. When the anchor is thus diſplaced, it is ſaid, in the ſea-phraſe, to *come home*.

At ANCHOR; the ſituation of a ſhip which rides by her anchor in a road or haven.

To fiſh the ANCHOR; to draw up the flukes upon the ſhip's ſide after it is catted.

To ſteer the ſhip to her ANCHOR, is to ſteer the ſhip's head towards the place where the anchor lies, when they are heaving the cable into the ſhip; ſo that the cable may enter the houſe with leſs reſiſtance, and the ſhip advance towards the anchor with greater facility.

ANCHOR-GROUND, is a bottom which is neither too deep, too ſhallow, or rocky.

ANCHORS, in heraldry, are emblems of hope, and are taken for ſuch in a ſpiritual, as well as a temporal ſenſe.

ANCHORAGE, in law, is a duty upon ſhips for the uſe of the port or harbour where they caſt anchor.

ANCHOVY, in ichthyology, the Engliſh name of the clupea encraſicolus.

ANCHOVY-PEAR, the ſame as GRIAS.

ANCHUSA, ALKANET or BUGLOSS, a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, aſperifoliæ. For the characters ſee Syſtem of BOTANY. There are eight ſpecies.

1. The officinalis, or greater garden bugloſs, is a native of France, and of the warmer parts of Europe, but will thrive well enough in Britain; but the roots ſeldom continue longer than two years in this country, unleſs they happen to grow in rubbiſh, or out of an old wall, where they will live three or four years.

2. The anguſtifolia, or perennial wild borage, grows to the height of two feet when cultivated in gardens; but in thoſe places where it grows wild, is ſeldom more than a foot and an half high.

3. The undulata, or Portugal bugloſs, is a biennial plant, which grows to the height of two feet, and ſends out many lateral branches.

4. The orientalis, or eaſtern bugloſs, is a native of the Levant, but hardy enough to bear the open air in Britain, if it hath a dry ſandy ſoil.

5. The virginiana, or puccoon, grows naturally in the woods of North America.

6. The ſempervirens, or evergreen borage, is a very hardy perennial plant, with weak trailing branches. It grows naturally in ſome parts of Great Britain.

7. The cretica, or warted bugloſs of Crete, is a low trailing annual plant, whoſe branches ſeldom extend more than ſix inches.

8. The tinctoria, or true alkanet, grows naturally in the Levant, but is equally hardy with the firſt ſpecies.

All the ſpecies of anchuſa may be propagated by ſeeds.

The flowers of the firſt ſpecies have obtained the name of cordial flowers; they moderately cool and ſoften, without offending, the palate or ſtomach.

ANCHYLOBLEPHARON, the ſame as ANCYLOBLEPHARON.

ANCHYLOPS, the ſame as ANCHILOPS.

ANCHYLOSIS, the ſame as ANCYLOSIS.

ANCIENT, or ANTIENT, a term applied to things which exiſted long ago; thus we ſay, ancient nations, ancient cuſtoms, &c.

ANCIENT, in a military ſenſe, denotes either the enſign or colours.

ANCIENT, in ſhips of war, the ſtreamer or flag borne in the ſtern.

ANCIENT DEMESNE, in Engliſh law, ſignifies a tenure, by which all manors belonging to the crown in William the conqueror's and St. Edward's time were held. The numbers, names, &c. hereof were entered by the Conqueror, in a book called Domeſday Book, yet remaining in the Exchequer; ſo that ſuch lands, as by that book appeared to have belonged to the crown at that time, are called ancient demeſne. The tenants are of two ſorts; one of which hold their lands frankly by charter; the other by copy of court-roll, or by the verge, at the will of the lord, according to the cuſtom of the manor.

The advantages of this tenure are, 1. That tenants holding by charter cannot be rightfully impleaded out of their manor; and when they are, they may abate the writ, by pleading the tenure. 2. They are free from toll for all things relating to their livelihood and huſbandry; nor can be impannelled on any inqueſt. Theſe tenants held originally by plowing the king's land, plaſhing his hedges, and the like ſervice, for the maintenance of his houſhold; and it was on this account that ſuch liberties were given them, for which they may have writs of *monſtraverunt* to ſuch as take the duties of toll, &c. No lands are to be accounted ancient demeſne, but ſuch as are held in ſocage.

ANCIENTY, in ſome ancient ſtatutes, is uſed for elderſhip or ſeniority. The elder ſiſter can demand no more than her other ſiſters, beſide the chief meſne, by reaſon of her ancienty.

ANCON, in anatomy, implies the gibbous eminence of flexure of the cubit, the middle of the eminence on which we lean, the greateſt of the two apophyſes of the ulna, and the ſame with the olecranon.

ANCONÆUS, in anatomy, names given to certain muſcles.

ANCREE, in heraldry, the ſame as ANCHORED.

ANCUS, in ſurgery, implies a ſtiffneſs in the arm, ſo as to render it conſtantly crooked.

ANCONES, in architecture, the corners or quoins of walls, croſs-beams, or rafters.

ANCONY, in the iron-works, ſignifies a piece of half-wrought iron, of about three quarters of an hundred weight, and of the ſhape of a bar in the middle, but unwrought at the ends.

ANCYLE, in ſurgery, the ſame as ANCYLOSIS.

ANCYLOBLEPHARON, from *αγκυλος*, *bent*, and *βλεφαρον*, *an eye-lid*; a diſeaſe of the eye, which cloſes the eye-lids. This diſorder muſt be diſtinguiſhed from that coalition of the eye-lids which happens from viſcid matter gluing them together. If the coheſion is on the cornea, the ſight is inevitably loſt, which ſometimes happens in the ſmall-pox. If there is only a growing together of the eye-lids, they may be ſeparated with the ſpecillum, and pledgets kept between them to prevent their re-union. If the eye-lids adhere to the eye, they are to be ſeparated by a fine-edged knife; and their re-union is to be prevented by a proper uſe of injections, and lint placed between them, after dipping it in ſome proper liniment.

ANCYLOGLOSSUM, in medical language, implies a contraction of the ligaments of the tongue. Some have this imperfection from their birth, others from ſome diſeaſe. In the firſt caſe, the membrane which ſupports the tongue is too ſhort or too hard: in the latter, an ulcer under the tongue, healing and forming a cicatrix, is ſometimes the cauſe: theſe ſpeak with ſome difficulty. The ancyloglosſi, by nature, are late before they ſpeak; but when they begin, they ſoon ſpeak properly.

ANCYLOMELE, in ſurgical inſtruments, denotes a crooked probe with a hook to it.

ANCYLOSIS, in ſurgery, implies a diſtortion or ſtiffneſs of the joints, cauſed by a ſettlement of the humours, or a diſtenſion of the nerves, and therefore remedies of a mollifying nature are required.

ANCYROIDES, the ſame as CARACOIDES.

ANCYSTRUM, in botany, a genus of the digynia order, belonging to the diandria claſs of plants; the eſſential characters of which are: the calyx is a ſingle-leaved, four-toothed perianthium, four-awn'd, the awns terminated with croſs-barbs: the corolla is four-cleft; the ſtigma pencilled.

ANDA, in botany, a name given to a Brazilian nut-tree, which yields a kind of grey, oily nut, ſomewhat like the cheſnut; but the fruit is only uſed in medicine as a purgative.

ANDABATÆ, in antiquity, a ſort of gladiators, who, mounted on horſeback, or in chariots, fought hoodwinked, having a helmet that covered their eyes.

ANDANTE, or ANDANTI, in muſic, ſignifies a movement moderately ſlow, between *largo* and *allegro*.

ANDECAVI, ANDEGAVI, ANDES, or ANDI, a people of Gallia Celtica, having the Turones to the eaſt, the Namnetes to the weſt, the Pictones to the ſouth, and the Aulerci Cœnomani to the north: now Anjou.

ANDENA, in old writers, denotes the ſwarth made in mowing of hay.

ANDIRA, or ANGELYN, a Brazilian wood of a very hard contexture, and generally uſed by the natives in building. It yields a fruit in a ſhell, the kernel of which is good againſt worms.

ANDIRA, in zoology, ſignifies the large Brazilian bat, commonly called the horned bat.

ANDRACHNE, BASTARD ORPINE, a genus of the gynandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 38th order, Tricoccæ. See Syſtem of BOTANY. There are three ſpecies.

1. The telephoides, or herbaceous trailing andrachne, is a low plant, whoſe branches trail upon the ground. The leaves are ſmall, of an oval ſhape, ſmooth, and of a ſea-green colour. It is found wild in Italy and the Archipelago.

2. The fruticoſa, or ſhrubby baſtard orpine, is a native of China, and ſome parts of America.

3. The arborea, with a tree-like ſtalk. This ſpecies grows naturally at Campeachy.

The firſt ſpecies may be raiſed by ſowing the ſeeds in March, on a moderate hot-bed. The other ſpecies are very tender, and therefore muſt be kept conſtantly in the bark-ſtove.

ANDRAPODISMUS, in ancient writers, the ſelling of perſons for ſlaves. Hence Andrapodiſtes, a dealer in ſlaves, and more particularly a kidnapper, who ſteals men or children to ſell them.

ANDRAPODOCAPELI, in antiquity, a kind of dealers in ſlaves. At Athens, ſeveral places in the forum were appointed for the ſale of ſlaves. Upon the firſt day of every month, the merchants, called Ανδραποδοκαπελοι, brought them into the market, and expoſed them to ſale; the crier ſtanding upon a ſtone erected for that purpoſe, called the people together.

ANDREW, *or Knights of St.* ANDREW, an order of knights, more uſually called the order of the thiſtle.

Knights of St. ANDREW, is alſo an order inſtituted by Peter the Great of Muſcovy in 1698; the badge of which is a golden medal; on one ſide whereof is repreſented St. Andrew's croſs, with theſe words, *Cazar Pierre monarque de tout la Ruſſie*. This medal, being faſtened to a blue ribbon, is ſuſpended from the right ſhoulder.

St. ANDREW's *Croſs*, one in form of the letter X, on which the Apoſtle is ſaid to have ſuffered death.

St. ANDREW's *Day*, a feſtival of the Chriſtian church, celebrated on the 30th of November, in honour of the apoſtle St. Andrew.

ANDRIÆ, in Grecian antiquity, public entertainments firſt inſtituted by Minos of Crete, and after his example appointed by Lycurgus at Sparta, at which a whole city or a tribe aſſiſted. They were managed with the utmoſt frugality, and perſons of all ages were admitted; the younger ſort being obliged by the lawgiver to repair thither as ſchools of temperance and ſociety.

ANDRODAS, in claſſical authors, denotes the 63d year of a man's age.

ANDROGYNA, in botany, implies male and female flowers on the ſame root.

ANDROGYNES, in natural hiſtory, ſignifies thoſe living creatures which, by a monſtrous formation of their generative parts, ſeem to unite in themſelves the two ſexes, of male and female. This luſus naturæ, this defect, or perhaps redundancy, in the animal-ſtructure, is deſcribed by medical authors in the following manner. "There is a depravation in the ſtructure of the parts intended by nature for propagation, when, beſides thoſe concealed parts that are found neceſſary for the diſcharge of prolific functions, the pudenda of the other ſex likewiſe appear. This monſtrous production of nature is diverſified in four different ways; of which three appear in males and one in females. In men, the female pudendum, cloathed with hair, ſometimes appears, contiguous to the perinæum; at other times, in the middle of the ſcrotum; at other times, which conſtitutes the third diverſity, through that part itſelf which in the midſt of the ſcrotum exhibits the form of a pudendum, urine is emitted. Near that part which is the teſt of puberty, and above the pudendum, even in females, the maſculine genitals appear in ſome, conſpicuous in all their three forms, one reſembling the viretram, the other like the two veſticles; but for the moſt part it happens, that, of the two inſtruments of generation, one is feeble and inert; and it is extremely rare that both are found ſufficiently valid and proper for feats of love; nay, even in a great many, both theſe members are deficient and impotent, ſo that they can perform the office neither of a male nor of a female."

Since this monſtrous exhibition of nature is not ſuch as to abrogate the rights or deſtroy the character of humanity amongſt human beings, this involuntary misfortune implies no right to deprive thoſe upon whom it is inflicted by nature, of the privileges natural to every citizen.

ANDROGYNOUS, in zoology, an appellation given to animals which have both the male and female ſex in the ſame individual. In botany, the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROGYNUM, in eccleſiaſtical law, denotes the ſtate of matrimony.

ANDROIDES, in mechanics, implies a human figure, which, by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living man.

A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute-player, and was capable of performing many different pieces of muſic on the german flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated notions of the fingers, muſt appear truly wonderful.

This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year.

The conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhow exquiſite ſkill; but what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, neverthelefs, has been done. For M. de Kempelen, a gentleman of Preſburg in Hungary, excited by the performances of M. de Vaucanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!

Every one who is acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment and rational faculties than is ſufficient to accompliſh many matters of greater importance. That this machine was really made, the public have had ocular demonſtration. The inventor came over to Britain in 1783, where he remained above a year with his automaton.

Mr. de Kempelen remarks as the moſt ſurpriſing circumſtance attending his automaton, that it had been exhibited at Preſburg, Vienna, Paris, and London, to thouſands, many of whom were mathematicians and cheſs-players, and yet the ſecret by which he governed the motion of its arm was never diſcovered.

ANDROLEPSY, in Grecian antiquity, an action allowed by Athenians againſt ſuch as protected perſons guilty of murder. The relations of the deceaſed were empowered to ſieze three men in the city or houſe whither the malefactor had fled, till he was either ſurrendered, or ſatisfaction made for the murder.

ANDROMACHE, in mythology, the wife of Hector, the mother of Aſtyanax, and daughter of Eton king of Thebes in Cilicia. After the death of Hector and the deſtruction of Troy, ſhe married Pyrrhus; and afterwards Helenus the ſon of Priam, with whom ſhe reigned over part of Epirus.

ANDROMACHE, in pharmacy, denotes Venice terpentine.

ANDROMEDA, in aſtronomy, a northern conſtellation, behind Pegaſus, Caſſiopeia, and Perſeus. It repreſents the figure of a woman chained; and is fabled to have been formed in memory of Andromeda, daughter of Cepheus and Caſſiopeia, and wife of Perſeus, by whom ſhe had been delivered from a ſea-monſter, to which ſhe had been expoſed to be devoured for her mother's pride.

Andromeda, or Marſh Cyſtus: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, Bicornes. For the characters ſee Syſtem of Botany.

There are five ſpecies. 1. The polifolia is a low plant, growing naturally in bogs in the northern countries. 2. The mariana, a native of North America. 3. The paniculata a native of Virginia and Carolina, growing in moiſt places. 4. The arborea is a native of the ſame countries, where it is called the ſorrel tree. 5. The calyculata, is a native of Siberia, and likewiſe of North America. All theſe ſorts, are hardy plants.

ANDRON, in Grecian antiquity, denotes the apartment in houſes deſigned for the uſe of men; in which ſenſe it ſtands oppoſed to Gynæceum.

The Greeks alſo gave their dining-rooms the title of andron becauſe the women had no admittance to feaſts with the men.

ANDRONA, in antiquity, denoted a ſtreet, or public place, where people met and converſed together. In ſome writers, androna ſignifies the ſpace between two houſes; in which ſenſe, the Greeks uſe the term ανδρωνας, for the way or paſſage between two apartments.

Androna, in eccleſiaſtical writers, ſignifies that part in churches deſtined for the men. Anciently it was the cuſtom for the men and women to have ſeparate apartments in places of worſhip, where they performed their devotions aſunder; which method is ſtill religiouſly obſerved in the Greek church. The ανδρων, or androna, was in the ſouth ſide of the church, and the womens apartment on the north.

ANDRONION, in medicine, ſignifies the paſtil of the celebrated phyſician Andro, and ſaid to be good againſt carbuncles on the face.

ANDROPHAGI, in ancient geography, the name of a nation whoſe country was adjacent to Scythia. Their name is compounded of two Greek words, and ſignifies man-eaters.

ANDROPOGON, or Man's-beard, in botany, a genus of the monœcia order, belonging to the polygamia claſs; and in the natural method ranking under the 4th order, graminæ. The hermaphrodite calyx is a one-flowered bivalved glume: the corolla is a bivalved glume awned at the baſe: the ſtamina conſiſt of three capillary filaments; the antheræ are oblong and bifurcated: the piſtillum has an oval germen; with two capillary ſtyli coaleſced, and villous ſtigmata: there is no pericarpium, the ſeed is one, ſolitary, and covered. The male calyx, corolla, and ſtamina, the ſame with the hermaphrodite; but the corolla without the awn.

There are above 18 ſpecies. Of theſe the moſt remarkable is the nardus, which produces the Indian nard or ſpikenard of the ſhops.

The ſpikenard, as brought from the Eaſt Indies, is a congeries of ſmall fibres iſſuing from one head, and matted cloſe together, ſo as to form a bunch about the ſize of the finger, with ſome ſmall ſtrings at the oppoſite end of the head. Spikenard has a warm, pungent, bitteriſh taſte; and a ſtrong not very agreeable ſmell.

It is ſtomachic and carminative; and ſaid to be alexipharmac, diuretic, and emmenagogue.

ANDROSÆMUM, Tutsan, or Hyperecum, in botany, implies a ſynonyme of the herb St. John's wort.

ANDROSACE, a genus of the monogynia order, belonging to the pedandria claſs of plants; and in the natural method ranking under the 21ſt order, Preciæ. For the characters ſee Syſtem of Botany. Of this genus there are ſix ſpecies. 1. The maxima grows naturally in Auſtria and Bohémia, among the corn. It has broad leaves, which ſpread near the ground; from the centre of theſe the footſtalks ariſe, which are terminated by an umbel of white flowers like thoſe of the auricular. 2. The ſeptentrionalis, villoſa, carnea, and lactea, grow naturally on the Alps and Helvetian mountains. Of the other ſpecies, called the elongata, we have no particular deſcription.

Theſe plants are propagated by ſeeds, which ſhould be ſown ſoon after they are ripe, otherwiſe they ſeldom come up the ſame year.

ANDRUM, a kind of hydrocele, to which the people of Malabar, are very ſubject. Its origin is derived from the vitious quality of the country waters, impregnated with corroſive muriatic ſalts, the ſource of moſt other diſeaſes that infect the Malabarians. Its ſymptoms, are an erryſipelas of the ſcrotum, returning every new moon, by which the lymphatics, being eroded, pour a ſerous ſaline humour into the cavity of the ſcrotum. The andrum is incurable; for thoſe once ſeized with it have it for life.

ANDRYALA, Downy Sow-Thistle: a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants: and in the natural method ranking under the 49th order, Compoſitæ-ſemifloſculus. The eſſential characters are: the receptacle is villous; the calyx is many parted, ſubequal, and rounded; and the pappus is ſimple and ſeſſile.

There are four ſpecies. 1. The integrifolia is an annual plant, growing naturally in the ſouth of France, Spain, and Italy. It riſes to the height of a foot and an half, with woolly branching ſtalks. 2. The raguſina is a native of the Cape of Good Hope. 3. The lanata is a native of Sicily and of the country round Montpelier. 4. The ſinuata grows in Spain and Portugal: the leaves are broader, longer, and more downy, than either of the other ſorts; the flower-ſtalks ariſing more than a foot high. All theſe plants are eaſily propagated by ſeeds, which ſhould be ſown in autumn.

ANECDOTE, Anecdota, in literature, ſignifies the titles of ſecret hiſtories; but it properly denotes a relation of detached and intereſting particulars. The word is Greek, ανεκδοτα, q. d. things not yet known or hitherto kept ſecret.

Anecdotes, in literary hiſtory, implies an appellation given to ſuch works of the ancients as have not yet been publiſhed.

ANEE, in commerce, ſignifies a meaſure for grain, uſed in ſome provinces of France. At Lyons, it ſignifies 80 Engliſh quarts, wine-meaſure.

ANELE, or Anil, implies the ſame with Indico.

ANEMIUS Furnus, among chemiſts, denotes a wind furnace, which draws the air ſo as to perform the operation of fuſion without the aſſiſtance of a bellows.

ANEMOMETER, in mechanics, implies a machine for meaſuring the force and velocity of the wind.

ANEMONE, Wind-flower, a genus of the polygnia order, belonging to the polyandria claſs of plants; and in the natural method, ranking under the 26th order, Multiſilique. It has its name from the Greek ανεμος, ſignifying the wind; becauſe the flower is ſuppoſed not to open unleſs the wind blows. For its characters ſee Syſtem of Botany.

Linnæus enumerates 21 ſpecies; of this genus 1. The nemoroſa, which grows wild in the woods in many parts of Britain, where it flowers in April and May. The flowers are white or high purple, ſingle; or reddiſh brown, double. 2. The appennina is likewiſe a native of Britain, growing in woods. 3. The coronaria. 4. The hortenſis. Theſe two are natives of the Levant, particularly of the Archipelago iſlands, where the borders of the fields are covered with them of the moſt beautiful colours.

The firſt and ſecond may be propagated by taking up their roots when the leaves decay, and tranſplanting them in wilderneſſes, where they will thrive and increaſe greatly, if they are not diſturbed. The two laſt ſorts require a good deal of care.

Sea Anemone, the ſame as Animal-Flower.

ANEMOSCOPE, a machine that ſhows either the courſe or velocity of the wind.

The machine which ſhows the courſe of the wind, conſiſts of an index moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compaſs are drawn inſtead of the hours. The index, which points to the diviſions on the dial, is turned by a horizontal axis, having a trundle-head at its external extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis; on the top of which a vane is fixed, that moves with the courſe of the wind, and puts the whole machine in motion. The whole contrivance is extremely ſimple; and nothing required in the conſtruction, but that the number of cogs in the wheel, and rounds in the trundle-head, be equal; becauſe it is neceſſary, that, when the vane moves entirely round, the index of the dial alſo makes a complete revolution.

The anemoſcope, calculated for indicating the force or velocity of the wind, is the ſame with what moſt writers call an anemometer: and we have accordingly deſcribed one of thoſe machines under that article.

ANEMOSPERMOS, in botany, a ſynonyme of Arctotis.

ANETHUM, Dill and Fennel, a genus of the digynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 45th order, Umbellatæ. For the characters, ſee Syſtem of Botany.

There are two ſpecies. 1. The graveolens, or dill, is an annual plant: the root is long, ſlender, and white: the leaves are divided into a multitude of fine, long, narrow ſegments like thoſe of fennel, but of a blueiſh green colour, and leſs ſtrong ſmell. The ſtalk is round and firm, growing to the height of four feet, with yellow flowers in large umbels.

2. The feniculum, or fennel; of which there are two varieties, the common and the ſweet. The ſweet fennel is ſmaller in all its parts than the common, except the ſeeds, which are conſiderably larger. Both ſorts are cultivated in gardens: the common is a perennial plant: the ſweet fennel periſhes after it has given ſeed.

Of the firſt ſpecies, only the ſeeds are uſed in medical preparations. Both the ſeeds and roots of fennel are uſed in medicine. They are ranked among the four greater hot ſeeds, and not undeſervedly looked upon as good ſtomachics and carminatives.

ANEURISM, or Aneurysm, in ſurgery, a throbbing tumor, diſtended with blood, and formed by a dilation or rupture of an artery.

ANFEALTHILE, or Anfeldthyde, in law, implies a ſimple accuſation, contradiſtinguiſhed from a complex one; which, in the Saxon code, anſwered to thoſe in the Engliſh ſtatutes, that hold to bail, being ſimple, and thoſe that can take no bail, as complex.

ANGARI, or Angarii, in antiquity, denote public couriers, appointed for carrying meſſages.

The ancient Perſians, Budæus obſerves, had their αγγαρειον δρομημα; which was a ſet of couriers on horſeback, poſted at certain ſtages or diſtances, always in readineſs to receive the diſpatches from one, and forward them to another, with wonderful celerity, anſwering to what the moderns call poſts, as being poſted at certain places or ſtages.

ANGARIA, in Roman antiquity, a kind of public ſervice impoſed on the provincials, to provide horſes and carriages for the conveyance of military ſtores, and other public burdens.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding; and conſequently includes both arteriotomy and phlebotomy.

ANGEL, a ſpiritual intelligent ſubſtance, the firſt in rank and dignity among created beings. The word Angel is Greek, and ſignifies a meſſenger: the Hebrew הלאר ſignifies the ſame thing. The angels are in Daniel (chap. iv. ver. 13, &c.) called שם, or watchers, from their vigilance: for the ſame reaſon they are, in the remains we have of the prophecy attributed to Enoch, named Egregori; which word imports the ſame in Greek.

Angels, therefore, in the proper ſignification of the word, do not import the nature of any being, but only the office, to which they are appointed, eſpecially by way of meſſage, or intercourſe between God and man: in which ſenſe they are called the miniſters of God, who do his pleaſure, and miniſtring ſpirits ſent forth to miniſter for them who ſhall be heirs of ſalvation.

That there are ſuch beings as we call angels, that is, certain permanent ſubſtances, inviſible, and imperceptible to our ſenſes, endued with underſtanding and power ſuperior to that of human nature, created by God, and ſubject to him as the ſupreme Being; miniſtring to his divine providence in the government of the world by his appointment, and more eſpecially attending the affairs of mankind; is a truth ſo fully atteſted by Scripture, that it cannot be doubted.

The creation of angels is not expreſsly mentioned by Moſes in the firſt of Geneſis, yet it is generally conſidered by judicious expoſitors as implied. All the writers that we have ſeen on this ſubject, think they were included in the firſt day's work, when the heavens were framed.

On a ſubject of this nature, it would be imprudent to indulge a ſpirit of conjecture: ſcripture is the only ſtandard by which truth and error can be tried, and to this we muſt ultimately appeal.

It is acknowledged that Moſes has not expreſsly mentioned angles by name; yet, as we have remarked, their creation is undoubtedly implied: for the heavens muſt include all that are in them; and therefore it is that the divine penman ſays, in the concluſion of his narrative, "Thus the heavens and the earth were finiſhed, and all the hoſt of them."

As the numbers of Angels are very great, it may well be ſuppoſed that there ſeveral orders in their government; the ancient fathers of the Chriſtian church have divided them into three Hierarchies, and theſe are divided again into three claſſes; viz.

1ſt Hierarchy.	2d Hierarchy.	3dHierarchy.
Seraphim	Virtues	Principalities
Cherubim	Powers	Archangels
Thrones	Dominations	Angels.

The Seraphim are, of all other ſpirits, the moſt inflamed with holy love. The Cherubim are the moſt enlightened, and communicate their rays and ſcience to the other orders. The Thrones are thoſe that encircle the majeſty of God. The Virtues are mighty to work wonder and miracles. The Powers counteract and prevent the malevolence of evil demons. The Dominations have the government of man. The Principalities have the charge of ſtates and kingdoms. Archangels are commiſſioned only on extraordinary occaſions; and Angels are the common heralds and meſſengers of Heaven.

Whatever grounds there may be for this particular arrangement of ſpiritual beings into ſo many different claſſes, allotting to each their peculiar departments, it is not our preſent purpoſe to enquire; but certain it is that there are ſuch beings; for no age or nation, whatever their tenets might be, but allowed of their exiſtence.

The Jews reckon four orders or companies of Angels, each headed by an Arch-angel; the firſt order being that of Michael, the ſecond of Gabriel, the third of Uriel, and the fourth of Raphael: but though the Jews believe them to be four, yet it ſeems there were rather ſeven.

Although the Angels were originally created perfect, good, and obedient, to their Maſter's will, yet ſome of them ſinned, and kept not their firſt eſtate, but left their habitation; and ſo, of the moſt bleſſed and glorious, became the moſt vile and miſerable of all God's creatures.

They were expelled the regions of light, and caſt down to hell, to be reſerved in everlaſting chains, under darkneſs, until the day of judgment. With heaven they loſt their heavenly diſpoſition, which delighted once in doing good and praiſing God; and fell into a ſettled rancour againſt him, and malice againſt men: their inward peace was gone; all deſire of doing good departed from them; and, inſtead thereof, revengeful thoughts and deſpair took poſſeſſion of them, and created an eternal hell within them.

What offence they committed, or at what period theſe apoſtate ſpirits fell from heaven, and plunged themſelves into ſuch an abyſs of wickedneſs and woe, are queſtions impoſſible to be determined by any evidence of Scripture. But on what occaſion ſoever it firſt ſhowed itſelf, pride ſeems to have been the leading ſin of the angels; who, admiring and valuing themſelves too much on the excellence of their nature, and the height of their ſtation, came at length to entertain ſo little reſpect for their Creator, as to be guilty of downright rebellion and apoſtacy.

It is certain from Scripture, that theſe fallen angels were in great numbers, and that there were alſo ſome order and ſubordination preſerved among them; one eſpecially being conſidered as their prince, and called by ſeveral names, Beelzebub, Satan, or Sammaël by the Jews; Ahârimam, by the Perſians; and Eblis, by the Mahometans. Their employment is not only evil themſelves, but endeavouring, by all arts and means, to ſeduce and pervert mankind, by tempting them to all kind of ſin, and thereby bringing them into the ſame deſperate ſtate with themſelves.

ANGEL, in commerce, the name of a gold coin formerly current in England, and valued at ten ſhillings. It had its name from the figure of an angel repreſented upon it, weighed four pennyweights, and was twenty-three and a half carats fine.

ANGEL FISH, in ichthyology, a ſpecies of ſqualus.

ANGELIC, or ANGELICAL, ſomething belonging to, or that partakes of, the nature of Angels. We ſay, an angelical life, &c. St. Thomas is ſtiled the angelical doctor. The angelical ſalutation is called by the Romaniſts Ave Maria; ſometimes ſimply Angelus.

ANGELIC GARMENT, *Angelica Veſtis*, among our anceſtors, was a monkiſh garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks.

ANGELICA, a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, Umbellatæ. The eſſential characters are, the fruit is roundiſh, angled, ſolid, with reflected ſtyli; the corollæ are equal, and the petals incurvated. There are five ſpecies.

1. The ſativa, or common angelica, which is cultivated in gardens for medicinal uſe, and likewiſe for a ſweetmeat, grows naturally in the northern countries. The root is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, compoſed of pinnated foliola, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the ſtalk is round, ſtriated, and as thick as a child's arm.

2. The arch-angelica is a native of Hungary and Germany.

3. The ſylveſtris grows naturally in moiſt meadows, and by the ſides of rivers, in many parts of Britain.

4. The atro-purpurea canadenſis; 5. The lucida canadenſis. Theſe are natives of North America, but have neither beauty nor uſe.

The common angelica delights to grow in a moiſt ſoil: the ſeeds ſhould be ſown ſoon after they are ripe.

For the purpoſes of medicine, Bohemia and Spain produce the beſt kinds of angelica. The London college direct the roots brought from Spain to be alone made uſe of.

All the parts of angelica, eſpecially the root, have a fragrant aromatic ſmell, and a pleaſant bitteriſh warm taſte, glowing upon the lips and palate for a long time after they have been chewed.

Angelica is one of the moſt elegant aromatics of European growth, though little regarded in the preſent practice. The root, which is the moſt efficacious part, is uſed in the aromatic tincture; and the ſtalks make an agreeable ſweat-meat.

ANGELICS, in Grecian antiquity, a celebrated dance performed at their feaſts; ſo called, becauſe the Dancus were dreſſed in the habit of meſſengers.

ANGELICS, the name of an order of knights, inſtituted in 1191, by Angelus Flavius Commenus, emperor of Conſtantinople.

ANGELICS alſo ſignifies a congregation of nuns, founded at Milan in 1534, by Louiſa Torelli, counteſs of Guaſtalla. They obſerve the rule of St. Auguſtine.

ANGELINA, ZANONI ACOSTÆ, in botany, is a tree which grows to a monſtrous ſize in the Eaſt Indies; ſome ſay to 16 feet thick, and bears fruit for a whole century without ceaſing. The leaves contain many medicinal virtues.

ANGELOT, an ancient Engliſh gold coin, ſtruck at Paris, while under ſubjection to the Engliſh. It was thus called from the figure of an angel ſupporting the eſcutcheon of the arms of England and France.

ANGELOT alſo denotes a ſmall fat, rich ſort of cheeſe, brought from Normandy.

ANGER, a violent paſſion of the mind, conſiſting in a propenſity to take vengeance on the author of ſome real or ſuppoſed injury done to the offended party.

Anger is either deliberative or inſtinctive; and the latter kind is raſh and ungovernable, becauſe it operates blindly, without affording time for deliberation.

All anger is not ſinful: hence the precept, "Be ye angry and ſin not." It becomes ſinful, however, and contradicts the rule of Scripture, when it is conceived upon ſlight and inadequate provocations, and when it continues long. It is then contrary to the amiable ſpirit of charity, which "ſuffereth long, and is not eaſily provoked."

"provoked." Hence theſe other precepts, "Let every man be ſlow to anger;" and, "Let not the ſun go down upon your wrath."

Theſe precepts, and all reaſoning upon the ſubject, ſuppoſe the paſſion of anger to be within our power: and this power conſiſts not ſo much in any faculty we have of appeaſing our wrath at the time, as in mollifying our minds by habits of juſt reflection, ſo as to be leſs irritated by impreſſions of injury, and therefore ſooner pacified.

ANGERIOGRAPHY, or Angeliology, among anatomiſts, implies a deſcription and hiſtory of the ſeveral veſſels of the human body.

ANGERONA, or Angina, in mythology, a pagan deity to whom the Romans prayed for the cure of the quinzy. She is repreſented with her mouth covered, to denote patience and refraining from complaints.

Her ſtatue was ſet up, in the temple of the goddeſs Volupia, to ſhow that a patient enduring of affliction, leads to pleaſure.

ANGERONALIA, in Roman antiquity, were ſolemn feaſts held by the Romans the 21ſt of December, in honour of Angerona.

ANGEROTOMY, in ſurgery, implies the opening of any of the veſſels of the human body.

ANGINA, in medicine, a violent inflammation of the throat, uſually called quinzy.

ANGIOSPERMIA, in botany, the ſecond order in the claſs didynamia. It conſiſts of thoſe plants, of that claſs, whoſe ſeeds are incloſed in a pericarpium. In this order the ſtigma is generally obtuſe.

ANGLE, the inclination of two lines meeting one another in a point.

Angle *of the Sun's Poſition*, is formed by the meridian and azimuth, or other great circle drawn through the center of the ſun.

Angle *of the Longitude*, is formed at the pole of the ecliptic, between the meridian, and a circle of longitude drawn through the center of the object.

Angle *at the Center*, in fortification, denotes, that which is found in the center of the figure by lines drawn from the angles of the figure.

Angle *of a Baſtion*, is that which the two faces of it form at the point of the baſtion.

Angle *of Incidence*, in optics, the angle which a ray of light makes with a perpendicular to that point of the ſurface of any medium on which it falls; though it is commonly underſtood of the angle which it makes with the ſurface itſelf; however, the former is the true explanation.

Angle *of Refraction*, generally implies the angle which a ray of light, refracted by any medium, makes with a perpendicular to that point of the ſurface on which it was incident; but it is ſometimes underſtood to be the angle which it makes with the ſurface of the refracting medium itſelf.

Angle *of the Terraille*, is formed by the line of defence, and the flank of the baſtion.

Angle *of Circumference*, is formed by an arch drawn from one gorge to the other.

Diminiſhed Angle, is formed by a line drawn from the face of the baſtion to the exterior ſide of the polygon.

Flanking Angle, is formed by the line of defence, and the flank of the baſtion.

Angle *Saliant*, points outwards towards the field.

Angle *of the Polygon*, is formed by two ſides of the polygon.

Angle *of the Complement of the Line of Defence*, is formed by the interſection of two complements with each other.

Angle *of the Moat*, is formed before the curtain where it is interſected.

Angle *of a Battalion*, in military affairs, is the laſt man where the rank and file terminates.

ANGLER, implies a perſon who practiſes the art of angling.

Angler, in ichthiology, the Engliſh name of a ſpecies of lophus.

ANGLES, in hiſtory, an antient German nation, originally a branch of the Suevi; who, after various migrations, ſettled in that part of Denmark, and duchy of Sleſwick, which to this day is called Angel, and of which the city of Flenſburgh is the capital. They were known, in the time of Tacitus, by the name of Angli.

To this nation the Britiſh ambaſſadors applied when ſoliciting ſuccours againſt the Scots and Picts. Who came over in greater numbers than any other Saxon nation; and accordingly had the honour of giving the name of Anglia to England.

ANGLING, in a general ſenſe, denotes the art of fiſhing with a rod, to which are fitted a line, hook and bait.

In angling the following rules are to be obſerved; 1. To place yourſelf ſo that your ſhadow do not at any time lie upon the water if ſhallow. 2. To angle in a pond near where the cattle go to drink, and in rivers in ſuch places as the fiſh you intend to angle for uſually frequent.

The beſt times for angling are from April to October, for in cold ſtormy weather fiſh will not bite. The morning is always the beſt time; however the afternoon of a cloudy day is generally good.

The beſt way to angle with a fly is down the river, with well timed baits and a proper ſized hook.

ANGLO Calvinists, a name given by ſome writers to the members of the church of England, as agreeing in many points with the calviniſts of other countries.

ANGLO Saxon, an appellation given to the language ſpoken by the Engliſh Saxons, in contradiſtinction to both the true Saxon and the modern Engliſh.

ANGON, in ancient hiſtory, denotes a kind of javelin, uſed in Gaul in the ſhape of the fleur de lys at the point.

ANGONÆUS, or Anconæus, in anatomy, the muſcle of the arm inſerted in the ſhoulder or ancon.

ANGUILLA, in zoology, the ſame with the eel.

ANGUILLIFORM, an appellation given by zoologiſts to all eel ſhaped animals.

ANGUINA, the ſame as Tricosanthes.

ANGUINUM Ovum, a fabulous kind of egg, ſaid to be produced by the ſaliva of a cluſter of ſerpents, and poſſeſſed of magical virtues.

This ſuperſtition was prevalent among the ancient Britons, and there ſtill remains a tradition of it in Wales. Pliny has given an account of it, and of which the following may ſerve as a tranſlation:

> But tell me yet
> From the grot of charms and ſpells,
> Where our matron ſiſter dwells,
> Brennus, has thy holy hand
> Safely brought the Druid wand,
> And the potent Adder-ſtone,
> Gender'd 'fore the autumnal moon?
> When, in undulating twine,
> The foaming ſnakes prolific join;
> When they hiſs, and when they bear
> Their wond'rous egg aloof in air:
> Thence before to earth it fall,
> The Druid in his hallow'd pall,
> Receives the prize,
> And inſtant flies,
> Follow'd by the envenom'd brood,
> 'Till he croſs the cryſtal flood.

This wondrous egg ſeems to have been nothing more than a large bead of glaſs, uſed by the Druids as a charm to impoſe on the vulgar, whom they made believe, that the poſſeſſor would be fortunate in all his undertakings.

ANGUIS, or Snake, in zoology, a genus belonging to the order of amphibia ſerpentes. For character, ſee Syſtem of Botany. There are 15 ſpecies, viz.

1. The eryx, a native of Britain and likewiſe of America; about a ſpan in length, and about the thickneſs of a man's finger. The tongue broad and forked, the noſtril ſmall and high in the noſe, the eyes lodged in oblong fiſſures above the angle of the mouth; belly of a bluiſh lead colour, marked with ſmall white ſpots irregularly diſpoſed: the reſt of the body of a greyiſh brown, with three longitudinal duſky lines; one extending from the head along the back to the point of the tail; the others broader, and extending the whole length of the ſides. And covered over with ſmall ſcales.

2. The fragilis, blindworm, or ſlow-worm, which is common in Great Britain, and grows to about a foot in length, and to the thickneſs of a man's little finger: the irides are red; the head ſmall; the neck ſtill more ſlender; from that part the body grows ſuddenly, and continues of an equal bulk to the tail, which ends quite blunt. The colour of the back is cinerous, marked with very ſmall lines compoſed of minute black ſpecks: the ſides are of a reddiſh caſt; the belly duſky; both marked like the back. The tongue is broad and forked; the teeth are minute and numerous, and the ſcales ſmall. The motion of this ſerpent is ſlow, from which, it derived its name. It reſembles the viper in the manner of producing its young.

3. The ventralis, or glaſs-ſnake, has 127 ſquamæ on the belly, and 223 on the tail. The head is very ſmall, and the tongue of a ſingular form. The upper part of the body is brown and green, blended together and regularly ſpotted with yellow. The ſkin is very ſmooth; and ſhining with ſmall ſcales, cloſely connected, and of a different ſtructure from thoſe of other ſerpents. They appear earlier in the ſpring than any other ſerpent, and are numerous in the ſandy woods of Virginia and Carolina, where they are ſaid to be harmleſs.

4. The jaculus, or dart-ſnake, is about ten or twelve inches long, and of the thickneſs of a man's little finger. Its colour is a milky grey on the back, variegated with ſmall black ſpots like ſo many eyes; and on the belly it is perfectly white. The neck is wholly black; and from that two milk-white ſtreaks run all the way along the back to the tail: the black ſpots are each ſurrounded with a ſmall circle of white. It has its name from its vibrating its body in the manner of a dart. It is a native of Egypt, Libya, and the iſlands of the Mediterranean.

5. The quadrupes: The body of this ſpecies is cylindrical, with 14 or 15 longitudinal aſh-coloured ſtreaks; the teeth are extremely ſmall; it has no ears: the feet are at a great diſtance from each other, very ſhort, with five toes and ſmall nails; but the

toes are ſo minute, that they can hardly be numbered: it is a native of Java.'

6. The bipes, is a native of the Indies; it has two ſhort feet, with two toes, near the anus. In every ſcale of the bipes there is a brown point.

7. The meleagris, is likewiſe a native of the Indies; it has ſmall teeth, but no ears. This ſpecies has a great reſemblance to the former.

8 The colubrina, an inhabitant of Egypt, is beautifully variegated with pale and yellow colours.

9. The maculata, a native of America, is yellow and interſperſed with aſh-couloured lines on the back: the head is ſmall in proportion to the body.

10. The reticulata, a native of America, has browniſh ſcales, with a white margin.

11. The ceraſtes, with 200 ſquamæ on the belly and 15 on the tail, is a native of Egypt.

12. The lumbricalis, a native of America, has 230 ſquamæ on the belly and ſeven on the tail; its colour is a yellowiſh white.

13. The platura: The head is oblong and without teeth; the body is about a foot and a half long, black above and white below; the tail is about one-ninth of the length of the animal, much compreſſed or flatted, and variegated with black and white; the ſcales are roundiſh, ſmall, not imbricated and are exceedingly numerous.

14. The laticauda, a native of Surinam: the tail is compreſſed, acute, pale, with browniſh belts.

15. The ſcytale, a native of the Indies, with 220 ſquamæ on the belly and 13 on the tail. The head is ſmall and oval, and the eyes are little; the body is cylindrical, about a foot and a half long, covered with oval obtuſe ſcales: the tail is thick and obtuſe like the head; it colour is white, interſperſed with browniſh rings; the margins of the ſcales are of an iron colour; and the top of the head blue. Linnæus informs us, that none of this genus are poiſonous.

ANGULAR, in a general ſenſe, denotes ſomething that relates to or hath angles. In aſtronomy, angular motion ſignifies the increaſe of the diſtance between any two planets revolving round any body as the common center of their motion.

ANGUNEAL Hyperbola, a kind of ſerpentizing hyperbola, cutting its aſymptotes with centre flexions.

ANGURIA, the Water-Melon, a genus of the diandria order, belonging to the monœcia claſs of plants: and in the natural method ranking under the 34th order, Cucurbitaceæ. For the characters ſee Syſtem of Botany.

Of this genus, Linnæus reckons three ſpecies, the trilobata, pedata, and trifoliata; but only one is known in this country, by the name of Citrul. The fruit is cultivated in Spain, Portugal, Italy, and other warm countries of Europe; as alſo in Africa, Aſia, and America; where it is eſteemed on account of its wholeſome cooling quality; but in this country it is held in little eſtimation.

ANGUSTICLAVIA, in Roman antiquity, a tunica embroidered with little purple ſtuds. It was worn by the Roman knights, as the laticlavia was by the ſenators.

ANHELATIO, or Anhelitas, among phyſicians, implies a ſhortneſs of breath.

ANHIMA, in ornithology, ſignifies a ſpecies of the cane, found in Brazil, South America.

ANHINGA, in ornithology, ſignifies a ſpecies of the duck, found in Brazil, South America.

ANHLOTE, or Anscot, in law, ſignifies a ſingle tribute of tax, uſually called Scot and Lot.

ANHUIBA, the ſame as Saſſafras.

ANHYDROS, in botany, a ſynonyme for the ſtrychna, or nightſhade, a poiſonous plant.

ANI, in ornithology, ſignifies the Brazilian paroquet.

ANIL, in botany, a ſynonyme of a ſpecies of indigofera.

ANIMA, among divines and naturaliſts, denotes the ſoul, or principle of life, in animals.

Anima, among chemiſts, denotes the volatile or ſpirituous parts of bodies.

Anima *Hepatis*, is a name by which ſome call ſal martis, or ſalt of iron, on account of its ſuppoſed efficacy in diſeaſes of the liver.

Anima *Mundi*, in metaphyſics, implies a certain pure ethereal ſubſtance or ſpirit, diffuſed, according to many of the ancient philoſophers, through the maſs of the world, informing, actuating, and uniting the divers parts thereof into one great, perfect, organical, and vital body or animal.

Anima *Saturni*, a white powder obtained by pouring diſtilled vinegar on litharge, and is of conſiderable uſe in enamelling.

ANIMADVERSION, in literature, ſignifies a particular ſcrutiny of any ſubject, in order to point out its errors or defects in the moſt ſcrupulous manner.

ANIMAL, in natural hiſtory, implies an organized and living body, endowed with ſenſation; thus, minerals are ſaid to grow or increaſe, plants to grow and live, but animals alone to have ſenſation.

Animal, uſed adjectively, denotes any thing belonging to, or partaking of, the nature of animals. Thus we ſay animal actions, which imply thoſe that are peculiar to animals; ſuch are ſenſation and muſcular motion.

Animal *Flower*, in zoology, a name given to ſeveral ſpecies of animals belonging to the genus of Actinia of Linnæus. They have likewiſe been diſtinguiſhed by the names of Urtica Marina, or Sea-nettle, from their ſuppoſed property of ſtinging; and Sea-anemone, from their claws or tentacles being diſpoſed in regular circles, and tinged with a variety of bright lively colours, reſembling the petals of ſome of our moſt beautiful flowers. As to one ſpecies particularly, mentioned by Abbé Diequemarre, Phil. Tranſ. for 1773, art. 37. the pureſt white, carmine, and ultramarine, are ſaid to be ſcarce ſufficient to expreſs their brilliancy. The bodies of ſome of them are hemiſpherical, of others cylindrical, and of others ſhaped like a fig. Their ſubſtance likewiſe differs; ſome are ſtiff and gelatinous, others fleſhy and muſcular; but all of them are capable of altering their figure when they extend their bodies and claws in ſearch of food. They are found on the rocky coaſts of the Weſt India iſlands, and likewiſe on ſome parts of the coaſt of England.

They have only one opening or mouth, which is in the centre of the uppermoſt part of the animal: round this are placed rows of fleſhy claws; this opening or mouth is capable of great extenſion. Theſe animals, though exceedingly voracious, will bear long faſting. They may be preſerved alive a year, or longer, in a veſſel of ſea-water, without any viſible food; but, when food is preſented, one of them will ſucceſſively devour two muſcles in their ſhells, or even ſwallow a whole crab as large as a hen's egg. In a day or two the crab-ſhell is voided at the mouth, perfectly cleared of all the meat. The muſcle-ſhells are likewiſe diſcharged whole, with the two ſhells joined together, but entirely empty, yet there is not the leaſt particle of fiſh to be perceived on opening them. An anemone of one ſpecies will even ſwallow an individual of another ſpecies; but, after retaining it ten or twelve hours, will throw it up alive and uninjured.

Through this opening it produces its young alive, furniſhed with claws, which, as ſoon as they fix themſelves, they begin to extend in ſearch of food.

A particular ſpecies of animal-flowers has been found in ſome of the iſlands ceded to Britain at the laſt treaty of peace with France; and the following account of them was publiſhed in the Philoſophical Tranſactions, vol. 57. by Mr. Ellis, in a letter to Lord Hillſborough.

" This compound animal, which is of a tender fleſhy ſubſtance, conſiſts of many tubular bodies, ſwelling gently towards the upper part, and ending like a buſh or very ſmall onion; on the top of each is its mouth, ſurrounded by one or two rows of tentacles, or claws, which when contracted look like circles of beads.

" The lower part of all theſe bodies have a communication with a firm fleſhy wrinkled tube, which ſticks faſt to the rocks, and ſends forth other fleſhy tubes, which creep along them in various directions. Theſe are full of different ſizes of theſe remarkable animals, which riſe up irregularly in groups near to one another.

" This adhering tube, that ſecures them faſt to the rock, or ſhelly bottom, is worthy of our notice. The knobs that we obſerve, are formed in ſeveral parts of it by its inſinuating itſelf into the inequalities of the coral rock, or by graſping pieces of ſhells, part of which ſtill remain in it, with the fleſhy ſubſtance grown over them.

" This ſhows us the inſtinct of nature, that directs theſe animals to preſerve themſelves from the violence of the waves, not unlike the anchoring of muſcles, by their fine ſilken filaments that end in ſuckers; or rather like the ſhelly baſis of the ſerpula, or worm-ſhell, the tree-oyſter, and the ſlipper barnacle, &c. whoſe baſes conform to the ſhape of whatever ſubſtance they fix themſelves to, graſping it faſt with their teſtaceous claws, to withſtand the fury of a ſtorm.

" When we view the inſide of this animal diſſected lengthwiſe, we find like a little tube leading from the mouth to the ſtomach, from whence there riſe eight wrinkled ſmall guts, in a circular order, with a yellowiſh ſoft ſubſtance in them; theſe bend over in the form of arches towards the lower part of the bulb, from whence they may be traced downwards, to the narrow part of the upright tube, till they come to the fleſhy adhering tube, where ſome of them may be perceived entering into a papilla, or the beginning of an animal of the like kind, moſt probably to convey its nouriſhment till it is provided with claws: the remaining part of theſe ſlender guts are continued on in the fleſhy tube, without doubt for the ſame purpoſe of producing and ſupporting more young ones from the ſame common parent.

" The many longitudinal fibres that we diſcover lying parallel to each other, on the inſide of the ſemi-tranſparent ſkin, are all inſerted in the ſeveral claws round the animal's mouth, and are plainly the tendons of the muſcles for moving and directing the claws at the will of the animal: theſe may be likewiſe traced down to the adhering tube.

" As this ſpecimen has been preſerved in ſpirits, the colour of the animal, when living, cannot be certainly known; it is at preſent of a pale yellowiſh brown.

« With regard to its name, it may be called Actinia Sociata, or the Cluſter Animal-flower."

ANIMAL *Syſtem* denotes the whole claſs of beings endowed with animal life, otherwiſe called the *animal kingdom*.

ANIMALS, the preparation for collections or muſeums.

ANIMALCULE, in general, ſignifies a little animal; and thus the term might be applied to every animal which is ſcarce diſcernable to the naked eye. It hath been cuſtomary, however, to diſtinguiſh by the name of Animalculæ, ſuch animals as are of a ſize ſo diminutive, that their true figure can only be diſcerned with the aſſiſtance of glaſſes; and more eſpecially ſuch as are altogether inviſible to the naked eye.

By the help of magnifying glaſſes, we are brought into a kind of new world; where numberleſs animals are diſcovered, which from their minuteneſs muſt otherwiſe for ever have eſcaped our obſervation: and how many kinds of theſe inviſible creatures there may be, is ſtill unknown; as they are diſcerned of all ſizes, from thoſe which are barely inviſible to the naked eye, to ſuch as reſiſt the action of the microſcope, comparatively ſpeaking as the fixed ſtars do that of the teleſcope, and with the beſt magnifiers hitherto invented appear only as ſo many moving points.

The ſmalleſt living creatures our inſtruments can ſhow are thoſe that inhabit the waters: for though poſſibly animalculæ, equally minute, or perhaps more ſo, may fly in the air, or creep upon the earth, it is ſcarce poſſible to bring ſuch under our examination; but water being tranſparent, and confining the creatures in it, we are able, by applying a drop of it to the microſcope, to diſcover all that it contains. Some of the moſt curious of theſe animalculæ, which have been deſcribed by microſcopical obſervers, I ſhall here give an account of.

1. *The Hair-like Inſect.* This is ſo called, by Mr. Baker, on account of its ſhape; being extremely ſlender, and frequently an hundred and fifty times as long as broad. The body or middle part, which is nearly ſtraight, appears, in ſome, compoſed of ſuch rings as the windpipe of land-animals is made up of; but in others, ſeems rather ſcaly, or made up of rings, that obliquely croſs one another. Its two ends are hooked or bent, pretty nearly in the ſame degree, but in a direction oppoſite to each other; and as no eyes can be diſcerned, it is difficult to judge which is the head or tail. Its progreſſive motion is very ſingular, being performed by turning upon one end as a centre, and deſcribing almoſt a quarter of a circle with the other.

When viewed ſingly, they are exceedingly tranſparent, and of a beautiful green colour; but when numbers of them are brought together, they become opaque, loſe their green colour, and grow apparently black.

Notwithſtanding the extreme minuteneſs of theſe animalculæ, they ſeem to be fond of ſociety; for, after viewing for ſome time a parcel of them taken up at random, they will be ſeen diſpoſing themſelves in a kind of regular order. If a multitude of them are put into a jar of water, they will form themſelves into a regular body, and aſcend ſlowly to the top, where, after they have remained for ſome time expoſed to the air, their green colour changes to a beautiful ſky-blue: and, when they are weary of this ſituation, they form themſelves into a kind of rope, which ſlowly deſcends as low as they intend; but if they happen to be cloſe to the ſide of the jar, they will deſcend upon it. They are ſo nearly of the ſpecific gravity of water itſelf, that they will either remain at bottom, float upon the ſurface, or be ſuſpended in the middle, according as they are originally placed, or as they themſelves are inclined.

A ſmall quantity of the matter containing theſe animalculæ having been put into a jar of water, it ſo happened, that one part went down immediately to the bottom, whilſt the other continued floating on the top. When things had remained for ſome time in this condition, each of theſe ſwarms of animalculæ began to grow weary of its ſituation, and had an inclination to change quarters. Therefore, both armies ſet out at the ſame time, the one proceeding upwards, and the other downwards; ſo that, after ſome hours journey, they met in the middle; when the army that was marching upwards, opened to the right and left, to make room for thoſe that were deſcending. Thus, without confuſion or intermixture, each held on its way; the army that was going up, marching in two columns to the top, and the other proceeding in one column to the bottom, as if each had been under the direction of experienced leaders.

The hair-like inſect was firſt diſcovered in a ditch at Norwich, one end of which communicates with the river there, and the other end with a ſecond ditch, into which ſeveral kennels empty themſelves. The length of this ditch, when Mr. Baker wrote his account of theſe animalculæ, was one hundred yards, and its breadth nine.

2. *Eels in Paſte, &c.* When paſte is allowed to ſtand till it becomes ſour, it is then found to be the habitation of numberleſs animalculæ, which may be diſcerned by the naked eye; and though their form cannot be perfectly diſtinguiſhed, their motion is very perceptible, and the whole paſte will ſeem to be animated.

The moſt remarkable property of theſe inſects is, that they are viviparous. If one of them is cut through near the middle, ſeveral oval bodies of different ſizes will be ſeen to iſſue forth. Theſe are young anguillæ, each of them coiled up, and incloſed in its proper membrane, which is ſo exquiſitely fine, as ſcarce to be diſcernible by the beſt magnifier, while it incloſes the embryo animal.

The uterus, or veſſel, that contains all theſe oval bodies, is compoſed of many ringlets, not unlike the aſperia arteria of land animals, and ſeems to be conſiderably elaſtic; for as ſoon as the animalculæ is cut in two, the oval bodies are thruſt out with ſome degree of violence, from the ſpringing-back or action of this bowel. An hundred and upwards of the young ones have been ſeen to iſſue from the body of one ſingle eel, whereby the prodigious increaſe of them may be eaſily accounted for.

Animalculæ of a ſimilar kind are likewiſe found in vinegar; and, like thoſe already deſcribed, are found to be viviparous. But it is not only in acid matters that ſuch appearances are obſerved. In ſome fields of wheat, many grains may be obſerved, that appear blackiſh outwardly, as if ſcorched; but, when opened, are found to contain a ſoft white ſubſtance, which, attentively conſidered, appears to be nothing elſe than a congeries of threads of threads or fibres, lying cloſe to each other in a parallel direction, much reſembling the unripe down of ſome thiſtles on cutting open the flower-heads before they begin to blow.

This fibrous matter diſcovers not the leaſt ſign of life or motion, unleſs when water is applied; but immediately on wetting, provided the grains of wheat have been newly gathered, the ſuppoſed fibres ſeparate, and appear to be living creatures. Their motions at firſt are very languid; but gradually become more vigorous, twiſting and wriggling themſelves ſomewhat in the manner of the eels in paſte, but always ſlower, and with leſs regularity.

3. *The Proteus.* This animalculæ has been dignified by Mr. Baker with the name of Proteus, on account of its aſſuming a great number of different ſhapes, ſo as ſcarce to be known as the ſame animal in its various transformations; and, indeed, unleſs it be carefully watched while paſſing from one ſhape to another, it will often become ſuddenly inviſible.

When water, wherein any ſort of vegetable has been infuſed, or animals preſerved, has ſtood quietly for ſome days, or weeks, in a glaſs or other veſſel, a ſlimy ſubſtance will be collected about the ſides; ſome of which, being taken up with the point of a penknife, placed on a ſlip of glaſs in a drop of water, and looked at through the microſcope, will be found to harbour ſeveral kinds of little animals, that are ſeldom found ſwimming about at large; among which the proteus is one. Its ſubſtance and colour ſeems to reſemble that of a ſnail; and its whole ſhape ſeems to bear a conſiderable reſemblance to that of a ſwan. It ſwims to and fro with great vivacity, but will now and then ſtop for a minute or two; during which time its long neck is uſually employed as far it can reach, forwards, and on every ſide, with a ſomewhat ſlow, but equable motion, like that of a ſnake, frequently extending thrice the length of its body, and ſeemingly in ſearch of food.

There are no eyes, nor any opening in the head like a mouth, to be diſcerned; yet its actions plainly prove it to be an animal that can ſee.

When it is alarmed, it ſuddenly draws in its long neck, and when it has continued ſome time in this poſture, it will often, inſtead of the head and neck it had formerly, put forth a new one, with a kind of wheel machinery, the motions of which draw a current of water to it from a conſiderable diſtance. Having often pulled in and thruſt out this ſhort head, ſometimes with and ſometimes without the wheel-work, the creature, as if weary, will remain motionleſs for a while; then its head and long neck will be very ſlowly protruded, and it ſoon reſumes its former agility.

4. *The Wheel-Animal, or Vorticellæ.* This wonderful animalculæ is found in rain water that has ſtood ſome days in leaden gutters, or in hollows of lead on the tops of houſes; or in the ſlime or ſediment left by ſuch water; but if the water ſtanding in gutters of lead, or the ſediment left behind it, has any thing of a red colour in it, one may be certain of finding them in it. Though it diſcovers no ſigns of life except when in the water, yet it is capable of continuing alive for many months after it is taken out of the water, and kept as dry as duſt.

In this ſtate it is of a globular ſhape, and exceeds not the bigneſs of a grain of ſand; but, being put into water, in the ſpace of half an hour, a languid motion begins, the globule turns itſelf about, lengthens itſelf by ſlow degrees, aſſumes the form of a lively maggot, and moſt commonly in a few minutes afterwards puts out its wheels; ſwimming vigorouſly through the water, as if in ſearch of food; or elſe, fixing itſelf by the tail, works the wheels in ſuch a manner as to bring its food to it.

The moſt remarkable part of this animalculæ is its wheelwork; which conſiſts of a couple of ſemicircular inſtruments, round the edges of which many little fibrillæ move themſelves very briſkly, ſometimes with a kind of rotation, and ſometimes in a trembling or vibrating manner. When in this ſtate, it ſometimes unfaſtens its tail, and ſwims along with a great deal of ſwiftneſs, ſeemingly in purſuit of its prey. At other times the wheels ſeem to be entire circles, armed with ſmall teeth like thoſe of the balance-wheel of a watch, appearing projected forwards beyond the head, and extending ſideways ſomewhat wider than its diameter. The teeth or cogs of theſe wheels are at an equal diſtance: but the figure of them varies according to their poſition, the degree of their protruſion, and perhaps the will of the animal itſelf. They appear ſometimes like minute oblong ſquares, riſing at right angles from the periphery of a circle, like ancient battlements on a round tower; and at other times they terminate in ſharp points, and all together reſemble a kind of gothic crown. They are often ſeen in a kind of curvular direction, all bending the ſame way, and ſeeming like ſo many hooks; and now then the ends of them will be perceived to be clubbed like mallets.

As theſe wheels are every where exceſſively tranſparent, except about their circular rim or edge, where the cogs are ſet, it is very difficult to determine by what contrivance they are turned about, or what their real figure is, though they ſeem exactly to reſemble wheels moving round upon an axis. The difficulty of conceiving how an articulation could be contrived ſo as to cauſe a real rotation, hath cauſed many people imagine that there was a deception in this caſe: but Mr. Adams and Mr. Baker aſſures us, that when the wheels are fully protruded, they never fail to ſhow all the viſible marks of a regular rotation; and, in ſome poſitions, the ſame cogs or teeth may be traced by the eye during a complete revolution.

All the actions of this creature ſeem to imply ſagacity and quickneſs of ſenſation: for at the leaſt motion in the water, they inſtantly draw in their wheels, whilſt maggot-ſtate, its motions are ſlow and irregular; but, after the wheels are protruded, they are performed with great regularity and ſwiftneſs.

Notwithſtanding the minuteneſs of this animalculæ, the microſcope generally diſcovers others in the ſame drop of water, compared with which the wheel-animal may be ſaid to be a whale.

The tranſparency of its body, allows its internal parts to be ſeen, which cannot be perceived in the minuteſt animalculæ on account of the ſmallneſs of their ſize.

The alternate motions of contraction and dilatation are performed with great ſtrength and vigour, in pretty much the ſame time as the pulſation of the arteries of a man in health. The motions of the heart are communicated to all the internal parts of the thorax; and ſeem to extend a great deal further; for a ſtrict examination diſcovers, at the ſame time, throughout the whole animal, contractions and dilatations going on, that are apparently correſpondent thereto. However, theſe motions of the heart are ſometimes ſuſpended, or imperceptible, for two or three minutes; after which they are renewed, and go on again with the ſame regularity as before.

The blood or circulating fluid of the wheel-animal is ſo abſolutely colourleſs, that the current of it through the veſſels is indiſtinguiſhable by the microſcopes.

Beſides the abovementioned animalculæ, there are found in the waters ſeveral other ſpecies of animals furniſhed with wheels, ſome of which appear to have a rotatory, and others a vibratory, motion.

5. *The Bell-flower Animal*, or *Plumed Polype*. Theſe animalculæ dwell in colonies together, from ten to fifteen, ſeldom falling ſhort of the former number, or exceeding the latter, in a ſlimy kind of mucilaginous or gelatinous caſe; which, out of the water, has no determined form, appearing like a little lump of ſlime; but when expanded therein, has ſome reſemblance to the figure of a bell with its mouth upwards; and is uſually about half an inch long, and a quarter of an inch in diameter. Theſe bells, or colonies, are to be found adhering to the large leaves of duckweed, and other aquatic plants.

The bell, or caſe, which theſe animals inhabit, being very tranſparent, all the motions of its inhabitants may be diſcerned through it diſtinctly. It ſeems divided internally into ſeveral apartments, or rather to contain ſeveral ſmaller ſacculi, each of which incloſes one of theſe animals. The openings at the tops of theſe ſacculi, are but juſt ſufficient to admit the creature's head and a ſmall part of its body to be thruſt out beyond them, the reſt remaining always in the caſe. It can, however, occaſionally retire into its caſe altogether; and never fails to do ſo when alarmed by any ſudden motion of the water, or of the veſſel which contains it.

Beſides the particular and ſeparate motion which each of theſe creatures is able to exert within its own caſe, independent of the reſt; the whole colony together have a power of altering the poſition of the bell, or even of removing it from one place to another; ſo that this bell is ſometimes found ſtanding perfectly upright, and at other times bending the upper part downwards. As theſe animalculæ ſeem not to chooſe to ſtay together in ſocieties whoſe number exceeds 15, when the colony happens to increaſe in number, the bell may be obſerved to ſplit gradually, beginning from about the middle of the upper or anterior extremity, and proceeding downwards towards the bottom, till they at laſt ſeparate entirely, and become too complete colonies independent of each other.

The arms of each individual of this colony are ſet round the head, to the number of 40, having each the figure of an Italic *ſ*, one of whoſe hooked ends is faſtened to the head; and all together, when expanded, compoſe a figure ſhaped ſomewhat like a horſe's ſhoe, convex on one ſide next the body, but gradually opening and turning outwards, ſo as to leave a conſiderable area within the outer extremities of the arms. When the arms are thus extended, the creature, by giving them a vibrating motion, can produce a current in the water, which brings the animalculæ or whatever other minute bodies are within the ſphere of its action, with great velocity to its mouth, ſituated between the arms; where they are taken in, if liked, or driven away by a contrary motion.

The food is conveyed immediately from the mouth or opening between the arms, through a narrow neck, into a paſſage ſeemingly correſpondent to the œſophagus in land-animals; down which it paſſes into the ſtomach, where it remains for ſome time, and then is voided upwards, in ſmall round pellets, through a gut whoſe exit is near the neck.

The body conſiſts of three diviſions; in the uppermoſt of which are contained all the abovementioned inteſtines, which are only to be diſcerned when the creature is full, at which time they become opaque. The other two diviſions, ſeem to be of no other uſe than to give the creature a power of contraction and extenſion. The arms are not able to contract like thoſe of the common polype; but, when the animal retires into its caſe, they are brought together in a cloſe and curious order, ſo as to be eaſily drawn in. Though their general appearance when expanded is that of a cup whoſe baſe and top are of an horſe-ſhoe form, they ſometimes ſeparate into four parts, and range themſelves ſo as to reſemble four ſeparate plumes of feathers.

6. *The Globe Animal.* This animalculæ, ſeems exactly globular, having no appearance of either head, tail or fins. It moves in all directions, forwards or backwards, up or down, either rolling like a bowl, ſpinning horizontally like a top, or gliding along ſmoothly without turning itſelf at all. Sometimes its motions are ſlow, at other times very ſwift; and when it pleaſes, it can turn round, as it were upon an axis, very nimbly, without removing out of its place.

The ſurface of the whole body appears, in ſome, as if all over dotted with points; in others, as if granulated like ſhagreen: but their more general appearance is, as if beſet thinly round with ſhort moveable hairs or briſtles, which probably are the inſtruments by which their motions are performed. Theſe animalculæ may be ſeen by the naked eye, but appear only like moving points.

7. *The Pipe Animal.* Theſe creatures are found on the coaſt of Norfolk, living in ſmall tubes or caſes of ſandy matter, in ſuch multitudes as to compoſe a maſs ſometimes of three feet in length. Some of theſe tubes are found petrified, and conſtitute one ſpecies of ſyringoides.

8. *An Inſect with net-like Arms.* The properties and ſhape of this little animal are very extraordinary. It is found only in caſcades, where the water runs very ſwift, where they appear in cluſters, ſtanding erect on their tails; and reſembling, when all together, the combs of the bees at the time they are filled with aureliæ. On being taken out of the water, they ſpin threads, by which they hang exactly in the ſame manner as the garden-ſpider. The body appears curiouſly turned as on a lath; and at the tail are three ſharp ſpines, on which it raiſes itſelf, and ſtands upright in the water: but the moſt curious apparatus is about its head, where it is furniſhed with two inſtruments like fans or nets, which ſerve to provide its food; which it frequently ſpreads out and draws in again; and when drawn up they are folded together with the utmoſt nicety and exactneſs, ſo as to be indiſcernible when brought cloſe to the body.

At the bottom of theſe fans a couple of claws are faſtened to the lower part of the head, which, every time the nets are drawn in, conduct to its mouth whatever is taken in them. When it does not chuſe to employ its nets, it thruſts out a pair of ſharp horns.

9. A *curious aquatic Worm*, which is found in ditch-water; and is of various ſizes, from $\frac{1}{40}$ to $\frac{1}{2}$ an inch in length. About the head it has ſomewhat of a yellowiſh colour; but all the reſt of the body is perfectly colourleſs and tranſparent, except the inteſtines, which are conſiderably opaque.

Along its ſides are ſeveral papillæ, with long hairs growing from them; it has two black eyes, and it is very nimble. But the moſt remarkable thing in this creature is a long horn or proboſcis; which, in the large ones, may be ſeen with the naked eye, if the water is clear, and is ſometimes $\frac{1}{10}$ of an inch in length: this it waves to and fro as it moves in the water.

10. *Spermatic Animals*, and *Animalcula Infurſoria*. The diſcovery of living animalculæ in the ſemen of moſt animals is claimed by Mr. Lewenoek who made this diſcovery about the beginning of 1678.

According to this naturaliſt, theſe animalculæ are found in the ſemen maſculinum of every kind of animals, but their general appearance is very much the ſame, nor doth their ſize differ in proportion to the bulk of the animal to which they belong.

The bodies of all of them ſeem to be of an oblong oval form, with long tapering ſlender tails iſſuing from them; and as by this ſhape they reſemble tadpoles, they have been frequently called by that name; though the tails of them, in proportion to their bodies, are much longer than the tails of tadpoles are: and it is obſervable, that the animalculæ in the ſemen of fiſhes have tails much longer and more ſlender than the tails in other animals; inſomuch, that the extremity of them is not to be diſcerned without the beſt glaſſes, and the utmoſt attention.

The numbers of theſe animalculæ are inconceivable. On viewing with a microſcope the milt or ſemen maſculinum of a living cod-fiſh innumerable multitudes of animalculæ were found therein, of ſuch a diminutive ſize that he ſuppoſed at leaſt 10,000 of them capable of being contained in the bulk of a drop of water; whence he concludes, that the milt of this ſingle fiſh contained more living animalculæ than there are to be found people in the whole world.

To find the comparative ſize of theſe animalculæ Mr. Lewenhoek placed an hair of his head near them; which hair, through his microſcope, appeared an inch in breadth; that at leaſt 60 ſuch animalculæ could eaſily lie within that diameter, whence their bodies being ſpherical, it follows, that 216,000 of them are but equal to a globe whoſe diameter is the breadth of a hair.

Theſe animalculæ appear to be very vigorous, and tenacious of life; for they may be obſerved to move long after the animal from which they are taken is dead.

They have this peculiarity alſo, that they are continually in motion, without the leaſt reſt or intermiſſion, provided there is fluid ſufficient for them to ſwim about in.

The *Animalcula Infuſoria,* take their name from their being found in all kinds either of vegetable or animal infuſions. For there is ſcarce any kind of water, unleſs impregnated with ſome mineral ſubſtance, but what will diſcover living creatures.

The production of *animalcula infuſoria* is very ſurpriſing. In four hours time, an infuſion of cantharides has produced animalculæ leſs than even the tails of the ſpermatic animals already deſcribed. Neither do they ſeem to be ſubject to the fate of other animals; but enjoy a ſort of immortality. Nor do the common methods by which other animals are deſtroyed, ſeem to be effectual for deſtroying their vital principle. Hot mutton-gravy, ſecured in a phial with a cork, and afterwards ſet among hot aſhes to deſtroy as effectually as poſſible every living creature that could be ſuppoſed to exiſt in it, has nevertheleſs been found ſwarming with animalculæ after ſtanding a few days.

ANIMALCULÆ *Inviſible.* Naturaliſts ſuppoſe another ſpecies or order of inviſible animalculæ, viz. ſuch as eſcape the cognizance even of the beſt microſcopes, and give many probable conjectures in relation to them. Reaſon and analogy give ſome ſupport to the exiſtence of infinite imperceptible animalculæ. The naked eye, ſay ſome, takes in from the elephant to the mite; but there commences a new order reſerved only for the microſcope, which comprehends all theſe from the mite to thoſe 27 millions of times ſmaller; and this order cannot be yet ſaid to be exhauſted, if the microſcope be not arrived at its laſt perfection.

[*We have in the foregoing account given the* general characters *of that numerous kingdom of nature called Animalculæ, or at leaſt ſo much as we judge uſeful in this place. It is neceſſary to remark, that, had a particular deſcription been given, under this head, it would require a volume in itſelf to enumerate the properties of this claſs of animals.*

For the entertainment of thoſe who are curious in exploring the wonders of creation, we have already introduced a plate of Animalculæ, in this work, which comes under the article Microſcopical Objects, and which will be illuſtrated there, with a particular deſcription; as we can with propriety, under that head, enter into a minute detail, as the ſubjects we have ſelected for this purpoſe are but few and curious.

There are not many of the Naturaliſts who have found out the relative properties of this minute Claſs of Animals. Mr. Adams, *of Fleet-ſtreet, and Mr.* Baker, *have thrown the greateſt lights upon this kingdom of reputed inviſibility.*]

ANIMATED, or ANIMATE, in a general ſenſe, denotes ſomething endowed with animal life. It alſo imports a thing to be impregnated with vermin or animalculæ.

ANIMATION, ſignifies the informing an animal body with a ſoul. The different hypotheſes of phyſicians and philoſophers, concerning the time of animation, have had their influence on the penal laws made againſt artificial abortions; it having been made capital to procure miſcarriage in the one ſtate, while in the other it was only deemed a venial crime.

ANIME, in heraldry, a term uſed when the eyes of a rapacious creature are borne of a different tincture from the creature itſelf.

ANIME, a reſin exſuding from the trunk of a large American tree called by Piſo, jetaiba, by the Indians, courbaril, which is a ſpecies of HYMENÆA. This reſin is of a tranſparent amber colour, a light agreeable ſmell, and little or no taſte. It diſſolves entirely, in rectified ſpirit of wine; the impurities, which are often in large quantities, remaining behind.

ANIMELLÆ, in anatomy, ſignifies the glands under the ears.

ANIMETTA, among eccleſiaſtical writers, denotes the cloth wherewith the cup of the euchariſt is covered.

ANINGA, in commerce, a root which grows in the Antilles iſlands, and is pretty much like the China plant. It is uſed by ſugar-bakers for refining the ſugar.

ANISUM, or ANISE, the ſame as Pimpinella.

ANKER, a liquid meaſure at Amſterdam. It contains about 32 gallons Engliſh meaſure.

ANKLE, in anatomy, the joint which connects the foot to the leg.

ANN, or ANNAT, in the Scotch law, ſignifies half a year's ſtipend, which the law gives to the executors of miniſters of the church of Scotland, over and above what was due to the miniſter himſelf, for his incumbency.

ANNALE, in the church of Rome, a term applied to the maſſes for the dead during a whole year after the perſon's deceaſe.

ANNALIS CLAVUS, in Roman hiſtory, the nail which the Prætor, Conſul, or Dictator, drove into the wall of Jupiter's temple annually upon the Ides of September, to ſhow the number of years. But this cuſtom was ſuperſeded by reckoning years by conſulſhips.

ANNALS, in literature, ſignify a ſpecies of hiſtory, which relates events in the chronological order wherein they happened. They differ from perfect hiſtory in this, that annals are but a bare relation of what paſſes every year, as a journal is of what paſſes every day; whereas hiſtory relates not only the tranſactions themſelves, but alſo the cauſes, motives, and ſprings of actions. Annals require nothing but brevity; hiſtory demands ornament.

ANNATES, among eccleſiaſtical writers, a year's income of a ſpiritual living.

In ancient times, theſe were given to the pope throughout all chriſtendom, upon the deceaſe of any biſhop, abbot, or pariſh clerk, and were paid by his ſucceſſor.

At the reformation they were taken from the pope, and veſted in the king; but queen Anne reſtored them to the church, by appropriating them to the augmentation of poor livings, generally called queen Anne's bounty.

ANNEALING, by workmen, alſo called nealing, is particularly uſed in making glaſs: it conſiſts in placing the bottles, &c. whilſt hot, in a kind of oven or furnace, were they are ſuffered to cool gradually; they would otherwiſe be too brittle for uſe. Metals are rendered hard and brittle by hammering: they are therefore made red hot, in order to recover their malleability; and this is likewiſe called nealing.

The difference between unannealed and annealed glaſs, with reſpect to brittleneſs, is very remarkable; for when an unannealed glaſs-veſſel is broken, it often flies into a ſmall powder, with a violence ſeemingly very diſproportioned to the ſtroke it has received. In general, it is in greater danger of breaking from a very ſlight ſtroke than from one of ſome conſiderable force. One of thoſe veſſels will often reſiſt the effects of a piſtol bullet dropt into it from the height of two or three feet; yet a grain of ſand falling into it, will make it burſt into ſmall fragments. This takes place ſometimes immediately on dropping the ſand into it: but often the veſſel will ſtand for ſeveral minutes after, ſeemingly ſecure; and then, without any new injury, it will fly to pieces.

The ſame phenomena are ſtill more ſtrikingly ſeen in glaſs drops or tears. They are globular at one end, and taper to a ſmall tail at the other. They are the drops which fall from the melted maſs of glaſs on the rods on which the bottles are made. They drop into the tubs of water which are uſed in the work; the greater part of them burſt immediately in the water. When thoſe that remain entire are examined, they diſcover all the properties of unannealed glaſs in the higheſt degree. They will bear a ſmart ſtroke on the thick end without breaking; but if the ſmall tail be broken, they burſt into ſmall powder with a loud exploſion. They appear to burſt with more violence, and the powder is ſmaller in an exhauſted receiver than in the open air. When they are annealed, they loſe thoſe properties.

Glaſs is one of thoſe bodies which increaſe in bulk when paſſing from a fluid to a ſolid ſtate. When it is allowed to cryſtallize regularly, the particles are ſo arranged, that it has a fibrous texture: it is elaſtick, and ſuſceptible of long continued vibrations; but when a maſs of melted glaſs is ſuddenly expoſed to the cold, the ſurface cryſtalizes, and forms a ſolid ſhell round the interior fluid parts: this prevents them from expanding when they become ſolid. They, therefore, have not the opportunity of a regular cryſtallization; but are compreſſed together with little mutual coheſion: on the contrary, they preſs outward to occupy more ſpace, but are prevented by the external cruſt. In conſequence of the effort of expanſion in the internal parts, the greater number of glaſs drops burſt in cooling; and thoſe which remain entire are not regularly cryſtallized.

By the proceſs of annealing, the glaſs is kept for ſome time in a ſtate approaching to fluidity; the heat increaſes the bulk of the cryſtallized part, and renders it ſo ſoft, that the internal parts have the opportunity of expanding aud forming a regular cryſtallization.

A ſimilar proceſs is now uſed for rendering kettles and other veſſels of caſt iron leſs brittle.

When caſt iron is broken, it has the appearance of being compoſed of grain: forged or bar iron appears to conſiſt of plates. Forged iron has long been procured, by placing a maſs of caſt iron under large hammers, and making it undergo violent and repeated compreſſion. A proceſs is now uſed for converting caſt iron into forged by heat alone. The caſt iron is placed in an air-furnace, and kept for ſeveral hours in a degree of heat, by which it is brought near to a fluid ſtate. It is then allowed to cool gradually, and is found to be converted into forged iron. This proceſs is conducted under a patent; although, if Reaumur's experiments upon caſt iron be conſulted, it will appear not to be a new diſcovery.

Caſt-iron, is brittle, becauſe it has not had the opportunity of cryſtallizing regularly. For when it is expoſed to cold, while fluid, the ſurface becoming ſolid, prevents the inner part from expanding and arranging themſelves into regular cryſtals. And when caſt iron is brought near to the melting-point, and continued for a ſufficient length of time in that degree of heat, the particles have the opportunity of arranging themſelves into that form of cryſtals by which forged-iron is diſtinguiſhed, and by which it poſſeſſes coheſion and all its properties.

Annealing of iron may be proved from the well-known fact of forged-iron being incomparably more difficult of fuſion than caſt-iron. Iron diminiſhes in bulk when it paſſes into a fluid ſtate, while moſt other metals increaſe in volume.

Many attempts have been made to procure a maſs of it in a malleable ſtate, but without ſucceſs. It is ſaid that the proceſs is now diſcovered by a chemiſt in Spain. The treatment of the metal is probably very ſimple. Perhaps it only conſiſts in precipitating it in a minute powder from aqua regia, expoſing it to a ſtrong heat which melts it, and keeping it for ſome time in a ſtate nearly fluid, that it may, like iron, cryſtallize regularly: by this it will poſſeſs all its metallic properties.

St. **ANN**'s *Day*, a feſtival of the Chriſtian church, celebrated by the Latins on the 26th of July, but by the Greeks on the 9th of December. It is kept in honour of Anna, mother of the Virgin Mary.

ANNEXATION, in law, a term uſed to imply the uniting of lands to the crown.

ANNEXED, in a general ſenſe, implies a thing joined to ſomething elſe.

ANNIHILATION, the act of reducing any created being into nothing.

ANNI NUBILES, in law, denotes the marriageable age of a woman; viz. after ſhe has arrived at the age of twelve years.

ANNIENTED, in law, ſignifies annulled or made void.

ANNIVERSARY, the annual return of any remarkable day.

ANNIVERSARY DAYS, in old times, denoted thoſe days in which an office was yearly performed for the ſouls of the deceaſed, or the martyrdom of the ſaints was yearly celebrated in the church.

ANNO DOMINI, i. e. the year of our Lord; the computation of the time from our Saviour's incarnation.

ANNOISANCE, in law, implies the ſame as NUISANCE.

ANNOMINATION, in rhetoric, the ſame with what is otherwiſe called Paronomaſia.

ANNONA, in Roman antiquity, denotes proviſion for a year of all ſorts, but eſpecially of corn.

ANNONA, is likewiſe the allowance of oil, ſalt, bread, fleſh, corn, wine, hay, and ſtraw, which was annually provided by the contractors for the maintenance of an army.

ANNONA, the Cuſtard Apple, a genus of the polygynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 52d order, Coadunatæ. For the characters ſee Syſtem of BOTANY. There are eight ſpecies.

1. The reticulata, or cuſtard-apple, is a native of the Weſt-Indies, where it grows to the height of twenty-five feet, and is well furniſhed with branches on every ſide. The bark is ſmooth, and of an aſh-colour; the leaves are of a light green, oblong, and have ſeveral deep tranſverſe ribs or veins, ending in acute points; the fruit is of a conical form, as large as a tennis-ball, of an orange colour when ripe, having a ſoft, ſweet, yellowiſh pulp, of the conſiſtence of a cuſtard, from whence it has its name.

2. The muricata, or ſour-ſop, rarely riſes above twenty feet high, and is not ſo well furniſhed with branches as the other,

3. The ſquamoſa, or ſweet ſop, ſeldom riſes higher than fifteen feet, and well furniſhed with branches on every ſide.

4. The paluſtris, or water-apple, grows to the height of thirty or forty feet.

5. The cherimola, with oblong ſcaly fruit, is a native of Peru, where it is much cultivated for the fruit, and grows to be a very large tree well furniſhed with branches.

6. The Africana, with ſmooth blueiſh fruit.

7. The Aſiatica, or purple apple. This grows in ſome of the French iſlands, as alſo in Cuba, in great plenty.

8. The triloba, or North-American annona, called by the inhabitants papaw, is a native of the Bahama iſlands, and likewiſe of Virginia and Carolina. The fruit grows in cluſters of three, and ſometimes of four together; when ripe, they are yellow, covered with a thin ſmooth ſkin, which contains a yellow pulp, of a ſweet luſcious taſte. In the middle of this pulp, lie in two rows twelve ſeeds, divided by as many thin membranes.

The laſt ſort will thrive in the open air in Britain, if it is placed in a warm and ſheltered ſituation; but the plants ſhould be trained up in pots, and ſheltered in winter for two or three years, till they have acquired ſtrength. All the other ſorts require to be kept in a warm ſtove, or they will not live in this country.

ANNONÆ PRÆFECTUS, in antiquity, an extraordinary magiſtrate, whoſe buſineſs it was to prevent a ſcarcity of proviſion, and to regulate the weight and fineneſs of bread.

ANNOTATION, in matters of literature, is a brief commentary, or remark, upon a book or writing, in order to clear up ſome paſſage, or draw ſome concluſion from it.

ANNOTTO, in commerce, the ſame as ANOTTO.

ANNUAL, in a general ſenſe, an appellation given to whatever returns every year, or is always performed within that ſpace of time.

ANNUAL LEAVES, are ſuch leaves as come up afreſh in the ſpring, and periſh in winter. Theſe ſtand oppoſed to ever-greens.

ANNUAL PLANTS, called alſo ſimply annuals, are ſuch as only live their year, i. e. come up in the ſpring, and die again in the autumn; and accordingly are to be recruited every year.

ANNUAL RENT, implies a yearly profit due by a debtor in a ſum of money to a creditor for the uſe of it.

Right of **ANNUAL RENT**, implies the original method of charging lands with a yearly payment for the loan of money, before the taking of intereſt for money was allowed by the ſtatute.

ANNUALIA, yearly oblations anciently made by the relations of the deceaſed.

ANNUEL, of Norway, of which mention is made in the acts of parliament of king James III. of Scotland, was an annual payment of an hundred marks ſterling, which the kings of Scotland were obliged to pay to the kings of Norway, in ſatisfaction for ſome pretenſions which the latter had to the Scottiſh kingdom, by virtue of a conveyance made thereof by Malcolm Kenmore, who uſurped the crown after his brother's deceaſe. This annuel was firſt eſtabliſhed in 1266; in conſideration whereof the Norwegians renounced all title to the ſucceſſion of the iſles of Scotland. It was paid till the year 1468, when the annuel, with all its arrears, was renounced in the contract of marriage between king James III. and Margaret, daughter of Chriſtian I. king of Norway, Denmark, and Sweden.

ANNUENTES MUSCULI, in anatomy, a pair of tranſverſe muſcles at the root of the vertebræ of the back, called Recti interni minores.

I enjoy the pleaſing expectation that the following Syſtem will be acceptable to the numerous readers of this work, as it is of an intereſting nature, and is requiſite to be known by every perſon of property.

I am the more emboldened in this expectation, as I have introduced the whole doctrine of Annuities with Brevity, Novelty, and Accuracy; avoiding the errors of other writers, and incorporating what is not to be met with in any Publication on this ſubject.

The 1ſt and 2d Tables in this Syſtem exhibit the amount and value of Annuities for years certain, and I have alſo applied them to caſes of intereſt, a thing which I believe has not been done before; by which two needleſs tables are ſaved.

The 3d and 4th Tables ſhew the Probability of Life, at all Ages, according to the bills of mortality at London and Northampton; the former I have ſelected from Mr. Simpſon's Treatiſe, and the latter from that of Dr. Price.

The 5th Table exhibits the Expectation of Life at every Age, according to the aforeſaid Bills, and includes both Mr. Simpſon's and Dr. Price's.

Table 6th, gives the Value of an Annuity for a ſingle Life of any Age, at the different rates of 3, 4, and 5 per Cent. Intereſt, both according to the London and Northampton Bills.

The laſt Table ſhews the value of an Annuity upon the joint continuance of two lives, according to the London and Northampton bills of mortality; and for the aforeſaid rates of intereſt. It compriſes the ſubſtance of 13 or 14 of Doctor Price's Tables, along with that of Mr. Simpſon, which mode of arrangement cannot fail of being extremely uſeful, as their difference in every caſe is diſcovered at one view.

Other Tables of Mr. Simpſon and Dr. Price, which appeared ſuperfluous, I have expunged; and have advanced correct methods for ſolving the ſame Problems for which they were intended, by means of thoſe Tables that are here given, ſo that brevity and comprehenſiveneſs are obſerved through the whole.

In the printing of the Tables, I have paid a moſt particular attention to the correcting of the preſs, a matter of the utmoſt import in calculations. And, indeed, my caſe in this particular, has been ſuch, that I dare, with confidence, affirm, that the Tables concerned in this Syſtem, are more correct than in Dr. Price's *laſt edition, as I have here rectified ſome typographical faults which appear in his Treatiſe.*

I have ſhewn theſe Tables to C. Brand, Eſq. of the Amicable Society for the Perpetual Aſſurance on Lives, (the gentleman who reviſed, corrected, improved, and enlarged the laſt edition of Smart's Tables of Intereſt, Annuities, &c.) who has honoured them with his inſpection and approbation, and whoſe ſanction gives me pleaſure, as I conſider they have undergone the teſt of critic examination.

Excise-Office, Broad-ſtreet.

ROBERT MOODY.

A NEW SYSTEM of ANNUITIES.

WHEN a ſum of money is to be paid annually to any perſon for a term of years, or for life, it is called an Annuity. The differences between a rent and an Annuity, in law, are, 1ſt. That every rent is conſidered as ariſing from, and going out of the land; but an Annuity charges only the granter or his heirs that have aſſets by decent; 2dly, That for the recovery of an annuity, no action lies, but only the writ of annuity againſt the granter, his heirs, or ſucceſſors; but of rent, the ſame actions lie as do of land: and 3dly, That an annuity is never taken for aſſets, becauſe it is no freehold in law, nor can be put in execution upon a ſtatute merchant, ſtatute ſtaple, or elegit, as a rent may be.

It is however frequently ſo ordered, that payments of this ſort, are to be made quarterly, or half yearly, in which caſes there ſeems ſome degree of impropriety in the term Annuity; for the expreſſion, "a Quarterly Annuity," is certainly a Soleciſm.

The calculation or doctrine of Annuities is diſtinguiſhed into two parts; namely, Annuities certain, and Annuities contingent; the former commencing and expiring with ſome given term of years; the latter either commencing or expiring on the deceaſe of ſome perſon or perſons concerned, or being dependent on ſuch perſon or perſon's ſurviving a certain age, &c. I ſhall treat of them both in their diſtinct order.

CHAP. I.

ANNUITIES CERTAIN.

PROBLEM I.

To find what an Annuity unpaid for a given Term of Years amounts to at a given Rate of Intereſt.

Remark. When it is a real caſe that an annuity has actually been unpaid for a certain number of years, the perſon entitled thereto cannot legally demand more, than the amount at ſimple intereſt; to find which, obſerve this Rule.

Let the rate of intereſt for 1l. the annuity, and the time, be multiplied together, and let $\frac{1}{2}$ this product be multiplied by the time, leſs 1, ſo will the reſult be the intereſt depending, to which add the product of the annuity by the time, and the ſum will be the amount.

N. B. In this rule the time is ſuppoſed to be complete years. If the time, however, in any caſe conſiſts of years and parts of a year, the amount for whole years muſt be calculated according to this method, and a proportional part of the annuity, according to the rule of three (allowing diſcount) muſt be taken for the remainder.

Examp. What will an annuity of 50£. amount to at the end of eight years, at the rate of 5 per cent. per annum, ſimple intereſt. Here, intereſt being at 5 per cent. the rate for 1£. is .05; and $.05 \times 50 \times 8 = 20$; and the half thereof, 10, multiplied by $8 - 1\ (7) = 70$ £. the intereſt; to which add 50×8, (400) and the ſum is 470; the amount required.

N. B. Simple intereſt being wholly unequitable, it is never admitted, neither indeed ought it to be in annuity-calculations, except in caſes ſimilar to the above, where the legiſlature for certain reaſons has ſo appointed it.

Scholium. If the payments are half yearly, or quarterly, then, in applying the above rule, the double or quadruple of the time muſt be uſed in lieu of the time, and the quarterly or half yearly payment, muſt be uſed inſtead of the annuity.

PROBLEM II.

The ſame Caſe given as above to find the Amount at Compound Intereſt.

Rule. Multiply the amount of 1£. for one year, as often into itſelf as there are years, leſs 1; or which is the ſame, raiſe it to the power whoſe index is equal to the number of years; from the reſult ſubtract 1, and divide the remainder by the intereſt of 1£. for a year; then multiply the quotient by the annuity, and the product will be the amount required.

Examp. What is the amount of an annuity of 50£. for three years, at 5 per cent. compound intereſt. Here the amount of 1£. for one year is 1.05, and this multiplied twice into itſelf, (viz. cubed) the reſult = 1.157625; and this, leſs 1, = .157625; which, divided by .05, the quotient is 3.1525, and this multiplied by 50, the product is 157.625£; or 157*l.* 12*s.* 6*d.* the anſwer ſought.

Scholium. If the payments are half yearly or quarterly, take the amount and intereſt of 1£. for half or quarter of a year and uſe them in the above rule, inſtead of the amount and intereſt for a year; alſo take the double or quadruple of the time, in lieu of the time; and the rule will hold good.

N. B. The amount of 1l. for half a year at compound intereſt, is equal to the ſquare root of the amount for a year; and the amount for a quarter of a year is equal to the ſquare root of the amount for half a year. The amount of 1l. leſs 1, is equal to the intereſt.

The amount of 1*l.* for $\frac{1}{4}$ and $\frac{1}{2}$ a year, reſpectively,

	3perCent	3$\frac{1}{2}$ per C.	4perCent	4$\frac{1}{2}$ per C.	5perCent
$\frac{1}{4}$ year	1.007417	1.008637	1.009853	1.011065	1.012272
$\frac{1}{2}$ year	1.014889	1,017349	1.019804	1.022252	1.024695

PROBLEM III.

To find the preſent Value of an Annuity to continue a given Time, at a given Rate per Cent.

Rule. Multiply the amount of 1l. for a year, as often into itſelf as there are years, leſs 1, (or which is the ſame, involve it to the power denoted by the time); by this reſult divide 1, and ſubtract the quotient from 1; divide the remainder by the intereſt of 1l. for a year; then multiply this laſt quotient by the annuity, and the product will be the preſent value.

Examp. What is the preſent worth of an annuity of 40l. to continue five years, diſcounting at 5 per cent. per annum, compound intereſt. Here 1.05 involved to the 5 power = 1.27628, by which dividing 1, there is .78353, which ſubtracted from 1, leaves, .21647; and this divided by .05, gives 4.3294, which multiplied by 40, we have 173.176l. = 173l. 3s. 6$\frac{1}{4}$d. *fere*, = the preſent worth.

N. B. If the payments are half yearly or quarterly, take the time and the amount, and intereſt of 1l. as directed in the laſt articles, and the rule will hold good.

Corollory. The preſent value of an annuity for a given term, but not to commence till certain years hence, is had by finding, firſt, the preſent value of the annuity for the given term, and then the preſent worth of that ſum according to the number of years which is to elapſe before the annuity commences.

PROBLEM IV.

An Annuity, the Amount thereof for a certain Term; and the Rate of Intereſt being given. To find the Time.

Rule. Multiply the amount by the intereſt of 1l. for a year, and divide the product by the annuity. To the quotient add 1, then divide the logarithm of this ſum, by the logarithm of the amount of 1l. for a year, and the quotient will be the time required.

Examp. In what time will an annuity of 100l. amount to 315l. 5s. 0d. at 5 per cent. per annum compound intereſt. Here $315.25 \times .05 = 15.7625$, which divided by 100, the quotient is .157625, to which adding 1, the ſum is 1.157625; and the logarithm thereof is .0635679. Alſo the logarithm of 1.05 is .0211893; by which, dividing .0635679, the quotient is 3, the true number of years required.

Scholium. This method, as well as that in the following Problem, always ſuppoſes that the perſon is intitled to a proportional part of the next annual payment, anſwerable to the parts of a year, which may happen to be over and above the complete years, diſcount being allowed for the remainder of the year.

PROBLEM V.

An Annuity, the preſent worth thereof, and the Rate of Intereſt being given to find the Time.

Rule. Multiply the preſent worth by the Intereſt of 1 l. for a year, and ſubtract the product from the annuity; take the logarithm of the remainder, and ſubtract it from the logarithm of the annuity; and divide this remainder by the logarithm of the amount of 1l. for a year, and the quotient will be the time required.

It will be needleſs to give an example, as thoſe who underſtand the laſt Problem will find no difficulty in this.

PROBLEM VI.

To find the Value of a Freehold Eſtate, or of an Annuity to continue for ever, at Compound Intereſt.

Rule. Divide 100l. by the rate of intereſt per cent. or, which is the ſame, divide 1l. by the intereſt of 1l. for a year; and the quotient will be the value of an annuity of 1l. to continue for ever; or of an eſtate, whoſe annual rent is 1l. or, in other terms, it will be the number of years purchaſe which ſuch annuity or eſtate is worth; and that being multiplied by the annuity or annual rent, will give the whole value required.

Examp. What is the value of an annuity of 100l. to continue for ever at 5 per cent. compound intereſt? Here 1l. divided by .05; or 100l. divided by 5, gives a quotient of 25, the number of years purchaſe; and this multiplied by 100l. gives 2500l. the value required.

N. B. The number of years purchaſe of an eſtate, or of an annuity to continue for ever, (which in this caſe is 25) is called the perpetuity thereof.

PROBLEM VII.

Given the amount or preſent Value of an Annuity or certain Annual Payments, to determine therefrom what would be the Amount or preſent Value, provided the ſame were paid in equal half yearly or quarterly payments, or in equal portions, at any other intervals, whereof one is an aliquot part of a year.

Rule. Multiply the given amount, or preſent value, by the intereſt of 1£. for a year, and divide the Product by twice the intereſt of 1l. for half a year, or four times the intereſt of 1l. for a quarter of a year, (or, in general, by *m* times the intereſt of 1l. for $\frac{1}{m}^{th}$ of a year) and the quotient in each caſe will be the amount or preſent worth required.

ANNUITIES.

To prove the truth of this rule, put $m =$ to any aliquot part of a year, or the interval between each payment, and $n =$ number of years. Then $1+\overline{1+r}^{\frac{1}{m}}+\overline{1+r}^{\frac{2}{m}}+\overline{1+r}^{\frac{3}{m}}+\overline{1+r}^{\frac{4}{m}}$, &c. to $\overline{1+r}^{\frac{nm-1}{m}} =$ the amount of an annuity of m pounds for n years

$$= \frac{\overline{1+r}^{\frac{1}{m}}\times\overline{1+r}^{\frac{nm-1}{m}}-1}{\overline{1+r}^{\frac{1}{m}}-1} = \frac{\overline{1+r}^{n}-1}{\overline{1+r}^{\frac{1}{m}}-1}.$$

But the numerator or dividend, $(\overline{1+r}^{n}-1)$ is the ſame, let m be what it will; and when $m = 1$, then the diviſor, $(\overline{1+r}^{\frac{1}{m}}-1)$ is $= r$, the intereſt of 1 l. for a year; and conſequently the yearly amount, multiplied by r, will always give the dividend.

Alſo the diviſor, in general, is equal to the intereſt of 1l. for the interval denoted by $\frac{1}{m}$; but when each payment is the $\frac{1}{m}$ of 1l. then the diviſor, in order to give the correct amount, is $m\times\overline{\overline{1+r}^{\frac{1}{m}}-1}$, or m times the intereſt of 1l. for the interval $\frac{1}{m}$, by which the dividend, when found as above, is to be divided.

Again $\frac{1}{\overline{1+r}|^{\frac{1}{m}}}+\frac{1}{\overline{1+r}|^{\frac{2}{m}}}+\frac{1}{\overline{1+r}^{\frac{3}{m}}}$ &c. to $\frac{1}{\overline{1+r}^{\frac{nm}{m}}}$ or $\frac{1}{\overline{1+r}^{n}}$, $=$ the preſent value of an annuity of m pounds for n years $=$

$$\frac{\frac{1}{\overline{1+r}^{\frac{2}{m}}}\times\frac{1}{\overline{1+r}^{n}}-\frac{1}{\overline{1+r}^{\frac{2}{m}}}}{\frac{1}{\overline{1+r}^{\frac{2}{m}}}-\frac{1}{\overline{1+r}^{\frac{1}{m}}}}=\frac{\frac{1}{\overline{1+r}^{n}}-1}{1-\frac{1}{\overline{1+r}^{\frac{1}{m}}}}.$$

But both the numerator and denominator, are negative quantities; and, therefore, the aſſirmative expreſſion is,

$$\frac{1-\frac{1}{\overline{1+r}^{n}}}{\overline{1+r}|^{\frac{1}{m}}-1}.$$

And the numerator, or dividend, being unaffected with m, remaineth the ſame, let m be what it will. Alſo, the diviſor being the ſame as in the former caſe, the ſame concluſions obtain here.

Cor. I. The amount of an annuity of 1l. for n years (ſuppoſing the firſt payment not due till a year hence) is equal to the intereſt of 1l. for n years divided by the intereſt of 1l. for a year.

Cor. II. The preſent value of ſuch an annuity for n years is equal to the diſcount of 1l. for n years divided by the ſaid diviſor, or intereſt of 1l. for a year.

Cor. III. The intereſt of 1 l. for n years, divided by m times the intereſt of 1l. for $\frac{1}{m}$ of a year, is equal to the amount of 1l. Annuity for n years, when the ſame is paid in equal portions at every $\frac{1}{m}$ of a year.

Cor. IV. Alſo if the diſcount of 1l. due n years hence, be divided by the ſame diviſor, the quotient will be the preſent value of ſuch annuity on the ſame terms.

N. B. The intereſt of 1 £. for any aliquot part of a year is found thus: Divide the logarithm of the amount of 1 £. for a year, at the given rate of intereſt, by the number denoting the aliquot part, and the quotient will be the logarithm of the amount of 1 £. for ſuch part of a year, then the number anſwerable thereto, is the amount itſelf. Alſo the amount, leſs 1, is the intereſt.

With regard to the foregoing rule, the time is ſuppoſed to be years complete, but if otherwiſe, the concluſion can ſcarce ever err the hundredth part of a year's purchaſe, and therefore it may juſtly be applied in all caſes of life annuities, the ſubject not being capable of greater accuracy. The caſes, however, which reſpect the two laſt corrollories, do not come under ſo cloſe a reſtriction; for when the payments are made at every $\frac{1}{m}^{th}$ part of a year, the time in them is limitable only to ſuch part of a year, or a complete number of payments, viz. it may be any fraction of a year expreſſed by $\frac{1}{m}$, $\frac{2}{m}$, $\frac{3}{m}$, $\frac{4}{m}$, &c. to $\frac{m-1}{m}$.

SCHOLIUM I.

Another ſtill ſhorter method may be uſed for reducing the value of yearly to that of half yearly payments, viz. Multiply half the amount or preſent value of the yearly payments by the intereſt of 1l. for half a year. Add the product to the ſaid amount, or preſent value, and it will be the anſwer required. Alſo, If half the half yearly value thus found be multiplied by the intereſt of 1l. for a quarter of a year, and the product be added to the half yearly value, it will give the quarterly value.

The former method, however, is preferable on account of its generality, and being in all caſes well adapted to practice.

SCHOLIUM II.

If the given time be ſuch as to fall between two payments, the amount or preſent value muſt be found for the time comprehending the complete payments, let the time between each be what it may; then, when the amount is to be found, the preſent worth of ſuch proportional part of the next payment as is anſwerable to the time which is over and above the laſt payment, muſt be found, by diſcounting for the interval which the given time falls ſhort of the next payment. Alſo the amount of the former amount muſt be ſought for the interval which is over and above the laſt payment; ſo will the ſum of this amount and the laſt mentioned preſent worth, be the true amount required. But if the preſent value is required, then the preſent worth of the ſaid proportional part of the next payment muſt be found, (by diſcounting for the whole given time) and added to the preſent value of the complete payments, and the ſum will be the anſwer required.

N. B. I believe theſe matters have not been ſo fully handled before.

SCHOLIUM III.

Where compound intereſt is concerned, all the caſes will be beſt wrought by logarithms, as that method ſaves a deal of trouble; multiplication and diviſion being thereby performed by the addition and ſubtraction of only two numbers, and involution by a ſhort multiplication, as will be ſhewn under the proper head. But as this work may fall into the hands of thoſe who are not well acquainted with the nature of them, or who, perhaps, have not accurate tables thereof, I ſhall add two ſmall tables, which in moſt caſes will very well ſupply the want of them.

TABLE I.

THE AMOUNT OF AN ANNUITY OF ONE POUND.

Y.	3 per Cent.	3½ per Cent.	4 per Cent.	4½ per Cent.	5 per Cent.
1	1.000000	1.000000	1.000000	1.000000	1.000000
2	2.030000	2.035000	2.040000	2.045000	2.050000
3	3.090900	3.106225	3.121600	3.137025	3.152500
4	4.183627	4.214943	4.246464	4.278191	4.310125
5	5.309136	5.362466	5.416323	5.470710	5.525631
6	6.468410	6.550152	6.632975	6.716892	6.801913
7	7.662462	7.779408	7.898294	8.019152	8.142008
8	8.892336	9.051687	9.214226	9.380014	9.549109
9	10.159106	10.368496	10.582795	10.802114	11.026564
10	11.463879	11.731393	12.006107	12.288209	12.577893
11	12.807796	13.141992	13.486351	13.841179	14.206787
12	14.192030	14.601962	15.025805	15.464032	15.917127
13	15.617790	16.113030	16.626838	17.159913	17.712983
14	17.086324	17.676986	18.291911	18.932109	19.598632
15	18.598914	19.295681	20.023588	20.784054	21.578564
16	20.156881	20.971030	21.824531	22.719337	23.657492
17	21.761588	22.705016	23.697512	24.741707	25.840366
18	23.414435	24.499691	25.645413	26.855084	28.132385
19	25.116868	26.357181	27.671229	29.063562	30.539004
20	26.870374	28.279682	29.778079	31.371423	33.065954
21	28.676486	30.269471	31.969202	33.783137	35.719252
22	30.536780	32.328902	34.247970	36.303378	38.505214
23	32.452884	34.460414	36.617889	38.937030	41.430475
24	34.426470	36.666528	39.082604	41.689196	44.501999
25	36.459264	38.949857	41.645908	44.565210	47.727099
26	38.553042	41.313102	44.311745	47.570645	51.113454
27	40.709634	43.759060	47.084214	50.711324	54.669126
28	42.930923	46.290627	49.967583	53.993333	58.402583
29	45.218850	48.910799	52.966286	57.423033	62.322712
30	47.575416	51.622677	56.084938	61.007070	66.438848
31	50.002678	54.429471	59.328335	64.752388	70.760790
32	52.502759	57.334502	62.701469	68.666245	75.298829
33	55.077841	60.341210	66.209527	72.756226	80.063771
34	57.730177	63.453152	69.857909	77.030256	85.066959
35	60.462082	66.674013	73.652225	81.496618	90.320307
36	63.275944	70.007603	77.598314	86.163966	95.836323
37	66.174223	73.457869	81.702246	91.041344	101.628139
38	69.159449	77.028895	85.970336	96.138205	107.709546
39	72.234233	80.724906	90.409150	101.464424	114.095023
40	75.401260	84.550278	95.025516	107.030323	120.799774
41	78.663298	88.509537	99.826536	112.846688	127.839763
42	82.023196	92.607371	104.819598	118.924789	135.231751
43	85.483892	96.848629	110.012382	125.276404	142.993339
44	89.048409	101.238331	115.412877	131.913842	151.143006
45	92.719861	105.781673	121.029392	138.849965	159.700156

TABLE II.

THE PRESENT VALUE OF AN ANNUITY OF ONE POUND.

Y	3 perCent.	3½ perCent.	4 perCent.	4½ perCent.	5 per Cent.
1	.970874	.966184	.961538	.956938	.952381
2	1.913470	1.899694	1.886095	1.872668	1.859410
3	2.828611	2.801637	2.775091	2.748964	2.723248
4	3.717098	3.673079	3.629895	3.587526	3.545951
5	4.579707	4.515052	4.451822	4.389977	4.329477
6	5.417191	5.328553	5.242137	5.157872	5.075692
7	6.230283	6.114544	6.002055	5.892701	5.786373
8	7.019692	6.873956	6.732745	6.595886	6.463213
9	7.786109	7.607687	7.435332	7.268790	7.107822
10	8.530203	8.316605	8.110896	7.912718	7.721735
11	9.252624	9.001551	8.760477	8.528917	8.306414
12	9.954004	9.663334	9.385074	9.118581	8.863252
13	10.634955	10.302738	9.985648	9.682852	9.393573
14	11.296073	10.920520	10.563123	10.222825	9.898641
15	11.937935	11.517411	11.118387	10.739546	10.379658
16	12.561102	12.094117	11.652296	11.234015	10.837770
17	13.166118	12.651321	12.165669	11.707191	11.274066
18	13.753513	13.189682	12.659297	12.159992	11.689587
19	14.323799	13.709837	13.133939	12.593294	12.085321
20	14.877475	14.212403	13.590326	13.007936	12.462210
21	15.415024	14.697974	14.029160	13.404724	12.821153
22	15.936917	15.167125	14.451115	13.784425	13.163003
23	16.443608	15.620410	14.856842	14.147775	13.488574
24	16.935542	16.058368	15.246963	14.495478	13.798642
25	17.413148	16.481515	15.622080	14.828209	14.093945
26	17.876842	16.890352	15.982769	15.146611	14.375185
27	18.327031	17.285365	16.329586	15.451303	14.643034
28	18.764108	17.667019	16.663063	15.742874	14.898127
29	19.188455	18.035767	16.983715	16.021889	15.141074
30	19.600441	18.392045	17.292033	16.288889	15.372451
31	20.000428	18.736276	17.588494	16.544391	15.592811
32	20.388766	19.068865	17.873552	16.788891	15.802677
33	20.765792	19.390208	18.147646	17.022862	16.002549
34	21.131837	19.700684	18.411198	17.246758	16.192904
35	21.487220	20.000661	18.664613	17.461012	16.374194
36	21.832252	20.290494	18.908282	17.666041	16.546852
37	22.167235	20.570525	19.142579	17.862240	16.711287
38	22.492462	20.841087	19.367864	18.049990	16.867893
39	22.808215	21.102501	19.584485	18.229656	17.017041
40	23.114772	21.355072	19.792774	18.401584	17.159086
41	23.412401	21.599104	19.993052	18.566109	17.294368
42	23.701359	21.834883	20.185627	18.723550	17.423208
43	23.981902	22.062689	20.370795	18.874210	17.545912
44	24.254274	22.282791	20.548841	19.018383	17.662773
45	24.518713	22.495450	20.720040	19.156347	17.774070

USE OF THE TABLES.

By Table the 1ſt, Problem the 2d may be reſolved; for the tabular number anſwering to the number of years and rate per cent. multiplied by the annuity will give the amount. In the example, the given number of years are three, and the intereſt 5 per cent. The tabular number is 3.1525, which multiplied by 50, the annuity, the product is 157.625 £. the ſame as before.

By Table 2d, the 3d Problem is reſolved. Thus the tabular number anſwering to five years and 5 per cent. is 4.329477 which multiplied by 40, the annuity, gives 173.179 £. nearly the ſame as before.

Alſo by means of table I. the amount of any ſum of money for a given number of years, at compound intereſt, according to any of the rates per cent. may be found by multiplying the given ſum by the difference between the tabular number for the given number of years, and the next greater tabular number in the ſame column.

Examp. Let it be required to find the amount of 50 £. at the expiration of ſeven years, at five per cent. per annum, compound intereſt. Here the tabular number for ſeven years at five per cent. is 8.142008, and the next greater (or that for eight years) is 9.549109. Their difference is 1.407101, which multiplied by 50=70.35505 £.=70 l. 7s. 1¼d. *fere*, the amount required.

In like manner the preſent worth of a ſum of money due certain years hence, may be found by Table 2d, by multiplying the given ſum by the difference between the tabular number anſwering to the given number of years, and the next leſs tabular number in the ſame column.

Examp. What is the preſent worth of 120 £. due nine years hence, at 5 per cent. per annum compound intereſt? Here the tabular number againſt nine years at 5 per cent. is 7.107822; and the next leſs (or that for eight years) is 6.463213; their difference is .644609; and this multiplied by 120=77.35308 £.=77 l. 7s. 0¼d. *fere*, the value required.

Alſo if the amount or preſent worth of an annuity be given and it be required to find the time, it will be found by dividing the ſame by the annuity, and looking for the quotient, or the next leſs number (in the table of amounts or preſent worths) under the proper rate per cent. For the number of years in the firſt column will be the time required. But if it is required to determine the time to parts of a year, take from table 2d, the preſent worth of 1 l. due one year hence, and add the ſame to the next leſs number. Then take the logarithm thereof, and ſubtract the ſame from the ſum of the logarithms of the ſaid next leſs number, and the quotient above mentioned. Divide the remainder by the logarithm of the amount of 1l. for a year, and the quotient will be the time required.

Likewiſe, if it be required to find the amount or preſent value of an annuity for a time greater than is ſpecified in the table, divide the propoſed time into two periods, and take the amount or preſent value for one period, and find the amount or preſent value of that ſum for the remaining period; alſo find the amount or preſent value of the annuity for the remaining time, then add the two amounts or preſent values together, and the ſum will be the anſwer. If the time be above 90 years, then divide it into 3 or more parts, and proceed in the ſame way to find the value of each part, and take the ſum of the whole.

With reſpect to the firſt part of annuities, or annuities certain, I have now given all that appears uſeful, according to the moſt correct methods; but in matters of ſcience, truth is more firmly eſtabliſhed, when the artiſt not only ſhews what is right, but alſo points out what is wrong; and therefore I cannot cloſe the chapter without noticing a certain inaccuracy of Doctor Price, relative to half yearly and quarterly payments. In the laſt edition of his Annuities, Vol. 2. Page 222, he ſays, that "the amount at any "given yearly intereſt of any given Annuity, payable half yearly, is "the ſame with the amount of half that Annuity at half the inter-"eſt, and payable a double number of times." This, however, is certainly wrong, and the amount in this manner will exceed the truth: for it ſhould not be half the intereſt; but, if in yearly payments, the intereſt of 1l. per annum is uſed, then in half yearly payments, not half of that, but the intereſt of 1l. for half a year, according to the method of compound intereſt, ſhould be taken, which is leſs than half the yearly intereſt of 1l. and for the ſame reaſon, the theorems, which the Doctor has given in his third additional eſſay, at the end of the ſaid volume, (pages 33, 34, 38, &c.) which is alſo publiſhed in the Philoſophical Tranſactions, Vol. 66. Part I. are incorrect; notwithſtanding the Doctor's obſervation, that he has no where ſeen theſe matters ſtated with accuracy; and therefore he thought his attempt might be of uſe.

I have not mentioned this with a view to depreciate Dr. Price, as he is certainly deſerving of praiſe for the pains which he has beſtowed on Annuity calculations, but (as the Doctor has cenſured the true method) that the young ſtudient may be guided right. To prove that his method is erroneous, nothing further is neceſſary than to find the amount of each payment by itſelf, according to the given yearly intereſt, and alſo to compute the value on his hypotheſis, and it will be found that this latter will exceed the ſum of the former, and is therefore manifeſtly wrong. By the ſame mode it will be found that the *preſent value* of half yearly or quarterly payments, on his hypotheſis is too ſmall.

CHAP. II.

ANNUITIES CONTINGENT.

THE calculations for life annuities depend ſolely on the doctrine of probabilities, which tho' to ſome may appear without the limits of human inveſtigation, yet the theory has been ſo far eſtabliſhed by practice, as to render it indiſputable.

It is by all allowed that the Supreme Being cannot be impreſſed with an idea of probability, ſince all things that are or ſhall be, are alike comprehended by Him, who is the Alpha and Omega. With Him, therefore, all things are certain, and all are directed by His infinite wiſdom to their proper ends, ſo that the notion of contingency, when applied to the Creator and Lord of the univerſe, is wholly abſurd. But to us who are ſhut up to the future, and can only form our judgments according to the preſent appearance of things, the idea of probability forces itſelf on our intellects. Thus we cannot but expect an approaching ſtorm, when we ſee the clouds black with tempeſt; and on the contrary, when there is a ſettled ſerenity in the atmoſphere, we have the ſtrongeſt expectations of a continuation of fair weather. In like manner, a phyſician forms his judgment from the ſeveral indications of a diſorder; and, in general, the happening of a future event appears more or leſs probable, according as there are more or fewer marks of its approach.

Wherefore, without preſuming on the Divine order, we may certainly form our eſtimations on lives, if our concluſions are fairly deduced from obſervation, and the more eſpecially ſo, as ſociety and various occurrences in life often render them neceſſary. Thus a perſon has as an undoubted a right to ſell a life eſtate, as any other, and this calls for a proper and equitable valuation; for who would give as much for a life eſtate on an age of 60, as for one on an age of 20 or 30, provided both the parties were equally healthful? To determine upon an average the proper values of each, with other things of the like nature, is the buſineſs of which I ſhall now treat. It appeared requiſite to make theſe obſervations, becauſe calculations of this ſort have been frequently ridiculed, from a want of giving the ſubject a right thought.

The calculations here given are formed from compariſons on the bills of mortality for all ages, the only method that can with propriety be depended on. Uſeful tables are given to facilitate the computations; but, before we proceed, it will be proper to give the following

DEFINITIONS:

I. The probability of life is greater or leſs according as there appears more or fewer chances for a perſon's living or dying at any given ſtage of life, and is denoted by a fraction, whoſe numerator is the chances of living, and denominator the ſum of the chances both of living and dying. Thus, if it be obſerved that out of 500 perſons of one age, only 380 of them are in being at the end of 2 years, in that caſe the probability of any one's ſurviving 2 years, is $\frac{380}{380+120}=\frac{380}{500}=\frac{38}{50}=\frac{19}{25}$, and the odds in that caſe are 19 to 6 that a perſon of that particular age ſhall be living two years hence. The probability of dying is a like fraction, whoſe numerator is the chances of dying. In the preſent caſe the probability of dying, is $\frac{120}{500}=\frac{6}{25}$; and the odds are 19 to 6 that the perſon does not die in 2 years. —The ſum of the probabilities of living and dying is $=1$, which is expreſſive of a certainty.

II. The extremity of life is that period beyond which there is no probability of ſurviving. In the Northampton tables this period is 97 years.

III. The complement of life, is the number of years which any perſon's age wants of the full extremity. Thus the complement of an age of 90 is 7.

IV. The expectation of life is the number of years which is due to the life of a perſon of a certain age upon an equality of chance, or it is the number of years purchaſe, which an annuity for life, ſecured upon land without intereſt, is worth in ready money.

This in ſingle lives is always equal to the ſum of all the probabilities of ſurviving each moment to the extremity of life.

V. The number of years purchaſe, in annuities, eſtates, &c. at any rate of intereſt, is that number which, if multiplied by the annuity or annual rent, is equal to the preſent value thereof, according to ſuch rate of intereſt, or it is the preſent value of an annuity or annual rent of 1l. according to the given rate of intereſt.

VI. Reverſion of a life annuity, is where two or more lives are in joint poſſeſſion, and the expectation depends upon the probability of one particular life's ſurviving the reſt.

TABLE III.

SHEWING THE PROBABILITIES OF LIFE AT ALL AGES, AS DEDUCED BY MR. SIMPSON, FROM TEN YEARS OBSERVATION ON THE BILLS OF MORTALITY IN LONDON.

Age.	Perſons living.	Decre. of Life.	Age.	Perſons living.	Decre. of Life.	Age.	Perſons living.	Decr. of Life.
0	1000	320	27	321	6	54	135	6
1	680	133	28	315	7	55	129	6
2	547	51	29	308	7	56	123	6
3	496	27	30	301	7	57	117	5
4	469	17	31	294	7	58	112	5
5	452	12	32	287	7	59	107	5
6	440	10	33	280	7	60	102	5
7	430	8	34	273	7	61	97	5
8	422	7	35	266	7	62	92	5
9	415	5	36	259	7	63	87	5
10	410	5	37	252	7	64	82	5
11	405	5	38	245	8	65	77	5
12	400	5	39	237	8	66	72	5
13	395	5	40	229	7	67	67	5
14	390	5	41	222	8	68	62	4
15	385	5	42	214	8	69	58	4
16	380	5	43	206	7	70	54	4
17	375	5	44	199	7	71	50	4
18	370	5	45	192	7	72	46	4
19	365	5	46	185	7	73	42	3
20	360	5	47	178	7	74	39	3
21	355	5	48	171	6	75	36	3
22	350	5	49	165	6	76	33	3
23	345	6	50	159	6	77	30	3
24	339	6	51	153	6	78	27	2
25	333	6	52	147	6	79	25	2
26	327	6	53	141	6	80	23	

TABLE IV.

SHEWING THE PROBABILITIES OF LIFE AT ALL AGES, DEDUCED FROM FORTY-SIX YEARS OBSERVATION ON THE BILLS OF MORTALITY AT NORTHAMPTON, VIZ. FROM 1735 TO 1780.

Age.	Perſons living.	Decre. of Life.	Age.	Perſons living.	Decre.	Age.	Perſons living.	Decre. of Life.
0	11650	1894	33	4160	75	67	1472	80
½	9756	1106	34	4085	75	68	1392	80
1	8650	1367	35	4010	75	69	1312	80
2	7283	502	36	3935	75	70	1232	80
3	6781	335	37	3860	75	71	1152	80
4	6446	197	38	3785	75	72	1072	80
5	6249	184	39	3710	75	73	992	80
6	6065	140	40	3635	76	74	912	80
7	5925	110	41	3559	77	75	832	80
8	5815	80	42	3482	78	76	752	77
9	5735	60	43	3404	78	77	675	73
10	5675	52	44	3326	78	78	602	68
11	5623	50	45	3248	78	79	534	65
12	5573	50	46	3170	78	80	469	63
13	5523	50	47	3092	78	81	406	60
14	5473	50	48	3014	78	82	346	57
15	5423	50	49	2936	79	83	289	55
16	5373	53	50	2857	81	84	234	48
17	5320	58	51	2776	82	85	186	41
18	5262	63	52	2694	82	86	145	34
19	5199	67	53	2612	82	87	111	28
20	5132	72	54	2530	82	88	83	21
21	5060	75	55	2448	82	89	62	16
22	4985	75	56	2366	82	90	46	12
23	4910	75	57	2284	82	91	34	10
24	4835	75	58	2202	82	92	24	8
25	4760	75	59	2120	82	93	16	7
26	4685	75	60	2038	82	94	9	5
27	4610	75	61	1956	82	95	4	3
28	4535	75	62	1874	81	96	1	1
29	4460	75	63	1793	81			
30	4385	75	64	1712	80	Total	299198	11650
31	4310	75	65	1632	80			
32	4235	75	66	1552	80			

TABLE V.

SHEWING THE EXPECTATION OF LIFE AT EVERY AGE, ACCORDING TO THE BILLS OF MORTALITY FOR LONDON AND NORTHAMPTON.

Age.	Expectation.		Age.	Expectation.		Age.	Expectation.	
	London.	Northamp		London	Northamp		London.	Northamp
0	19.5	25.18	33	22.8	26.72	65	11.0	10.88
1	27.5	32.74	34	22.4	26.20	66	10.6	10.42
2	32.5	37.79	35	22.0	25.68	67	10.3	9.96
3	34.5	39.55	36	21.6	25.16	68	9.9	9.50
4	36.1	40.58	37	21.2	24.64	69	9.6	9.05
5	36.5	40.84	38	20.8	24.12	70	9.3	8.60
6	36.5	41.07	39	20.4	23.60	71	8.9	8.17
7	36.3	41.03	40	20.1	23.08	72	8.6	7.74
8	36.1	40.79	41	19.7	22.56	73	8.3	7.33
9	35.7	40.36	42	19.3	22.04	74	8.0	6.92
10	35.3	39.78	43	19.0	21.54	75	7.7	6.54
11	34.8	39.14	44	18.6	21.03	76	7.3	6.18
12	34.2	38.49	45	18.3	20.52	77	6.9	5.83
13	33.6	37.83	46	17.9	20.02	78	6.5	5.48
14	33.0	37.17	47	17.5	19.51	79	6.0	5.11
15	32.4	36.51	48	17.2	19.00	80	5.5	4.75
16	31.8	35.85	49	16.8	18.49	81		4.41
17	31.2	35.20	50	16.5	17.99	82		4.09
18	30.6	34.58	51	16.1	17.50	83		3.80
19	30.0	33.99	52	15.7	17.02	84		3.58
20	29.4	33.43	53	15.4	16.54	85		3.37
21	28.8	32.90	54	15.0	16.06	86		3.19
22	28.2	32.39	55	14.7	15.58	87		3.01
23	27.7	31.88	56	14.3	15.10	88		2.86
24	27.1	31.36	57	13.9	14.63	89		2.66
25	26.6	30.85	58	13.6	14.15	90		2.41
26	26.1	30.33	59	13.2	13.68	91		2.09
27	25.6	29.82	60	12.9	13.21	92		1.75
28	25.1	29.30	61	12.5	12.75	93		1.37
29	24.6	28.79	62	12.1	12.28	94		1.05
30	24.1	28.27	63	11.7	11.81	95		0.75
31	23.6	27.76	64	11.3	11.35	96		0.50
32	23.2	27.24						

TABLE VI.

SHEWING THE VALUE OF AN ANNUITY ON A SINGLE LIFE, ACCORDING TO THE PROBABILITIES OF LIFE AT LONDON AND NORTHAMPTON, FROM THE AGE OF SIX TO SEVENTY-FIVE YEARS.

Age.	Years purchaſe at 3 per Cent.		Years purchaſe at 4 per Cent.		Years purchaſe at 5 per Cent.	
	London.	Northamp.	London.	Northamp.	London.	Northampton.
6	18.8	20.73	16.2	17.48	14.1	15.04
7	18.9	20.85	16.3	17.61	14.2	15.17
8	19.0	20.89	16.4	17.66	14.3	15.23
9	19.0	20.81	16.4	17.63	14.3	15.21
10	19.0	20.66	16.4	17.52	14.3	15.14
11	19.0	20.48	16.4	17.39	14.3	15.04
12	18.9	20.28	16.3	17.25	14.2	14.94
13	18.7	20.08	16.2	17.10	14.1	14.83
14	18.5	19.87	16.0	16.95	14.0	14.71
15	18.3	19.66	15.8	16.79	13.9	14.59
16	18.1	19.44	15.6	16.62	13.7	14.46
17	17.9	19.22	15.4	16.46	13.5	14.33
18	17.6	19.01	15.2	16.31	13.4	14.22
19	17.4	18.82	15.0	16.17	13.2	14.11
20	17.2	18.64	14.8	16.03	13.0	14.01
21	17.0	18.47	14.7	15.91	12.9	13.92
22	16.8	18.31	14.5	15.80	12.7	13.83
23	16.5	18.15	14.3	15.68	12.6	13.75
24	16.3	17.98	14.1	15.56	12.4	13.66
25	16.1	17.81	14.0	15.44	12.3	13.57
26	15.9	17.64	13.8	15.31	12.1	13.47
27	15.6	17.47	13.6	15.18	12.0	13.38
28	15.4	17.29	13.4	15.05	11.8	13.28
29	15.2	17.11	13.2	14.92	11.7	13.18
30	15.0	16.92	13.1	14.78	11.6	13.07
31	14.8	16.73	12.9	14.64	11.4	12.97
32	14.6	16.54	12.7	14.50	11.3	12.85
33	14.4	16.34	12.6	14.35	11.2	12.74
34	14.2	16.14	12.4	14.20	11.0	12.62
35	14.1	15.94	12.3	14.04	10.9	12.50
36	13.9	15.73	12.1	13.88	10.8	12.38
37	13.7	15.52	11.9	13.72	10.6	12.25
38	13.5	15.30	11.8	13.55	10.5	12.12
39	13.3	15.08	11.6	13.38	10.4	11.98
40	13.2	14.85	11.5	13.20	10.3	11.84
41	13.0	14.62	11.4	13.02	10.2	11.70
42	12.8	14.39	11.2	12.84	10.1	11.55
43	12.6	14.16	11.1	12.66	10.0	11.41
44	12.5	13.93	11.0	12.47	9.9	11.26
45	12.3	13.69	10.8	12.28	9.8	11.11
46	12.1	13.45	10.7	12.09	9.7	10.95
47	11.9	13.20	10.5	11.89	9.5	10.78
48	11.8	12.95	10.4	11.68	9.4	10.62
49	11.6	12.69	10.2	11.47	9.3	10.44
50	11.4	12.44	10.1	11.26	9.2	10.27
51	11.2	12.18	9.9	11.06	9.0	10.10
52	11.0	11.93	9.8	10.85	8.9	9.93
53	10.7	11.67	9.6	10.64	8.8	9.75
54	10.5	11.41	9.4	10.42	8.6	9.57
55	10.3	11.15	9.3	10.20	8.5	9.38
56	10.1	10.83	9.1	9.98	8.4	9.19
57	9.9	10.61	8.9	9.75	8.2	9.00
58	9.6	10.34	8.7	9.52	8.1	8.80
59	9.4	10.06	8.6	9.28	8.0	8.60
60	9.2	9.78	8.4	9.04	7.9	8.39
61	8.9	9.49	8.2	8.80	7.7	8.18
62	8.7	9.21	8.1	8.55	7.6	7.97
63	8.5	8.91	7.9	8.29	7.4	7.74
64	8.3	8.61	7.7	8.03	7.3	7.51
65	8.0	8.30	7.5	7.76	7.1	7.28
66	7.8	7.99	7.3	7.49	6.9	7.03
67	7.6	7.68	7.1	7.21	6.7	6.79
68	7.4	7.37	6.9	6.93	6.6	6.54
69	7.1	7.05	6.7	6.65	6.4	6.28
70	6.9	6.73	6.5	6.36	6.2	6.02
71	6.7	6.42	6.3	6.08	6.0	5.76
72	6.5	6.10	6.1	5.79	5.8	5.50
73	6.2	5.79	5.9	5.51	5.6	5.24
74	5.9	5.49	5.6	5.23	5.4	4.99
75	5.6	5.20	5.4	4.96	5.2	4.74

TABLE VII.

SHEWING THE VALUE OF AN ANNUITY ON THE JOINT CONTINUANCE OF TWO LIVES, ACCORDING TO THE PROBABILITIES OF LIFE IN LONDON AND NORTHAMPTON.

Ages.		Value at 3 per Cent.		Value at 4 per Cent.		Value at 5 per Cent.	
		Lond.	North.	Lond.	North.	Lond.	North.
10	10	14.7	16.34	13.0	14.28	11.6	12.67
	15	14.3	15.76	12.7	13.84	11.3	12.30
	20	13.8	15.15	12.2	13.35	10.8	11.91
	25	13.1	14.68	11.6	12.00	10.2	11.63
	30	12.3	14.15	10.9	12.59	9.7	11.30
	35	11.5	13.53	10.2	12.10	9.1	10.92
	40	10.7	12.79	9.6	11.51	8.6	10.44
	45	10.0	11.98	9.0	10.85	8.1	9.90
	50	9.3	11.04	8.4	10.08	7.6	9.26
	55	8.6	10.05	7.8	9.26	7.1	8.56
	60	7.8	8.95	7.2	8.31	6.6	7.75
	65	6.9	7.72	6.5	7.24	6.1	6.80
	70	6.1	6.35	5.8	6.01	5.5	5.70
	75	5.3	4.96	5.1	4.72	4.9	4.52
15	15	13.9	15.23	12.3	13.41	11.0	11.96
	20	13.3	14.66	11.8	12.96	10.5	11.58
	25	12.6	14.23	11.2	12.63	10.1	11.32
	30	11.9	13.73	10.6	12.25	9.5	11.02
	35	11.2	13.15	10.0	11.79	9.0	10.66
	40	10.4	12.46	9.4	11.23	8.5	10.21
	45	9.6	11.69	8.8	10.61	8.0	9.69
	50	8.9	10.80	8.2	9.87	7.5	9.08
	55	8.2	9.85	7.6	9.08	7.0	8.40
	60	7.5	8.79	7.0	8.17	6.5	7.62
	65	6.8	7.60	6.4	7.13	6.0	6.71
	70	6.0	6.26	5.7	5.93	5.4	5.63
	75	5.2	4.91	5.0	4.70	4.8	4.50
20	20	12.8	14.13	11.3	12.54	10.1	11.23
	25	12.2	13.74	10.8	12.23	9.7	10.99
	30	11.6	13.29	10.3	11.87	9.2	10.71
	35	10.9	12.74	9.8	11.45	8.8	10.36
	40	10.2	12.10	9.2	10.92	8.4	9.94
	45	9.5	11.37	8.6	10.33	7.9	9.45
	50	8.8	10.52	8.0	9.63	7.4	8.86
	55	8.1	9.62	7.5	8.87	6.9	8.22
	60	7.4	8.60	6.9	8.00	6.4	7.46
	65	6.7	7.44	6.3	6.99	5.9	6.58
	70	6.0	6.15	5.7	5.83	5.4	5.53
	75	5.2	4.83	5.0	4.62	4.8	4.42
25	25	11.8	13.38	10.5	11.94	9.4	10.76
	30	11.3	12.97	10.1	11.62	9.0	10.50
	35	10.7	12.46	9.6	11.22	8.6	10.18
	40	10.0	11.85	9.1	10.73	8.2	9.77
	45	9.4	11.16	8.5	10.16	7.8	9.30
	50	8.7	10.36	7.9	9.49	7.3	8.74
	55	8.0	9.48	7.4	8.75	6.8	8.12
	60	7.3	8.50	6.8	7.91	6.3	7.38
	65	6.6	7.37	6.2	6.92	5.8	6.52
	70	5.9	6.10	5.6	5.78	5.3	5.49
	75	5.1	4.80	4.9	4.59	4.7	4.40
30	30	10.8	12.59	9.6	11.31	8.6	10.26
	35	10.3	12.13	9.2	10.95	8.3	9.95
	40	9.7	11.57	8.8	10.49	8.0	9.58
	45	9.1	10.92	8.3	9.96	7.6	9.14
	50	8.5	10.16	7.8	9.32	7.2	8.60
	55	7.9	9.33	7.3	8.62	6.7	8.00
	60	7.2	8.38	6.7	7.80	6.2	7.29
	65	6.5	7.29	6.1	6.84	5.7	6.45
	70	5.8	6.04	5.5	5.73	5.2	5.44
	75	5.1	4.76	4.9	4.56	4.7	4.37
35	35	9.9	11.72	8.8	10.61	8.0	9.68
	40	9.4	11.21	8.5	10.20	7.7	9.33
	45	8.9	10.62	8.1	9.71	7.4	8.92
	50	8.3	9.91	7.6	9.11	7.0	8.42
	55	7.7	9.13	7.1	8.45	6.6	7.85
	60	7.1	8.23	6.5	7.70	6.1	7.17
	65	6.4	7.18	6.0	6.75	5.6	6.36
	70	5.7	5.97	5.4	5.66	5.1	5.38
	75	5.0	4.72	4.8	4.52	4.6	4.33
40	40	9.1	10.76	8.1	9.82	7.3	9.02
	45	8.7	10.44	7.8	9.55	7.1	8.79
	50	8.2	9.59	7.4	8.83	6.8	8.18
	55	7.6	8.87	6.9	8.22	6.4	7.65
	60	7.0	8.03	6.4	7.49	6.0	7.02
	65	6.4	7.03	5.9	6.61	5.5	6.24
	70	5.7	5.87	5.4	5.57	5.1	5.30
	75	5.0	4.66	4.8	4.46	4.6	4.27

TABLE VII.

[IN CONTINUATION.]

Ages.		Value at 3 per Cent.		Value at 4 per Cent.		Value at 5 per Cent.	
		Lond.	North.	Lond.	North.	Lond.	North.
45	45	8.3	9.78	7.4	8.99	6.7	8.31
	50	7.9	9.20	7.1	8.50	6.5	7.89
	55	7.4	8.56	6.7	7.95	6.2	7.41
	60	6.8	7.78	6.3	7.27	5.8	6.82
	65	6.3	6.85	5.8	6.45	5.4	6.09
	70	5.6	5.75	5.3	5.46	5.0	5.20
	75	4.9	4.58	4.7	4.39	4.5	4.21
50	50	7.6	8.71	6.8	8.08	6.2	7.52
	55	7.2	8.15	6.5	7.59	6.0	7.10
	60	6.7	7.46	6.1	6.99	5.7	6.57
	65	6.2	6.61	5.7	6.24	5.3	5.90
	70	5.5	5.58	5.2	5.31	4.9	5.05
	75	4.8	4.47	4.6	4.28	4.4	4.11
55	55	6.9	7.68	6.2	7.18	5.7	6.74
	60	6.5	7.09	5.9	6.66	5.5	6.27
	65	6.0	6.33	5.6	5.99	5.2	5.67
	70	5.4	5.39	5.1	5.13	4.8	4.89
	75	4.7	4.35	4.5	4.17	4.3	4.01
60	60	6.1	6.61	5.6	6.23	5.2	5.89
	65	5.7	5.97	5.3	5.66	4 9	5.37
	70	5.2	5.14	4.9	4.90	4.6	4.68
	75	4.6	4.19	4.4	4.02	4.2	3.87
65	65	5.4	5.47	5.0	5.20	4.7	4.96
	70	4.9	4.78	4.6	4.57	4.4	4.38
	75	4.4	3.96	4.2	3.81	4.0	3.67
70	70	4.6	4.26	4.4	4.09	4.2	3.93
	75	4.2	3.60	4.0	3.47	3.9	3.35
75	75	3.8	3.11	3.7	3.02	3.6	2.92

USE OF THE TABLES.

The 1ſt and 2d Tables exhibit the probabilities of life at all ages in London and Northampton, according to the bills of mortality; that for London I have taken from the ſelect exerciſes of the late engenious Mr. Thomas Simpſon, F. R. S. together with ſuch of the following tables as are dependent thereon, it being proved from recent obſervations that they are ſtill the moſt correct of any extant.

The other with the reſt of the tables for Northampton are extracted from the laſt treatiſe of Dr. Price, a work in itſelf truly valuable, notwithſtanding the fault which I remarked at the concluſion of the laſt chapter, relative to half yearly and quarterly payments. I was the more induced to give thoſe tables, becauſe Northampton, though a pretty large town, is healthfully ſituated, and conſequently they may be taken as a ſtandard for country lives.

Of the 1ſt and 2d Tables, the 1ſt column is the age, the 2d the number of perſons living at any age, and the third column is the annual decrement, or the number of deaths happening each year. Thus in Northampton Table, out of 11650 births, there are but 4310 perſons who ſurvive the age of 31, and only one perſon who attains the age of 96. In the London Table, out of 1000 perſons born, there are but 400 living at the age of 12 and only 25 arrive at the age of 79. Hence according to the London Table, the probability of living to the age of 40 is $\frac{400}{1000}$ or $\frac{4}{10}$, and the probability of the contray is $\frac{1000-400}{1000}, = \frac{600}{1000} = \frac{6}{10}$, and conſequently the odds that a new born child does not attain to that age is 6 to 4. Again in the London Table out of 280 perſons of 33 years of age, but 141 arrive at the age of 53; the probality is $\frac{41}{80}$, or $\frac{1}{2}$ nearly, ſo that is an equal wager that a perſon of good health aged 33 ſhall live 20 years. Theſe things promiſed I ſhall proceed to the ſolution of problems relative to lives, &c.

PROBLEM I.

To find the period or term of years which a perſon of a given age has any aſſigned probability of ſurviving. Rule take from the table the number of perſons anſwerable to the given age, multiply the ſame by the given probability and ſeek the reſult in the 2d column of the table, and againſt it in the firſt column is the age limiting the term of years required.

EXAMP. If the probability that a perſon aged 40 ſhall live a certain term of years is $\frac{3}{4}$, or which is the ſame, if the odds in his favour are juſt 3 to 1; required the number of years? Here (by the Northampton Table) the number of perſons at that age is 3635; and $3635 \times \frac{3}{4} = \frac{10905}{4} = 2726\frac{1}{4}$. I look in the table for 2726, and find it falls between the age of 51 and 52. And by taking a proportional part according to the differences, the exact age is 51.606 years? Hence the required term is 11.606 years.

SCHOL. If the term expire before the 8th or 9th year of age, the decrements of life being ſo exceeding irregular within that period, the time over and above the complete years cannot be determined accurately, for the proportioning of the differences will not hold good.

PROBLEM II.

To find what is the Probability that any Number of Perſons of given Ages, ſhall all ſurvive a certain Term of Years.

RULE, Find (from the table) as has been before illuſtrated, the probability of each perſon's ſurviving the term; then the product of all theſe probabilities will be the probability ſought.

EXAMP. What is the probability that three inhabitants of London, whoſe Ages are 40, 50, 60, reſpectively, ſhall be all living 10 years hence?

Firſt, that one of the age of 40 ſhall live 10 years, the probability is $\frac{159}{229}$, that one of 50 lives 10 years, is $\frac{102}{159}$, and that one of 60 ſurvives that term, is $\frac{54}{102}$. The product of theſe is $\frac{159 \times 102 \times 54}{229 \times 159 \times 102} = \frac{54}{229} = \frac{3}{13}$ nearly; and conſequently the odds are 10 to 3 that they are not all living 10 years hence.

SCHOL. If it is required to know the probability of certain perſon's being alive, and alſo of other's being dead at the end of any given term. Then the reſpective probabilities of living and dying muſt be multiplied together, and the product will be the probability ſought.

PROBLEM III.

If a Perſon of a given Age has a certain Sum of Money due at ſo many Years hence, provided he lives ſo long, it is required to determine the preſent Value thereof, or what it is worth in Caſe it ſhould be ſold.

RULE. Find the preſent worth of the ſum for the given number of years, as though the time were certain; then multiply the ſame by the probability of the perſon's living till that time, and the product will be the anſwer.

EXAMP. A perſon aged 70 years is to receive 10l. if he lives till 75. What is the preſent value thereof according to the London bills of mortality, ſuppoſing intereſt to be at 4 per cent. per annum? Here the preſent value of 10l. due 5 years hence is 8.2193, and the probability of one of 70 years old living 5 years is $\frac{36}{54} = \frac{2}{3}$; and $8.2193 \times \frac{2}{3} = 5.4795$l. = 5l. 9s. 7d. the the anſwer.

SCHOL. If ſeveral ſums of money were due, in like manner at different periods, the preſent value of the whole would be obtained by finding the value of each ſeparate ſum, and adding the whole together. By a ſimilar mode of proceeding the value of an annuity upon any ſingle life may be found, as alſo upon any number of joint lives, by multiplying the probability of their all continuing in being till the end of each diſtinct year taken ſeparately, and during the complement of the oldeſt life, by the preſent value of 1l. diſcounted from the expiration of each ſuch year, according to the given rate of intereſt, then the ſum of the whole will give the value ſought. But in practice, the proceeding in this way, year by year, to the utmoſt period of life would be intolerable labour, and on this account it is that I have added tables whereby this and other caſes of ſtill greater difficulty may be ſolved with facility and diſpatch. I ſhall not, therefore, inſiſt further on the theory from the doctrines of chance, but proceed to the direct application of the tables in the moſt uſeful caſes, which as it is a ſubject of general utility, wherein even the nation itſelf is concerned; I am perſuaded, that the extending of it rather beyond the bounds which we had preſcribed will be highly agreeable to the reader. It is our wiſh and aim to be ſufficiently copious on every intereſting matter, and to expunge as much as poſſible whatever appears to be not ſo.

PROBLEM IV.

To find the Value of an Annuity during the Life of a Perſon of a given Age, at any propoſed Rate of Intereſt.

RULE. In Table VI. look for the age in the 1ſt column, and againſt it, under the proper intereſt, is the number of years purchaſe, or, which is the ſame, the preſent value of an annuity of 1l. during ſuch life. Multiply this by the annuity, and the product is the anſwer.

EXAMP. Suppoſe the age be 50, the rate of intereſt 3 per cent. and the annuity 20l. Here againſt age 50, and under 3 per cent. we have 11.6, according to the London Bills, and 12.69, as by the bills of Northampton, which, multiplied by 20, there is 232l. for the value of a London life, and 253l. or 253l. 16s. for the value of a Northampton life.

PROBLEM V.

To determine the Value of an Annuity granted for a given Term of Years, upon the Contingency of its ceaſing on the Failing of a propoſed Life, before the Expiration of the ſaid given Term.

Rule. Take the value of the whole life from the table. Alſo take the value of another life whoſe age is greater than the former by the given term of years; and find the preſent value thereof by diſcounting at the given rate of intereſt for the ſaid given term: then take ſuch part of that value as is denoted by the probability of the perſon's ſurviving the ſaid term; ſubtract the ſame from the value of the whole life, and the remainder will be the anſwer.

Examp. Let the age be 10, the term of years 15, and the rate of intereſt 5 per cent. per annum. Here the value of an age of 10 by the London table is 14.3; the value of an age of 25 is 12.3; and the preſent value of 1l. to be received at the end of 15 years is .481; then $12.3 \times .481 = 5.9$ = preſent value of an annuity to be granted to an age of 25, fifteen years hence. Alſo the probability that one of the age of 10 is ſurviving 15 years, hence is $\frac{333}{410} = \frac{100}{123}$ nearly, and $5.9 \times \frac{100}{123} = \frac{590}{123}$ 4.8 = the value of a life annuity to be granted 15 years hence upon an age of 25, on the contingency that one, whoſe preſent age is 10, will be then ſurviving. And $14.3 - 4.8 = 9.5$, = the number of years purchaſe which an annuity on propoſed conditions is worth.

Problem VI.

To find the Value of an Annuity for Life, to commence after a given Term of Years, provided a Perſon of a certain Age ſhall Live till then.

Rule. Find the value of an annuity for an age greater by the given term than the propoſed age, and multiply the ſame by the probability of the perſon's ſurviving the ſaid term; then find the preſent worth thereof, diſcounting for the given term of years according to the propoſed rate of intereſt, and it will be the value ſought.

Examp. What is the value of an annuity for the life of a perſon of 10 years of age, but not to commence till 15 years hence, ſuppoſing the intereſt 5 per cent. per annum. Here the value of a life of 25 years is (by the London Tables) 12.3 the probability of an age of 10 living 15 years, is $\frac{333}{410}$; this multiplied by 12.3, the product is $\frac{12.3 \times 333}{410} = \frac{12.3 \times 999}{1230.} = \frac{999}{100} = 9.99$ or 10, nearly; the preſent value of 1l. due 15 years hence = .481, and $.481 \times 10 = 4.81$ = the number of years purchaſe of the propoſed annuity.

Schol. If the value thus found be ſubtracted from the value of the life of 10 years, the remainder will be the value of an annuity granted, during the 15 years, on proviſo that ſuch life ſhall continue ſo long, but to ceaſe on the failure thereof, if the ſame ſhall happen before the expiration of that term. This will hold in all ſimilar caſes.

Problem VII.

To find the Value of an Annuity during the Joint Lives of two Perſons of given Ages.

Rule. In table VII. column 1, look for the age of the younger (or that neareſt to it) and find in column 2d the age of the elder, againſt which, under the given rate of intereſt, you will have the number of years purchaſe.

Examp. Let the ages be 25 and 30 reſpectively, and the rate of intereſt 3 per cent. Here it is manifeſt at ſight that the value according to the London bills 11.3 years purchaſe, and according to the Northampton bills 12 97 years purchaſe.

Schol. If the ages had been 25 and 33, the value muſt have been determined by taking proportional parts. Thus, for London, the value for 25 and 30 is as before 11.3, and for 25 and 35 it is 10.7, the decrement is .6; then as 5 (or 35—30) : .6 :: 3 (or 33—30) : .3; which ſubtracted from 11.3, the remainder is 11, for the value ſought.

Again, if the ages were 28 and 33. Here, by the foregoing, the value for the ages 25 and 33 is 11. and by proceeding in the ſame manner the value for 30 and 33 will be found = 10.5; the difference is .5. And as 5 (or 30—25) : .5 :: 3 (or 28—25) : .3 which ſubtracted from 11. the remainder is 10.7 = the number of years purchaſe for the joint lives of two perſons, whoſe ages are 28 and 33. And thus by proportioning the differences may the value for any other ages within the limits of the table be determined.

Problem VIII.

To find the Value of an Annuity granted during the longeſt of Two Lives.

Rule. Find the value of each life ſeparately, and alſo the value of the joint lives; then, from the ſum of the two ſingle lives, ſubtract the joint life, and the remainder will be the number of years purchaſe for an annuity granted during the life of the longer liver of two perſons.

Examp. Let the given ages be 15 and 40 years, and the rate of intereſt 4 per cent. Here, the value of a life, whoſe age is 15 years, (by the London Tables) is 15.8; and of a life, whoſe age is 40 years, it is 11.5. Alſo the value of the joint lives is 9.4. Then $15.8 + 11.5 - 9.4 = 17.9$, the value required.

Problem IX.

To find the Value of an Annuity during the joint Lives of Three Perſons.

Rule. Find the value of the joint lives of any two, and find the age of a ſingle life, equivalent to that value. Then find the value of the joint lives of the remaining perſon, and a perſon whoſe age is the age of ſuch ſingle life, and it will be the anſwer ſought.

Examp. Let the ages be 20, 35, and 45, reſpectively; and intereſt at 4 per cent. Here take the value of the joint lives of any two, ſuppoſe 20 and 35, which, by the London Table, is 9.8; and the age, which anſwers to this in the table of ſingle lives is 52. Alſo the value of the joint lives, whoſe ages are 45 and 52, is 6.4 = the number of years purchaſe for an annuity, on the joint lives of three perſons, whoſe ages are as above ſpecified, and intereſt at 4 per cent.

Schol. If the value of the joint lives of four perſons is required; find the age anſwering to the value of any three; then in the table of joint lives, with the age ſo found, and the remaining age, take out the correſponding value, and it will be the anſwer ſought. If the value of the joint lives of five perſons is required, ſeek an age anſwerable to four, and proceed as above; and ſo on for any other number of lives.

Problem X.

To find the Value of an Annuity on the longeſt Life of three or more Perſons.

Rule. Find an age anſwerable to the value of the longeſt life of any two, which ſubſtitute in lieu of the two, and then find the value of the longeſt life of it and another, and it will be the value of the longeſt life among three lives. If there are four or more lives, ſubſtitute the age correſponding to this value in lieu of the three lives, and find the value of the longeſt life of this age, and the other remaining age, and it will be the value of the longeſt of four lives. Proceed in the ſame manner for five or more lives, regard being had to the rate of intereſt.

Having given Examples in the former Problems ſufficient to ſhew the uſe of the Tables, it will be unneceſſary to give more, the rules being plain and eaſy. I ſhall, however, add a few other Problems with proper directions, and then conclude the ſubject.

Problem XI.

To find the Value of an Annuity for as long as any two or three certain Perſons ſhall be alive.

Rule. From the ſum of the values of the joint lives of every two (viz. of AB; AC, and BC) ſubtract twice the value of the joint lives of the three, (viz. ABC) and the remainder will be the number of years purchaſe required.

Problem XII.

To find the Value of a Reverſion of an aſſigned Life after a given Term of Years.

Rule. From the value of the propoſed life ſubtract the value of an annuity for the given term of years, on the contingency of its ceaſing upon the extinction of the aforeſaid life (found by Prob. V.) and the remainder will be the anſwer.

Problem XIII.

To find the Value of the Reverſion of an Annuity for the Remainder of a given Term of Years, after an aſſigned Life.

Rule. From the value of an annuity certain for the given term, ſubtract the value of the annuity for the ſaid term, on the contingency of its ceaſing upon the failing of the propoſed life, and the remainder will be the value of the reverſion.

Problem XIV.

To find the Value of the Reverſion of one Life after another.

Rule. From the value of the life in expectation ſubtract the value of the two joint lives, and the remainder will be the value of the reverſion.

Problem XV.

To find the Value of the Reverſion of two Lives after one.

Rule. From the value of the longeſt of the three lives ſubtract the value of the life in poſſeſſion, and the remainder will be the value of the reverſion.

Problem XVI.

To find the Value of the Reverſion of one Life after Two Joint Lives.

Rule. From the value of the life in expectation, ſubtract the value of the three joint lives, and the remainder will be the anſwer.

Problem XVII.

To find the Value of the Reverſion of One Life after Two.

Rule. From the value of the three lives (found by Problem X.) ſubtract the value of the two lives in poſſeſſion; and the remainder will be the value of the reverſion.

Problem XVIII.

To find the Value of the Reverſion of Two Joint Lives after One.

Rule. From the value of the two joint lives in expectation, ſubtract the value of the three joint lives, and the remainder will be the value of the reverſion.

Problem XIX.

Two Perſons A & B have a Joint Annuity, which, after the Deceaſe of either of them, is to belong entirely to the Survivor for Life. To find the Value of the Right of each in that Annuity.

Rule. From the value of the life of A or B ſubtract half the value of the two joint lives, the remainder will be the value of the right of A or B accordingly.

Problem XX.

D, and his Heirs, as ſoon as any two of three joint Lives, A, B and C, become extinct, are to enter upon an Annuity, and to enjoy the ſame during the Life of the Survivor; required the preſent Value of the Expectation.

Rule. To the ſum of the ſingle lives A, B, and C, add thrice the value of the three joint lives, deducting therefrom twice the ſum of the values of each pair of joint lives; viz. of A and B; A and C, and B and C, and the remainder will be the anſwer.

Problem XXI.

A given Annuity after the Deceaſe of A, is to be divided equally between B and C, during their Joint Lives, and then is to go entirely to the Laſt Survivor for Life, it is required to find the Value of B's Expectation.

Rule. From the value of the reverſion of the life of B, after the life of A (found by Problem XIV) ſubtract half the value of the reverſion of the joint lives, B and C, after the life of A (found by Problem XVIII) and the remainder will be the value of B's expectation.

Problem XXII.

A B and C enjoy an Annuity equally amongſt them, which, upon the Deceaſe of any One, is to be equally enjoyed by the Survivors during their Joint Lives, and then the laſt Survivor is to have the Whole during his Life. To find the Value of the Right of any One, as A, in the ſaid Annuity.

Rule. From the value of the life of A, take half the ſum of the values of the joint lives, A and B, and the joint lives A and C, then to the remainder add $\frac{1}{3}$ of the value of the three joint lives, and the ſum will be the anſwer.

Problem XXIII.

A, enjoys an Annuity for Life, and is to have the Nomination of a Succeſſor, who is likewiſe to enjoy the Annuity for his Life: it is propoſed to find the Preſent Value of the Two ſucceſſive Lives.

Rule. Multiply the value of the life of A, by the value of the life put in at his deceaſe; divide the product by the perpetuity (found by Prob. VI. Chap. I.) and ſubtract the quotient from the ſum of the ſaid values, and the remainder will be the anſwer.

Problem XXIV.

To find the preſent Value of any Number of Lives in Succeſſion.

Rule. Multiply the value of each life, without regard to the order of ſucceſſion, by the intereſt of 1l. for a year, and ſubtract each product from unity; multiply all the remainders continually together, and ſubtract this product alſo from unity: then the laſt remainder multiplied by the perpetuity, will be the value of all the ſucceſſive lives.

Or, find (by table II.) the number of years anſwering to the value of each of the given lives; find alſo by *the ſame table*, the value of an annuity *certain*, for the whole of all theſe years added together, and it will be the anſwer ſought.

Problem XXV.

A given Sum of Money is to be received (as a Legacy) on the Deceaſe of B, who, is now of a given Age: what is the Value thereof in preſent Money?

Rule. Subtract the value of the life of B from the perpetuity. Then, by the rule of three, as the perpetuity is to the remainder, ſo is the propoſed ſum to its preſent value in money.

Problem XXVI.

A given Sum is to be received on the Extinction of the 1ſt. 2d. or 3d. of three aſſigned Lives, to find the preſent Value of the Expectation.

Rule. Find (by Prob. IX, X, or XI.) the value of an annuity granted upon the aſſigned lives, on condition of its ceaſing on the failing of the 1ſt, 2d, or 3d, of thoſe lives, according to the caſe propoſed; ſubtract the value from the perpetuity, and then proceed according to the proportion given in the laſt Problem.

Problem XXVII.

A given Sum is to be received as a Legacy, on the Deceaſe of B, in caſe that A is then extinct; it is required to find the preſent Value thereof, allowing for this Contingency.

Rule. From the value of an annuity, in land, *certain*, for as many years as are expreſſed by the complement of B's age, ſubtract the value of the oldeſt life. And then it will be, as the complement of the youngeſt life is to the remainder, ſo is the propoſed ſum, to its preſent value.

Schol. The tables in this chapter are founded on the principle of yearly payments, and withal ſuppoſe that nothing is to be paid to the heir, or executor, &c. of the annuitant for the time from the laſt yearly payment to his deceaſe, which, I believe, is frequently otherwiſe, and therefore to correct the value found by the tables ſo as to anſwer to any particular caſe, the following directions muſt be obſerved.

I. If it is required to have the yearly value ſuch as to include the lateſt moment of life; then find the preſent worth of an annuity of 1l. (by Table II.) for a number of years equal to twice the expectation found (by Table V.) divide the ſame by twice that number (or four times the expectation) and add the quotient to the value found in Table VI. and it will be the proper value agreeable to the above condition.

II. If the value according to half yearly or quarterly payments, on ſuch conſideration, is required, then, from the correct yearly value found as above, deduce the half yearly or quarterly values, by Problem VII. of Chapter I. and the reſult will be the anſwer.

III. If the half yearly or quarterly values are to be found on this ſuppoſition, that nothing is to be paid for the time between the laſt half yearly or quarterly payment and the death of the annuitant, then take the half or fourth (as the caſe ſhall be) of the correction found by the firſt direction for the yearly payments, and ſubtract the ſame from the value obtained by the 3d direction, and the remainder will be the anſwer.

Examp. Let the age be 36, ſthen the expectation is 25 nearly, the double thereof $=50$ years, and the value of an annuity of 1l. for that time at 4 per cent. is 21.4, which being divided by 100 makes .214, the correction to be added to 13.88, the value from the Northampton table of an age of 36; and conſequently the true value, ſuppoſing a proportional part of the annuity to be paid up to the time of the annuitant's death, is 14.09.

Alſo $\frac{14.09 \times .04}{.0396} = 14.23$, the value for half yearly payments; and $\frac{14.09 \times .04}{.0394} = 14.3$, the value for quarterly payments on the ſame principle.

But if nothing is to be allowed for the interval between the laſt half yearly or quarterly payment, and the time of death, then $14.23 - \frac{.214}{2}$ (or .107) $= 14.12$; and $14.3 -, \frac{.214}{4}$ (or .05) $= 14.25$, for the half yearly and quarterly values required; which methods of deducing the quarterly, and half yearly values are my own, and are much more correct than thoſe given by Doctor Price, in pages 38, 40, and 51 of his third additional Eſſay, not only on account of his making uſe of a falſe rate of intereſt, as I have before ſhewn, but upon other principles which are not ſtrictly true. I made choice of this example from his treatiſe, for the ſake of compariſon, and am well convinced, notwithſtanding the Doctor has continued his operations to three places of decimals, that ſome of his concluſions are incorrect in the *firſt* place.

Many of the foregoing Problems I have taken from the ſelect exerciſes of the late ingenious Thomas Simpſon, F. R. S. A work both ſcarce and valuable. More might have been added, though there are but few caſes, if any, that will occur in practice, that are not to be met with here, which cannot be announced of any other Dictionary of Arts and Sciences.

Indeed, in every other publication of this kind, the doctrine of Annuities has been paſſed over in a very curſory way, and therefore this Syſtem being at once full and compendious, as well as replete with uſeful improvements, will I hope by agreeable to the numerous Patronizers of this Work.

I think it proper alſo to apprize the Subſcribers, Authors, and literary Contributors to this Publication, that I am engaged by Mr. Cooke to write the Syſtem of Arithmetic, *and as I propoſe to introduce a variety of new matter, not to be met with in productions of a ſimilar kind, I flatter myſelf it will meet the general approbation of the public, and add to the eſtimation with which this work is favoured.*

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Annuities for lives have generally been granted either upon ſeparate lives, or upon lots of lives, which in France are called tontines, from the name of their inventor.

When annuities are granted upon ſeparate lives, the death of every individual annuitant diſburthens the public revenue ſo far as it was affected by his annuity.

When annuities are granted upon tontines, the liberation of the public revenue does not commence till the death of all the annuitants comprehended in one lot, which may ſometimes conſiſt of twenty or thirty perſons, of whom the ſurvivors ſucceed to the annuities of all thoſe who die before them; the laſt ſurvivor ſucceeding to the annuities of the whole lot. Therefore upon the ſame revenue more money can be raiſed by tontines than by annuities for ſeparate lives.

An annuity, with a right of ſurvivorſhip, is really worth more than an equal annuity for a ſeparate life, and from the confidence which every man naturally has in his own good fortune, the principle upon which is founded the ſucceſs of all lotteries; ſuch an annuity generally ſells for ſomething more than it is worth.

The expedient which will raiſe moſt money, is almoſt always preferred to that which is likely to bring about in the ſpeedieſt manner the liberation of the public revenue.

In France a much greater proportion of the public debts conſiſts in annuities for lives than in England; for according to a memoir preſented by the parliament of Bourdeaux to the king in 1764, the whole public debt of France is eſtimated at twenty-four hundred millions of livres; of which the capital, for which annuities for lives had been granted, is ſuppoſed to amount to three hundred millions, the eighth-part of the whole public debt. The annuities themſelves are computed to amount to thirty millions a-year, the fourth part of one hundred and twenty millions, the ſuppoſed intereſt of that whole debt.

It is not the different degrees of anxiety in the two governments of France and England for the liberation of the public revenue, which occaſions this difference in their reſpective modes of borrowing; it ariſes altogether from the different views and intereſts of the lenders.

In Great Britain, the ſeat of government being in the greateſt mercantile city in the world, the merchants are generally the people who advance money to government. Yet, by this advance, they do not diminiſh; but are certain to increaſe their capitals; for unleſs they expected to ſell with ſome profit their ſhare in the ſubſcription for a new loan, they would not ſubſcribe.

But if they were to purchaſe annuities for lives only, whether their own or thoſe of other people, they would not always be ſo likely to ſell them with a profit, which perpetual annuities are always ſure to bring.

Annuities upon their own lives they would always ſell with loſs; becauſe no man will give for an annuity upon the life of another, whoſe age and ſtate are nearly the ſame with his own, the ſame price which he would give for one upon his own. An annuity upon the life of a third perſon, is, no doubt, of equal value to the buyer and the ſeller; but its real value begins to diminiſh from the moment it is granted, and continues to do ſo as long as it ſubſiſts. Therefore it can never make ſo convenient a transferable ſtock, as a perpetual annuity, of which the real value may be ſuppoſed always the ſame.

In France, the ſeat of government not being in a great mercantile city, merchants do not make ſo great a proportion of the people who advance money to government. The perſons concerned in the finances, are the farmers general, who receive the taxes which are not in farm; and the court bankers, make the greater part of thoſe who advance their money in all public exigencies. Thoſe people are generally men of mean birth, but of great wealth, and frequently of great pride. They are too proud to marry their equals, and women of quality diſdain to marry them. They frequently reſolve, therefore, to live bachelors, and having neither any families of their own, nor much regard for thoſe of their relations, whom they are not always very fond of acknowledging, they deſire only to live in ſplendor during their own time, and are not unwilling that their fortune ſhould end with themſelves. The number of rich people, beſides, who are either averſe to marry, or whoſe condition of life renders it either improper or inconvenient for them to do ſo, is much greater in France than in England. To ſuch people, who have little or no care for poſterity, nothing can be more convenient than to exchange their capital for a revenue, which is to laſt during life, which is as long as they wiſh it to do.

ANNUITY of Tiends, in the ancient Scots law, was a certain proportion of the tiends of erected benefices, formerly payable to the crown.

ANNULAR, in a general ſenſe, denotes ſomething in the form of a ring. It is alſo a peculiar denomination of the fourth or ring-finger. In anatomy, it denotes a ligament or cartilage that ſurrounds any particular bone, &c.

ANNULET, in architecture, ſignifies a ſmall ſquare member in the Doric capital, under the quarter-round.

Annulet implies alſo a narrow flat moulding, which is common to divers places of the columns. It is the ſame member which Vitruvius calls a *fillet*; Palladio, a *liſtil* or *cincture*; Scamozzi, and Mr. Brown, a *ſupercilium*, *liſt*, *tinea*, *eye-brow*, *ſquare*, *rabbit*.

Annulet, in heraldry, denotes a little circle, borne as a charge in coats-of-arms, as alſo added to them as a difference. Among the Romans it repreſented liberty and nobility. It alſo denotes ſtrength and eternity, by reaſon of its circular form.

When this figure is added as a difference, ſome authors aſſert, that it ſerves to remind the bearer to atchieve great actions.

ANNULLING, implies the cancelling or making void a deed, ſentence, or the like.

ANNUNCIADA, Annuntiada, or Annuntiata, an order of knighthood in Savoy, firſt inſtituted by Amadeus I. in the year 1409: the collar was of 15 links, interwoven one with another, in form of a true lover's knot, and the motto, F. E. R. T. ſignifying, *Fortitudo ejus Rhodum tenuit*. Amadeus VIII. gave the name Annunciada to this order, which was formerly known by that of the knot of love; changing at the ſame time the image of St. Maurice, patron of Savoy, which hung at the collar, for that of the Virgin Mary; and, inſtead of the motto above-mentioned ſubſtituting the words of the angel's ſalutation.

Annunciada is alſo the title of ſeveral religious orders, inſtituted in honour of the annunciation.

ANNUNCIATION, the tidings brought by the angel Gabriel to the Virgin Mary of the incarnation of Chriſt.

Annunciation is alſo a feſtival, kept by the church on the the 25th of March, in commemoration of theſe tidings. This feſtival is of very great antiquity; ſo that we may date its original from the ſeventh century.

Annunciation is likewiſe a title given by the Jews to part of the ceremony of the paſſover.

ANNUNCIATOR, the name of an officer in the church of Conſtantinople, whoſe buſineſs is to inform the people of the feſtivals that are to be celebrated.

ANOCHUS, in medicine, implies any thing which lodges in the ſtomach, and is incapable of digeſtion; as hair, wax, &c.

ANOCTORON, in eccleſiaſtical hiſtory, ſignifies a church built on the ſcite of a hill. In the modern acceptation of the word, it implies a religious houſe, or place of worſhip, built upon the ruins of a place of entertainment.

ANODUS, in chemiſtry, denotes a kind of putritory liquid, which is ſeparated by the kidneys, and neceſſarily contained in the body, as the ſuperfluities are carried off by urine and ſtool.

ANODYNE, among phyſicians, a term applied to medicines which eaſe pain, and procure ſleep. They are divided into three ſorts, viz. 1. Paregorics, or ſuch as aſſuage pain. 2. Hypnotics, or ſuch as relieve by procuring ſleep. 3. Narcotics, or ſuch as eaſe the patient by ſtupifying him.

Opiates and narcotics deſtroy ſenſation. Some hypnotics and paregorics, as nitre, camphor, &c. procure eaſe and ſleep by removing the offending cauſe. Camphor is ſaid to be the beſt anodyne in nervous caſes, and at the decline of fevers.

ANOINT, in the bible, has the following explanations; viz.

1. To pour oil upon, Gen. xxxi. 13. and xxviii. 18.

2. To conſecrate and ſet one apart to an office: anointing being generally practiced among the Jews on that occaſion to denote the perſon's being endued with the gifts and graces of the ſpirit. Exod. xxviii. 41.

3. To uſe ſpiritual means to get ſaving knowledge. Rev. iii. 18.

4. To ſmear or daub. John ix. 6. 11

5. One particularly deſigned and choſen by God, to be the king, prieſt, and prophet of his church; namely, Chriſt Jeſus, who was filled with the holy ghoſt in an extraordinary manner, and thereby conſecrated and authorized to be the Meſſiah. Pſal. ii. 2. xlv. 7. Acts vi. 27.

6. A king. Lam. iv. 20.

7. Touch not mine anointed. Pſal. cv. 15.

Hurt not the people conſecrated to myſelf, by the gift and graces of my ſpirit, nor thoſe eſpecially among them, to whom I familiarly reveal my mind and will that they may teach others.

Thou anointeſt my head with oil. Pſal. xiii. 5.

Thou beſtoweſt upon me the conſolation of thy ſpirit.

The ſpirit of illumination. Great knowledge in heavenly things. 1 John ii. 27.

ANOINTERS, were formerly a religious ſect in ſome parts of England, ſo called from the ceremony they uſed of anointing all perſons before they admitted them into their church. They founded their opinion of anointing upon the fifth of James, verſes 14 and 15.

ANOLE, in zoology, ſignifies a ſpecies of ſtriped lizard, natives of the Weſt Indies, that dig holes in the earth like rabbits; but keep watch all night like dogs, making a very diſcordant hoarſe noiſe, reſembling the barking of a ſmall terrier.

ANOLYMPIADES, in antiquity, was a name given by the Elians to thoſe Olympic games which had been celebrated under the direction of the Piſæans and Arcadians. The Elians claimed the ſole right of managing the Olympic games, in which they ſometimes met with competitors. The hundred and fourth Olympiad was celebrated by order of the Arcadians, by whom the Elians were at that time reduced very low: this, as well as thoſe managed by the inhabitants of Piſa, they called ανολυμπιαδας, that is, "unlawful Olympiads;" and left them out of their annals, in which the names of their victors and other occurrences were regiſtred.

ANOMALISTICAL, Year, in aſtronomy, the time that the earth takes to paſs through her orbit: it is alſo called the Periodical Year. The ſpace of time belonging to this year is greater than the tropical year, on account of the proceſſion of the equinoxes.

ANOMALOUS, a term applied to whatever is irregular, or deviates from the rule obſerved by other things of the like nature.

ANOMALY, or Anomalous *Verbs*, in grammar, are ſuch as cannot be conjugated conformably to the paradigm of their conjugation.

In Latin, the verb *lego* is the paradigm of the third conjugation; and runs thus, *lego, legis, legit:* By the ſame rule it ſhould be *fero, feris, ferit*; but we ſay *fero, fers, fert: fero*, then, is an anomalous verb.

In Engliſh the irregularity relates often to the preter tenſe and paſſive participle: for example, *give*, were it formed according to rule, would make *gived* in the preter tenſe and paſſive participle; whereas, in the former, it makes *gave*, and in the latter *given*.

ANOMALY, in aſtronomy, an irregularity in the motion of the planets, whereby they deviate from the aphelion or apogee.

ANOMIA, in the Linnæan ſyſtem of zoology, a genus of inſects belonging to the order of vermes teſtacea. The ſhell is bivalve, and the valves are unequal. One valve is perforated near the hinge; affixed by that perforation to ſome other body. There are 27 ſpecies of the anomia; of which only two are natives of the Britiſh ſeas, viz. 1. The ephippium, with the habit of an oyſter; the one ſide convex, the other flat; perforated; adherent to other bodies, often to oyſter-ſhells, by a ſtrong tendinous ligature; colour of the inſide perlaceous. Size, near two inches diameter. 2. The ſquammula, with ſhells reſembling the ſcales of fiſh; very delicate and ſilvery, much flatted, perforated, and very ſmall. Adheres to oyſters, crabs, lobſters, and ſhells. The ſpecies of this genus are commonly called *Beaked cockles*. No name has been given to the fiſh that inhabit it; the recent ſhells of this kind are ſo very rare, that there is ſcarcely one to be found perfect. They are, perhaps, as well as that which has given its form to the *corna amonis*, inhabitants of the deepeſt parts of the ocean; conſequently it muſt be ſome extraordinary agitation of that great body of water that can bring them at all to our knowledge in their recent ſtate.

The foſſile ſpecies of the Anomia genus are uncommonly numerous in chalk-pits, limeſtone-quarries; and, on ploughed lands.

ANOMOEANS, in eccleſiaſtical hiſtory, the name by which the pure Arians were called in the fourth century, in contradiſtinction to the Semi-Arians. The word is formed from the Greek, ανομοιος, *different, diſſimilar:* For the poor Arians aſſerted, that the Son was of a nature different from, and in nothing like, that of the Father: on the contrary, the Semi-Arians acknowledged a likeneſs of nature in the Son; at the ſame time that they denied, with the pure Arians, the conſubſtantiality of the world.

The Semi-Arians condemned the Anomœans in the council of Seleucia; and the Anomœans in their turn condemned the Semi-Arians in the councils of Conſtantinople and Antioch, eraſing the word ομοιος, *like*, out of the formula of Rimini and that of Conſtantinople.

ANOMORHOMBOIDIA, in natural hiſtory, is the name of a genus of ſpars; the word is derived from the Greek ανωμαλης, *irregular*, and ϱομϐοιδης a *rhomboidal* figure.

The bodies of this genus are pellucid cryſtalline ſpars, of no determinate or regular external form, but always breaking into regularly rhomboidal maſſes; eaſily fiſſile, and compoſed of plates running both horizontally and perpendicularly through the maſſes, but cleaving more readily and evenly in an horizontal, than in a perpendicular direction; the plates being always compoſed of irregular arrangements of rhomboidal concretions.

This genus contains five known ſpecies, viz. 1. A white, bright, and ſhattery one; found in great quantities in the lead-mines of Derbyſhire, Yorkſhire, and Wales. 2. A milk-white, opake, and ſhattery one, found in France, Germany, and Wales. 3. A hard, dull, ſnow-white one, found in the mines of Derbyſhire, and in many of the northern counties. 4. A hard grey and pellucid one, found in the lead-mines of Yorkſhire, and very common in Germany. And, 5. A pellucid and colourleſs one found in the lead mines of Derbyſhire and Yorkſhire. All of which have in ſome degree the double refraction of iſland cryſtal.

ANONIS, in botany, ſynonymous with Ononis, or Reſt-harrow.

ANONYMOUS, in grammar, implies, ſomething that is nameleſs, or of which the name is concealed. It is a term uſually applied to books which do not expreſs the author's name, or to authors whoſe names are unknown.

Anonymous, in commerce, are partnerſhips in trade, which are not carried on under any particular name, but each of the partners trades viſibly on his own account, and in his own name; and finally all the partners give an account of their profit or loſs in trade. Theſe ſorts of partnerſhips, which are common in France, are concealed, and known only to the parties themſelves.

Anonymous *Partnerſhips in Trade*, where perſons of fortune and quality depoſit ſums of money, in order to ſhare the profits. To this purpoſe, thoſe who furniſh the capital have no trouble in carrying on the trade, nor do their names appear to be any way intereſted therein. Thoſe kinds of partnerſhips are uſual in France.

Anonymous, in law. The ſending anonymous letters demanding money, &c. is felony by the Black Act, 9 Geo. I. chap. 22.

ANOREXIA, Anorexy, in phyſic, implies, a want of appetite, or a loathing of food. The diſorder is either original or ſymptomatic. When it is original, its cauſes are, bad diet, too free drinking, voraciouſneſs, &c. In which caſes, a vomit or two of ipecacuanha may be taken; and temperance, a light but cordial nouriſhing diet, and daily exerciſe, perſiſted in, will generally effect a recovery. But it is more frequently a ſymptom of ſome other diſorder; and then the cure depends on the removal of the original one.

ANOTTA, or Arnotta, in dyeing, implies, an elegant red colour, formed from the pellicles or pulp of the ſeeds of the Bixa, a tree common in South America. It is alſo called Terra Orleana, and Roucou.

Anotta is ſaid to be a ſucceſsful remedy in bloody-fluxes. The roots have much the ſame properties with the wax; but theſe are obſerved to work more powerfully by the urinary paſſages.

ANPITS, in military ſcience, denotes a kind of breaſt work, uſually denominated barbacan.

ANSÆ, or Anses, in aſtronomy, implies the handles or parts of Saturn's ring which project beyond the diſk of that planet.

ANSARIANS, in hiſtory, denotes a people of Syria, ſo called in the country, but ſtyled in Deliſſe's maps *Enſarians*, and in thoſe of D'A Danville, *Naſſaris*.

ANSATUM Telum, in ancient hiſtory, denotes a kind of beard on the point of the javelins, which prevented their going through the body, whilſt at the ſame time it helped to ſecure the wounded perſon as a hooked priſoner. This weapon was only uſed in battle.

ANSCOTE, in law, a ſynonyme of Scot or Anblote.

ANSER, in ornithology, the trivial name of a ſpecies of anas.

Anser, in aſtronomy, a ſmall ſtar, of the fifth or ſixth magnitude, in the milky way, between the ſwan and eagle, firſt brought into order by Hevelius.

ANSERES, the third order of birds in the Linnæan ſyſtem. See Syſtem of Ornithology.

Anseres *Order*, is diſtinguiſhed by a ſmooth beak, covered with a ſkin, gibbous at the baſe, and enlarged towards the apex; the jaw is denticulated, and the tongue fleſhy; the feet are formed for ſwimming, having their toes connected by a membrane, the legs are thick and ſhort; the body is bulky, and covered with a thin ſkin and feathers. This order is analogous to the belluæ in the claſs of Mammalia, Linnæi, Syſtema Naturæ.

ANSIBARII, or Ansivarii, an ancient people of Germany, ſituated in the neighbourhood of the Chauci.

ANSPESSADES, in the French armies, are a kind of inferior officers in the foot, below the corporals, but above the common centinels.

ANSWER, in law, implies a detail of facts refuted or acknowledged by a defendant, as ſet forth in a bill of complaint exhibited by a complainant in a court of equity, i. e. the chancery or the exchequer.

The formula is regular, but the particulars vary, as the caſe may be, and in the higher courts has but little weight unleſs proofs are exhibited by affidavit, and filed in the proper office.

In the practice of the common law, it is analogous to a rejoinder. For the ſcope of this term, ſee the *Univerſal Syſtem of* Law, in this work.

ANT, in zoology, the ſame as Formica and Termes.

Ant *Bear*, or *Ant-eater*, in zoology, the ſame as Myrmecophaga.

Ant *Eggs*, in natural hiſtory, a name popularly given to a kind of little white balls found in the banks or neſts of ants, ordinarily ſuppoſed to be the ova of this inſect.

Modern naturaliſts have obſerved, that theſe are not the ant's eggs, but the young brood themſelves in their firſt ſtate; for they are ſo many little vermiculi wrapped up in a film, or ſkin, compoſed of a ſort of ſilk, which they ſpin out of themſelves as ſilk-worms and caterpillars do.

At firſt they are hardly obſerved to ſtir; but, after a few days continuance, they exhibit a feeble motion of flexion and extenſion; and begin to look yellowiſh and hairy, and are ſhaped ſomewhat like ſmall maggots, in which ſhape they grow up till they are almoſt as large as ants.

When they paſs their metamorphoſis, and appear in their proper ſhape, they have a ſmall black ſpeck on them cloſe to the anus of the included ant. Theſe are brought up every morning in ſummer, near the top of the bank, where they are lodged all the warm part of the day, within reach of the ſun's influence; and at night, or if it be cool, or like to rain, they carry them down to a greater depth; ſo that one may dig a foot in depth to come at them. The true ants eggs are the white ſubſtance which, upon opening their banks, appear to the eye like the ſcatterings of fine white ſugar, or ſalt, but very ſoft and tender. If examined by a microſcope, it is found to conſiſt of ſeveral pure, white appearances, in diſtinct membranes, all figured like the leſſer ſort of birds eggs, and as clear as a fiſh's bladder. The ſame ſubſtance is found in the bodies of the ants themſelves. On this ſpawn, when emitted, they lie in multitudes, to brood, till in ſome time it is turned into little vermicles as ſmall as mites, commonly called ants-eggs.

Ant *Hills*, are little hillocks of earth, which the ants throw up for their habitation and the breeding of their young. They are a very great miſchief to dry paſtures, not only by waſting ſo much land as they cover, but by hindering the ſcythe in mowing the graſs, and yielding a poor hungry food that is pernicious to cattle. The manner of deſtroying them is to cut them into four parts from the top, and then dig into them ſo deep as to take out the core below, ſo that, when the turf is laid down again, it may lie ſomewhat lower than the level of the reſt of the land: by this means it will lodge the rain and prevent the ants from returning to the ſame place, which otherwiſe they would certainly do. The earth that is thus taken out muſt be ſcattered to as great a diſtance every way as may be, otherwiſe they will collect it together and make another hill juſt by. The proper time for doing this is in winter; and if the places be left open, the froſt and rains of that time of the year will deſtroy the reſt. Human dung is an excellent remedy, as is proved by experiment; for it will kill great numbers of them, and drive all the reſt away, if only a ſmall quantity of it be put into their hills.

Captain Cook gives the following account of a very peculiar kind of ants, which he met with at Botany Bay. "They are as green as a leaf. They live upon trees, where they build their neſts. Theſe neſts are of a very curious ſtructure: they are formed by bending down ſeveral of the leaves, each of which is as broad as a man's hand; they glue the points of them together, ſo as to form a purſe. The viſcus uſed for this purpoſe is an animal juice, which nature has enabled them to elobrate. Their method of firſt bending down the leaves our naturaliſts had not an opportunity to obſerve; but they ſaw thouſands uniting all their ſtrength to hold them in this poſition, while other buſy multitudes were employed within, in applying the gluten that was to prevent their returning back. To ſatisfy themſelves that the leaves were bent and held down by the efforts of theſe diminutive artificers, our people diſturbed them in their work, and, as ſoon as they were driven from their ſtation, the leaves on which they were employed ſprang up with a force much greater than they could have thought them able to conquer, by any combination of their ſtrength."

Acid of Ants, an acid produced by diſtilling a great number of theſe inſects, either without addition, or with water. It reſembles vinegar in many reſpects; but differs from it in forming cryſtals with magneſia, iron, and zinc. Its attractions are not yet determined, but are ſuppoſed to coincide with thoſe of vinegar.

ANTA, in the ancient architecture, was a ſquare pilaſter, placed at the corners of buildings.

ANTACIDS, in pharmacy, an appellation given to all medicines proper to correct acid or ſour humours.

Under the claſs of antacids come, 1. Abſorbents; as chalk, coral, ſea-ſhells, hæmatites, and ſteel-filings. 2. Obtundents; as oils and fats. 3. Immutants; as lixivious ſalts, and ſoaps.

ANTÆUS, in fabulous hiſtory, was a name given to a giant of Libya, ſon of Neptune and Terra. Deſigning to build a temple to his father, of mens ſculls, he ſlew all he met; but Hercules fighting him, and perceiving the aſſiſtance he received from his mother (for by a touch of the earth he refreſhed himſelf when weary) lifted him up from the ground, and ſqueezed him to death.

ANTAGONIST, in a general ſenſe, denotes an adverſary, eſpecially in ſpeaking of combats, games, and literary diſputes.

Antagonist *Muſcles*, in anatomy, thoſe which have oppoſite functions; as flexors and extenſors, abductors and adductors, &c.

ANTALGIC, in medicinal preparation, amounts to a literal definition of Anodynes.

ANTALIUM, Antale or Antalus, in natural hiſtory, denominates a ſmall ſea ſhell of a tubular form, ſometimes ſtiled tubulus marinus. It is in length about an inch and an half, and not thicker than a large ſized quill, but ſomewhat taper, and fluted from end to end. Its colour is generally a pale green, and ſometimes white. It is an acid reſolvent, if uſed medicinally, greatly tending to dry up humours.

ANTANACLASIS ,in rhetoric, ſignifies a figure which repeats the ſame word, but in a different ſenſe; as dum vivimus, vivamus.

ANTAGOGE, in rhetoric, a figure by which, when the accuſation of the adverſary is unanſwerable, we load him with the ſame or other crimes.

ANTANISOPHYLLUM, in botany, a ſynonyme with hogweed.

ANTAPHRODISIACS, in pharmacy, imply medicines proper to diminiſh ſemen, and conſequently extinguiſh or leſſen all deſires of venery.

ANTAPOCHA, in civil law, denotes an acknowledgment in writing for monies to be paid, in exoneration of ſome annual demand; this term is uſed in contradiſtinction to Apocha, which amounts to the ſame as a receipt for ſuch payment, and may be properly called a voucher, whilſt the former may be ſaid to be an acknowledged incumbrance.

ANTARCTIC, in a general ſenſe, denotes ſomething oppoſite to the arctic or northern pole. Hence antarctic circle is one of the leſſer circles of the ſpheres, and diſtant only 23° 30′ from the ſouth pole, which is likewiſe called antarctic pole for the ſame reaſon.

ANTARES, in aſtronomy, the name of a ſtar of the firſt magnitude, called alſo the ſcorpion's heart. Its longitude is 60° 13 14′′ of Sagittarius; and its latitude 4° 31′ 26′′S.

ANTASTROPHE, in rhetoric, is the ſame as Antipoſition.

ANTE, in heraldry, denotes that the pieces are let into one another in ſuch form as there is expreſſed; for inſtance, by dove-tails, rounds, ſwallow-tails, or the like.

ANTECANIS, in aſtronomy, implies the ſame as Canis Minor or Procyon.

ANTEAMBULONES, in Roman antiquity, denoted ſervants who went before perſons of diſtinction to clear the way before them. They uſed this formula, Date locum domino meo, i. e. Make room or way for my maſter.

ANTECEDENT, in rhetoric, in a general ſenſe, implies ſomething that goes before another, either in order of time or place.

Antecedent, in grammar, the words to which a relative refers.

Antecedent, in logic, is the firſt of the two propoſitions in an enthymeme.

Antecedent, in mathematics, is the firſt of two terms of a ratio, or that which is compared with the other.

ANTECEDENCE, Antecedency, or Antecedentia, in aſtronomy, implies an apparent motion of a planet towards the weſt, or contrary to the order of the ſigns.

ANTECESSOR, one that goes before. It was an appellation given to thoſe who excelled in any ſcience; and, in the univerſities of France, the teachers of law take the title anteceſſores in all their theſes.

ANTECURSORES, in the Roman hiſtory, implied a party of horſe detached before, partly to get intelligence, proviſions, &c. and partly to chuſe a proper place to encamp in. Theſe were otherwiſe called anteceſſores, and by the Greeks *prodromi*.

ANTEDATE, in law, implies a ſpurious or falſe date, prior to the true date of a bond, bill, or the like.

ANTEDILUVIAN, or Antidiluvian, in a general ſenſe, implies ſomething that exiſted before the flood or deluge.

Antediluvian *World*; the earth as it exiſted before the flood; and more properly comes under the theory of the earth.

ANTEDILUVIANS, a general name for all mankind who lived before the flood, and ſo includes the whole of the human race from Adam to Noah and his family. Refer to the various productions of Drs. Burnet, Woodward, Meſſrs. Whiſton, Gilbert, &c. &c. under the article, The Theory of the Earth, in order to gratify the curious reader, relative to the conjectures of the learned world on this intereſting ſubject.

ANTEJURAMENTUM, in ancient law, was called *juramentum calumniæ*, an oath which both accuſer and accuſed were to take before any trial or purgation. The accuſer was to ſwear that he would proſecute the criminal; and the accuſed to make oath, on the day he was to undergo the ordeal, that he was innocent of the crime charged againſt him.

ANTELOPE, in zoology, is deſcribed under the article Capra.

ANTELUCAN, in eccleſiaſtical writers, is applied to things done in the night or before day. Hence we find frequent mention of the antelucan aſſemblies of the ancient Chriſtians in times of perſecution.

ANTEMURALE, in the ancient military art, denotes much the ſame with what the moderns call an out-work.

ANTENATI, in modern Engliſh hiſtory, is chiefly underſtood of the ſubjects of Scotland, born before king James the Firſt's acceſſion to the Engliſh crown, and alive after it. Contradiſtinguiſhed from thoſe who were denominated poſtnati, or born after it. The antenati were conſidered as aliens in England, whereas the poſtnati claimed the privilege of natural ſubjects.

ANTENATUS, in law, ſignifies the eldeſt ſon or heir male in tail general, uſually called aiſné. Hence it ſometimes implies the ſon of a former marriage, when ſpeaking of the iſſue of a ſubſequent marriage.

ANTENCLEMA, in oratory, is where the whole defence of the perſon accuſed turns on criminating the accuſer. Such is the defence of Oreſtes, or the oration for Milo: *Occiſus eſt, ſed latro. Exſectus, ſed raptor.*

ANTENICENE, in eccleſiaſtical writers, denotes a thing or perſon prior to the firſt council of Nice. We ſay the Antenicene faith, Antenicene creeds, Antenicene fathers.

ANTENNÆ, in the hiſtory of inſects, ſlender bodies with which nature has furniſhed the heads of theſe creatures, being the ſame with what in Engliſh are called horns or feelers.

ANTENUPTIAL, in law, implies any article that entitles a woman to ſeek for redreſs in a court of judicature, for a breach of marriage. Hence, antenuptial promiſes in the preſence of two credible witneſſes, will always carry a verdict in an honourable cauſe.

All things preſented previous to marriage, are called antenuptial preſents, and are in the gift and diſpoſal of the wife after the conſummation of marriage. In all other cards, deeds of ſettlement are neceſſary.

ANTEPAGMENTA, in ancient architecture, the jambs of a door. They are alſo ornaments, or garniſhings, in carved work, of men, animals, &c. made either of wood or ſtone, and ſet on the architrave.

ANTEPENULTIMA, in grammar, ſignifies the third ſyllable of a word from the end, or the laſt ſyllable but two.

ANTEPILANI, in the Roman armies, a name given to the haſtati and principes, becauſe they marched next before the triarii, who were called pilani.

ANTEPILEPTICS, among phyſicians, expreſs all thoſe medicines eſteemed good in the epilepſy.

ANTEPOSITION, a grammatical figure, by which a word, according to the ordinary rules of Syntax ought to follow another, comes before it. As when, in the Latin, the adjective is put before the ſubſtantive, the verb before the nominative caſe, &c.

ANTEPREDICAMENTS, among logicians, certain preliminary queſtions which illuſtrate the doctrine of predicaments and categories.

ANTERIOR, denotes ſomething placed before another, either with reſpect to time or place.

ANTEROS, in mythology, one of the two cupids who were the chief of the number. They are placed at the foot of the Venus of Medica; this is repreſented with a heavy and ſullen look, agreeably to the poetical deſcription of him, as the cauſe of love's ceaſing. The other was called Eros.

ANTESIGNANI, in the Roman armies, ſoldiers placed before the ſtandards, in order to defend them, according to Limpſius; but Cæſar and Livy mention the Anteſignani as the firſt line, of heavy-armed troops. The Velites, who uſed to ſkirmiſh before the army, were likewiſe called Anteſignani.

ANTESTATURE, in fortification, implies a ſmall retrenchment made of paliſadoes, or ſacks of earth, with a view to diſpute with an enemy the remainder of a piece of ground.

ANTESTARI, in Roman antiquity, ſignifies to bear witneſs againſt any one who refuſed to make his appearance in the Roman courts of judicature, on the day appointed, and according to the tenor of his bail. The plaintiff, finding the defendant after ſuch a breach of his engagement, was allowed to carry him into court by force, having firſt aſked any of the perſons preſent to bear witneſs. The perſon aſked to bear witneſs in this caſe, expreſſed his conſent by turning his right ear, which was inſtantly taken hold of by the plantiff, and this was to anſwer the end of a ſubpœna. The ear was touched upon this occaſion, as the ſeat of memory, and therefore the ceremony was a ſort of caution to the party to remember his engagement.

ANTEVIRGILIAN Husbandry, an appellation given to Mr. Tull's method of horſe-hoeing huſbandry.

ANTHELION, a ſynonyme of Corona and Parhelion.

ANTHELIX, in anatomy, the inward protuberance of the external ear, being a ſemicircle within, aad almoſt parallel to the helix.

ANTHELMA, ſignifies the Indian pink.

ANTHELMINTICS, among phyſicians, medicines proper to deſtroy worms.

ANTHEM, a church-ſong performed in cathedral ſervice by choriſters, who ſung alternately. It was uſed to denote both pſalms and hymns, when performed in this manner. But, at preſent, an anthem is uſed in a more confined ſenſe, being applied to certain paſſages taken out of the Scriptures, and adapted to a particular ſolemnity.

Anthems were firſt introduced in the reformed ſervice of the Engliſh church, in the beginning of the reign of queen Elizabeth.

ANTHEMIS Camomile or Chamomile, a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ diſcoides. The eſſential characters are theſe: The receptaculum is chaffy; there is no pappus; the calyx is hemiſpheric and ſubequal; and the florets of the ray are more than five.

There are 17 ſpecies: the moſt remarkable of which are the following: viz.

1. The nobilis, or common camomile, grows in plenty upon commons, and other waſte land. It is a trailing perennial plant, which puts out roots from the branches, by which it ſpreads and multiplies greatly. Of this kind there is a variety with double leaves.

2. The pyrethrum, or pillatory of Spain, is a perennial plant, which grows naturally in Spain and Portugal, from whence the roots are brought to this country.

3. The tinctoria, with ſawed winged leaves, is a perennial plant, which flowers from June to November.

4. The Arabica, with a branching empalement. The ſeeds of this ſpecies were brought from Africa by the late Dr. Shaw, and diſtributed to many curious botaniſts in this and other countries of Europe.

The firſt ſort may be very eaſily propagated by procuring a few ſlips in the ſpring, and planting them about a foot diſtant from each other, when they will ſoon cover the ground.

The other ſorts may be propagated from ſeeds ſown in the ſpring, and will require no other care than to be kept free from weeds.

The firſt and ſecond ſorts are uſed in medicine. The firſt have a ſtrong, not ungrateful, aromatic ſmell, and a very bitter nauſeous taſte.

They are accounted carminative, aperient, emollient, and in ſome meaſure anodyne; and ſtand recommended in flatulent colics, for promoting the uterine purgations, in ſpaſmodic pains, and the pains of childbed-women.

Theſe flowers are alſo uſed externally in diſcutient and antiſeptic fomentations, and in emollient clyſters. They enter the *decoctum pro enemate and decoctum pro fomento* of our pharmacopœias. A ſimple watery infuſion of them taken in a tepid ſtate, is at preſent frequently employed to promote the operation of emetics. The principal uſe of pyrethrum in the preſent practice is as a maſticatory, for promoting the ſalival flux, and evacuating viſcid humours from the head and neighbouring parts; by this means it often relieves the tooth-ach, ſome kinds of pains of the head, and lethargic complaints.

ANTHERA, or Antheræ, among botaniſts, expreſſes that part of the ſtamen which is fixed on the top of the filamentum, within the corolla: it contains the pollen or fine duſt, which, when mature, it emits for the impregnation of the plant, according to Linnæus.

ANTHERICUM, Spider-Wort; a genus of the monogynia order, belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 10th order, Coronariæ.

There are nine ſpecies; viz. 1. The ramoſum, with a branching ſtalk. 2. The liliago. Theſe are perennial plants, natives of Spain, Portugal, and other warm countries.

They flower in June and July, and the ſeeds are ripe in September. 3. The truteſcens, with a ſhrubby ſtalk, it produces many ligneous branches from the root, each ſupporting a plant with long taper leaves, in ſhape like thoſe of an onion, and full of a yellow pulp, very juicy. This ſpecies is a native of the Cape of Good Hope.

The other ſpecies, being of little or no value, do not admit of any deſcription.

The two firſt are propagated by ſeeds, which ſhould be ſown in a warm ſituation, on a bed of light ſandy earth. The third requires ſhelter in winter, but will live in the open air, if planted cloſe to the warm wall.

ANTHESPHORIA, in antiquity, a Sicilian feſtival inſtituted in honour of Proſerpine. It ſeems to be the ſame thing with the floriſertum of the Latins, and anſwers to the harveſt-home among us.

ANTHESTERIA, in antiquity, was a feaſt celebrated by the Athenians in honour of Bacchus. The moſt natural derivation of the word is from the Greek ανθος (*flos*), a flower, it being the cuſtom at this feaſt to offer garlands of flowers to Bacchus; laſted three days.

ANTHESTERION, in ancient chronology, was the ſixth month of the Athenian year. It contained 29 days; and anſwered to the latter part of our November and beginning of December. It had its name from the feſtival anthereſteria kept in it.

ANTHIA, in ichthyology, a trivial name of the ſalx venetorum, or ſickle fiſh.

ANTHIAS, a ſynonyme in ichthyology, for a ſpecies of the labrus.

ANTHINE, or Anthinos, in hiſtory, is a record, implying the mixture of wine and oil in one veſſel for immediate uſe.

ANTHISTIRIA, in botany, is a genus of the trigynia order, belonging to the triandria claſs of plants; and, in the natural method, ranking under the 4th order, Gramina. The generic characters are: The calyx is a four-valved glume, equally cleft to the baſe; the corolla is a two-valved glume; the ſtamina conſiſt of three ſhort ſlender filaments; the antheræ oblong and erect; the piſtillum has an oblong germen; the ſtyli are two; and the ſtigmata are clavated and hairy; there is no pericarpium, except a cloſed calyx; the ſeed is oblong and furrowed. There is only one ſpecies of this graſs, the ciliata or fringed anthiſtiria, a native of India.

ANTHOCEROS, or Horn Flower, is a genus of the order of algæ, belonging to the cryptogamia claſs of plants; and, in the natural method, ranking under the 57th order, Algæ. The eſſential generic characters are: The calyx of the male is ſeſſile, cylindric, and entire; the antheræ (one) is ſubulated, very long, and two-valved; the calyx of the female is monophyllous, divided into ſix parts, and expanding; the ſeeds are about three, naked and roundiſh.

There are only three ſpecies of the anthoceros; viz. The punctatus, or ſpotted anthoceros, a native of Britain; the lævis, a native of Europe and America; and the multifidus, a native of Germany.

ANTHOLOGION, is the title of the ſervice-book uſed in the Greek church. It is divided into twelve months, containing the offices ſung throughout the year, on the feſtivals of our Saviour, the Virgin, and remarkable ſaints days.

ANTHOLOGY, or **Anthologia**, in literature, denotes a ſelection of beautiful paſſages from any authors. It is alſo the name given to a collection of epigrams taken from ſeveral Greek poets.

ANTHOLYZA, **Mad Flower**, a genus of the monogynia order, belonging to the triandria claſs of plants; and, in the natural method, ranking under the 6th order, Enſatæ. The eſſential characters are theſe: the calyx is tubular, irregular, and bent back; and the capſule is beneath the flower. There are two ſpecies; viz.

1. The ringens, whoſe flower-ſlips ſpread aſunder. This hath red, round, bulbous roots, from which ariſe ſeveral rough, furrowed leaves, near a foot long, and half an inch broad. The flower appears in June, and the ſeeds ripen in September.

2. The ſpicata, with narrow furrowed leaves, is in ſhape and ſize like the vernal crocus.

Both theſe ſpecies are natives of Africa, from whence their ſeeds are firſt obtained, and raiſed in the Dutch gardens.

The anthyloza may be propagated by offſets, which it ſends off in pretty great plenty; or by ſeeds, which are ſometimes perfected in Europe.

ANTHONY, or *Knights of* **St. Anthony**, was a military order, inſtituted by Albert, Duke of Bavaria, Holland, and Zealand, when he deſigned to make war againſt the Turks in 1382. The knights wore a collar of gold, made in form of a hermit's girdle, from which hung a ſtick, with a little bell, as they are repreſented in St. Anthony's pictures.

St. **Anthony** alſo gives the denomination to an order of religious, founded in France about the year 1095, to take care of thoſe afflicted with St. Anthony's fire.

St. **Anthony's** *Fire*, a name popularly given to the eryſipelas. Apparently it took this denomination, as thoſe afflicted with it made their peculiar application to St. Anthony of Padua for a cure. It is known, that anciently particular diſeaſes had their peculiar ſaints: thus, in the ophthalmia, perſons had recourſe to St. Lucia; in the tooth-ach, to Saint Apollonia; in the hydrophobia, to Saint Hubert, &c.

ANTHOPHYLLI, or **Antophali**, in botanical language, expreſſes a larger ſpecies of cloves.

ANTHORA, in botany, is the trivial name of a ſpecies of Aconitum.

ANTHORISMUS, in rhetoric, denotes a contrary deſcription or definition of a thing from that given by the adverſe party.

For example; if the plaintiff urge, that to take any thing away from another, without his knowledge or conſent, is a theft; this is called ορος, or definition. If the defendant reply, that to take a thing away from another, without his knowledge or conſent, provided it be done with deſign to return it to him again, is not theft; this is an Ανθορισμος.

ANTHOS, ανθος, a flower, in botany ſignifies roſemary only. It implies alſo the elixir of gold, as well as a medicine extracted from pearls.

ANTHOSMIAS, the ſame as Anthine, or wine and oil mixed with the juice of odoriferous herbs; a choice kind of beverage uſed by the ancients at their feſtivals and public rejoicings.

ANTHOSPERMUM, the **Amber Tree**, a genus of the diœcia order, belonging to the polygamia claſs of plants; and, in the natural method, ranking under the 47th order, Stellatæ. For the characters ſee Syſtem of **Botany**.

There are three ſpecies; viz. The Æthiopica, ciliare, and herbacea; but the firſt is moſt generally known in the gardens of the curious. Its beauty conſiſts in its ſmall ever-green leaves, which grow as cloſe as heath. Theſe being bruiſed between the fingers, emit a very fragrant odour; whence the name amber tree.

This plant is eaſily propagated by cuttings during the ſummer-months, in a border of light earth, where they will take root in ſix weeks time.

ANTHOXANTHUM, or **Vernal Grass**, a genus of the digynia order, belonging to the diandria claſs of plants; and, in the natural method, ranking under the 4th order, Gramina. The eſſential characters are: The calyx is a bivalved gluma, with one flower; the corolla is bivalved, obtuſe, and without any awn.

There are three ſpecies; viz. the odoratum, or ſpring-graſs, a native of Britain; the indicum, a native of India; and the paniculatum, a native of the ſouthern parts of Europe.

ANTHRACIS, **Anthracias**, or **Anthracitis**, were names promiſcuouſly uſed by ancient naturaliſts for very different foſſils; viz. the carbuncle, hæmatites, and a kind of aſteria.

ANTHRACOSIS, in medicine, implies, a corroſive ſcaly ulcer either in the bulb of the eye or the eye-lids.

ANTHRAX, ανθραξ, a Greek term, literally ſignifying a burning coal, uſed by the ancients to denote a gem, generally known by the name of *carbuncle*. Alſo it denoted a diſeaſe.

Anthrax, likewiſe ſignifies lithanthrax or pitcoal.

ANTHROPOGLOTTUS, among zoologiſts, is an appellation given to ſuch animals as have tongues reſembling that of mankind; and particularly to the parrot kind.

ANTHROPOGRAPHY, or **Anthrographia**, denotes the deſcription of the human body, its parts and ſtructure.

ANTHROPOLATRÆ, in church-hiſtory, is an appellation given to the Neſtorians, on account of their worſhipping Chriſt, notwithſtanding they believed him to be a mere man.

ANTHROPOLATRIA, ſignifies paying divine honours to a man; and is ſuppoſed to be the moſt ancient kind of idolatry.

ANTHROPOLITES, is a term which denotes petrifactions of the human body, as thoſe of quadrupeds are called zoolites.

The generality of naturaliſts aſſure us of real anthropolites being ſometimes found. And, as it is univerſally admitted that the zoolites are frequently ſeen, what negative argument therefore can be brought againſt the exiſtence of the others? One in particular was diſcovered at Aix en Florence, Anno 1583, in a rocky cliff, the cerebrum whereof, when ſtruck againſt a piece of ſteel, produced ſparks, the bones being at the ſame time friable. The human vertebræ, fragments or portions of the tibia, and even the whole cranium itſelf, have been ſeen in an abſolute ſtate of petrification. Some of theſe are ſaid to appear vitriolated or mineralized.

As to the petrified bones of pretended giants, they are more probably real zoolites, the bones of the larger animals. Some are only indurated; others calcined, vitriolated, or mineralized; ſome, again, are ſimply incruſted; whilſt others have been proved completely petrified.

ANTHROPOLOGY, a diſcourſe upon human nature.

Anthropology, in theology, denotes a mode of ſpeaking of God, after the manner of men; by attributing human parts and paſſions to him.

We have frequent inſtances of anthropology in Holy Scripture; by which we are only to underſtand what God hath done.

ANTHROPOMANCY, a ſpecies of divination, performed by inſpecting the intrails of a human body.

ANTHROPOMETRIA, implies a deſcription of the human body, according to the juſt dimenſions, of length, breadth, and thickneſs, conſidered comparatively to each other.

ANTHROPOMORPHA, in the Linnæan ſyſtem of nature, that claſs of animals which in ſome degree reſemble the human form. See the Claſſification of Natural Hiſtory.

ANTHROPOMORPHISM, in the language of divines, implies the ſectary, or erroneous principles of the Anthropomorphites.

ANTHROPOMORPHITE, in a general ſenſe, ſignifies a perſon who attributes to God the figure of a man.

The word comes from the Greek, ανθρωπος, man, and μορφη, ſhape.

Anthropomorphites, in eccleſiaſtical hiſtory, were a ſect of ancient heretics, who, taking every thing ſpoken of God in Scripture, in a literal ſenſe, particularly, the paſſage in Geneſis, where it is ſaid, that God made man after his own image, ſo maintained that God had a human form.

Epiphanius calls the Antropomorphites, Audiani, or Odiani, from Audius, the ſuppoſed founder of the ſect; who lived, about the time of Arius, in Meſopotamia. St. Auguſtine calls them Vadiani.

ANTHROPOMORPHOUS, ſomething that bears the figure or reſemblance of a man. Naturaliſts give inſtances of anthropomorphous plants, anthropomorphous minerals, &c. Theſe generally come under the claſs of what they call luſus naturæ, or monſters.

ANTHROPOPATHY, a figure or expreſſion, by which ſome paſſion is attributed to God, that properly belongs only to man.

ANTHROPOPHAGI, ſignifies men-eaters it is compounded of the Greek ανθρωπος, man, and Φαγειν, *edere*, to eat.

The Cyclops, the Leſtrygons, and Scylla, are all repreſented in Homer as anthropophagi, or man-eaters; and the female phantoms, Circe, and the Syrens, firſt bewitched with a ſhew of pleaſure, and then deſtroyed. This, like the other parts of Homer's poetry, had a foundation in the manners of the times preceding his own. It was ſtill in many places the age ſpoken of by Orpheus,

> When men devoured each other like the beaſts,
> Gorging on human fleſh.——

Hiſtory, gives us divers inſtances of perſons driven by exceſs of hunger to eat their own relations. And alſo out of revenge and hatred, where ſoldiers in the heat of battle have been known to be carried to ſuch an exceſs of rage, as to tear their enemies with their teeth.

The violence of love has ſometimes produced the ſame effect as the exceſs of hatred.

Among the Eſſedonian Scythians, when a man's father died, his neighbours brought him ſeveral beaſts, which they killed, mixed up their fleſh with that of the deceaſed, and made a feaſt.

Among the Maſſageti, when any perſon grew old, they killed him and eat his fleſh; but if the party died of ſickneſs, they buried him, eſteeming him unhappy.

Idolatry and ſuperſtition have occaſioned the eating more human fleſh than both love and hatred put together.

There are few nations but have offered human victims to their deities; and it was an eſtabliſhed cuſtom to eat part of the ſacrifices they offered.

It appears pretty certain from Dr. Hawkeſworth's account of the voyages to the South Seas, that the inhabitants of New Zealand eat the bodies of their enemies. Mr. Petit has a learned diſſertation on the nature and manners of the Anthropophagi. Among other things, he diſputes whether or no the Anthropophagi act contrary to nature?

The philoſophers, Diogenes, Chryſippus, and Zeno, followed by the whole body of ſtoics, held it a very reaſoneable thing for men to eat each other.

According to Sextus Empiricus, the firſt laws were thoſe made to prevent men from eating each other, as been had done till that time.

The Greek writers repreſent Anthropophagi as univerſal before Orpheus.

Leonardus Floroventius informs us that having fed a hog with hog's fleſh, and a dog with dog's fleſh, found a repugnancy in nature to ſuch food; the former loſt all his briſtles; the latter its hair, and the whole body broke out in blotches.

If even this horrid practice of eating human fleſh originates from hunger, ſtill it muſt be perpetuated from revenge: as death muſt loſe much of its horror among thoſe who are accuſtomed to eat the dead; and where there is little horror at the ſight of death, there muſt be leſs repugnance to murder.

ANTHROPOPHAGIA, implies the habit of eating human fleſh; which is pretended to be the effect of a diſeaſe, that leads people affected with it to eat every thing alike. Some conſider it as a ſpecies of Pica.

The annals of Milan, furniſh an extraordinary inſtance of Anthropophagy.

"A Milaneſe woman, named Elizabeth, from a depraved appetite, like what women with child, and thoſe whoſe menſes are obſtructed, frequently experience, had an invincible inclination to human fleſh, of which ſhe made proviſion by enticing children into her houſe, where ſhe killed and ſalted them: a diſcovery of which having been made, ſhe was broken on the wheel and burnt in 1519."

ANTHROPOSCOPIA, ſignifies the art of judging a man's diſpoſition, from the lineaments of his body.

ANTHROPOSOPHIA, implies the ſcience of the nature of man, his ſtructure and compoſition, both internal and external.

ANTHROPOTHYSIA, denotes the inhuman practice of offering of human ſacrifices.

ANTHUMON, in the material medica of the ancients, ſignifies the epithymum, or dodder, growing upon thyme.

ANTHUS, in ornithology, ſignifies a ſynonyme of a ſpecies of the whin-chat or loxia.

ANTHYLLIS, in botany, is the kidney-votch or lady's finger; belonging to the diadelphia claſs and decandria order, ranking in the 32d order of the natural method, papilionaceæ.

The characters of which are few, viz. The calyx is ventricoſe, and the legumen round and well covered.

In the Linnean ſyſtem there are nine ſpecies enumerated, the chief of which are the following diſtinctions:

1. The Vulneraria with unequal winged leaves, a native of ſeveral parts of Europe.

2. The Montana or herbaceous wound wort, a native of France and Italy.

3. The Barba jovis, or ſilver-buſh with white leaves, a native of warm climates only.

4. The Cytiſoides, or ſhrubby wound wort, a native alſo of warm climates, although now to be found in ſeveral gardens in England.

The firſt and ſecond ſorts may be raiſed by ſeeds, and require no particular management, further than being kept free from weeds. The third and fourth may be propagated by cuttings planted any time from the latter end of May to the latter end of Auguſt, but are to be early removed on the approach of the winter and houſed; otherwiſe they will die by the ſlighteſt froſt, which the gardener muſt carefully guard againſt.

ANTHYPOMOSIA, in ancient law, was an oath taken by a proſecutor, declaring that the abſence of the party accuſed was not for any juſt cauſe, and therefore demanded that judgment.

ANTHYPOPHORA, in rhetoric, ſignifies a figure of ſpeech by which we covertly obviate a reaſon or objection.

ANTI, αντι, is a prepoſition uſed in compoſition with ſeveral words, both in Greek, Latin, French, and Engliſh, in different ſenſes.

In Engliſh, it ſignifies *oppoſite*; and is then derived from αντι, *contra, againſt.*

Anti, in matters of literature, is a title given to divers pieces written by way of anſwer to others, whoſe names are uſually annexed to the anti.

ANTIADES, in anatomy, ſignifies the glandules, kernels, tonſils, or almonds of the ears.

ANTIADIAPHORISTS, Antiadiaphoristæ, in church hiſtory, a name given, in the fourteenth century, to the rigid Lutherans, who diſavowed the epiſcopal juriſdiction.

ANTIBACCHIUS, in ancient poetry, a foot, conſiſting of three ſyllables; the two firſt long; and the third ſhort.

ANTIBARBAROUS, in literature, implies ſeveral works levelled againſt the uſe of barbarous terms and phraſes, chiefly in the Latin tongue.

ANTICADMIA, in pharmacy, denotes a ſpecies of mineral Cadmia, ſometimes alſo called pſeudo-cadmia.

ANTICARDIUM, in anatomy, ſignifies the pit of the ſtomach, or ſcrobiculus cordis.

ANTICATARRHAL, in medicine, is an epithet given to medicines preſcribed for catarrhs.

ANTICAUSOTICS, among phyſicians, denote medicines againſt burning fevers. In this ſenſe Juncker has given the deſcription of anticauſotic ſyrup.

ANTICHAMBER, ſignifies a room to wait in, till an audience is given.

ANTICHORUS, in botany, a genus of the octandria claſs, and monogynia order: it has a four-leaved calyx, four petals, an awl-ſhaped, four-celled capſule, with four valves, and many ſeeds. There is only one ſpecies, a native of Arabia.

ANTICHRESIS, in law, is a covenant, by which a perſon borrowing money of another, makes over his lands or goods to the lender, with the uſe and occupation of them, for the intereſt of the money lent.

ANTICHRIST, in a general ſenſe, denotes an adverſary of Chriſt, or one who denies that he has been upon earth.

The Antichriſt mentioned by the apoſtle John, 1 Ep. ii. 18. and and more particularly deſcribed in the book of Revelation, ſeems evidently to be the ſame with the man of ſin, &c. characteriſed by St. Paul in the ſecond chapter of his ſecond Epiſtle to the Theſſalonians.

ANTICHRISTIANISM, a ſtate or quality, in perſons or principles, which denominates them oppoſite to the kingdom of Chriſt.

ANTICHRISTIANS, in a religious ſenſe, denote the followers or worſhippers of Antichriſt.

Antichristians may alſo be denominated to be thoſe who believe in a falſe Meſſiah.

ANTICHTHON, in the Pythagorean ſyſtem of aſtronomy, denotes a globe of earth reſembling ours, but inviſible to us, becauſe on the oppoſite ſide of the ſun, that luminary being always interpoſed between this earth and the antichthon.

ANTICHTHONES, in geography, imply the inhabitants of oppoſite hemiſpheres. They are ſometimes alſo called antigenæ, or antipodes.

ANTICIPATION, implies the act of doing a thing before the time.

Anticipating a payment denotes the diſcharging it before it falls due.

Anticipation, in logic, denotes a preconceived opinion.

Anticipation, in medicine, implies thoſe diſeaſes where the ſymptoms belonging to ſome future period, appear in the beginning.

Anticipation, in the Epicurean philoſophy, denotes the idea of a thing, without which we cannot enquire concerning it.

Anticipation, in rhetoric, implies a figure generally called a Prolepſis.

ANTICK, in architecture, ſculpture and painting, denotes a fantaſtical compoſure of figures of different natures, ſexes, &c. which the Italians call *groteſca*, and the French *groteſque*.

ANTICLIMAX, in rhetoric, implies a figure, by which the progreſs of a diſcourſe deſcends from great to little.

ANTICNEMION, in anatomy, denotes the ſkin; or the fore prominent part of the tibia.

ANTICOR, among farriers, is uſually deſcribed as a preternatural ſwelling; but is really an inflammation in the gullet and throat; and is the ſame that, in human bodies, is called the angina, or ſquinancy.

ANTICUM, or Antæ, in architecture, denotes a porch before a door; alſo that part of a temple, which is called the outer temple, and lies between the body of the temple and the portico.

ANTICUS, *Serratus minor*, a ſynonyme of Serratus.

Anticus, *Peronæus*, a ſynonyme of Peronæus.

Anticus, *Tibialis*, a ſynonyme of Tibialis.

ANTIDACTYLUS, in poetry, implies that which is the reverſe of a dactyl, as conſiſting of three ſyllables, the firſt two of which are ſhort, and the laſt long.

ANTIDESMA, in botany, implies a genus of the pentandria claſs, and belonging to the dioecia order; whoſe genuine properties are as follow, viz. The calyx of the male is 5 leaved; having no corolla, the antheræ are bifid: the female calxy is 5 leaved; the corolla is wanting; the ſtigmata are 5; the being is cylindric and one ſeeded.

There is but one ſpecies, and that is denominated a native of the hither India.

ANTIDÆMONICI, in eccleſiaſtical hiſtory, a ſect who denied the exiſtence of devils, or evil ſpirits; alſo all ſpectres, incantations, witchcrafts, &c.

ANTIDISMA, in botany, a genus of the dioecia claſs and pentandria order, without an Engliſh name.

ANTIDORON, in eccleſiaſtical writers, a name given by the Greeks to the conſecrated bread, out of which the middle part, marked with the croſs, in which the conſecration reſides, being taken away by the prieſt, the remainder is diſtributed, after maſs, to the poor.

ANTIDOSIS, in antiquity, denotes an exchange of eſtates, practiſed by the Greeks on certain occaſions, and firſt inſtituted by Solon. It originated thus: When a perſon was nominated to an office, the expence of which he was not able to ſupport, he had recourſe to the antidoſis, that is, he was to ſeek for ſome citizen of better ſubſtance than himſelf, who was free from this, and other offices; in which caſe, the former was excuſed. But in caſe the perſon thus ſubſtituted denied himſelf to be the richeſt, they were to exchange eſtates, after this manner; the doors of their houſes were cloſe ſhut up and ſealed, that nothing might be conveyed away; then both took an oath to make a faithful diſcovery of all their effects; accordingly, within three days, a full diſcovery and exchange of eſtates was made.

ANTIDOTARY, a ſynonymous term with Diſpenſatory.

ANTIDOTE, in medicine, ſignifies a remedy taken to prevent the effects of poiſon, either by way of cure or preſervative.

Antidote, has the ſame ſignification with alexipharmic, alexiterial, and counterpoiſon.

ANTIGRAPHE, in antiquity, denotes a law-ſuit about kindred, whereby a perſon claimed relation to family.

ANTIGRAPHUS, in antiquity, an officer of Athens, who kept a counterpart of the apodecti, or chief treaſurer's accounts, to prevent miſtakes, and keep them from being falſified.

Antigraphus, a ſecretary or chancellor.

Antigraphus, in eccleſiaſtical hiſtory, denotes an abbreviator of the papal letters; and in the modern acceptation of the word, conſiſts in making minutes of bulls from the petitions agreed to by his holineſs, and renewing the bulls after engroſſing.

ANTIGUGLER, in mechanics, is a crooked tube of metal, ſo bent, ſo as to be eaſily introduced into the necks of bottles, and uſed in decanting liquors, without diſturbing them. For this purpoſe the bottle ſhould be a little inclined, and about half a ſpoonful of the liquor poured out, ſo as to admit an equal quantity of air; let one end of the bent tube be ſtopped with the finger, whilſt the other is thruſt into the body of the liquor near to the bubble of air already admitted. When the finger is taken off, the bottle will have vent, and the liquor will run out ſteadily and undiſturbed.

ANTIHECTICS, in medicine, ſignify remedies taken againſt hectical diſorders.

ANTIHECTICUM *Poterii*, in pharmacy, a celebrated chemical preparation, formerly much in practice; but now deſervedly laid aſide.

ANTILEXIS, in antiquity, denotes a new trial granted in the Athenian judicatories, where judgment had before paſſed againſt a party for non-appearance.

ANTILOGARITHM, denotes the complement of the logarithm of a ſine, tangent, or ſecant.

ANTILOGY, in literature, implies a contradiction between two paſſages, in an author, or book, on any one ſubject.

ANTILUTHERANS, in church hiſtory, denote a ſect among the ancient reformers, who maintained opinions, chiefly in relation to the euchariſt, different from thoſe of Luther.

ANTELOPE, a ſynonyme of the ſpecies capra, under which it is deſcribed.

ANTILYSSUS *Pulvis*, in medicine, is compoſed of equal parts of the lichen cinereus teareſtris & piper niger. It is reckoned uſeful in preventing the rabies canina.

ANTIMENSIUM, a kind of conſecrated table cloth, occaſionally uſed in the Greek church, in places where there is no proper altar.

Antimensium, in the Greek church, anſwers to the altareportabile, or portable altar, in the Latin church.

Antimensia is alſo applied to other tables, uſed in offices of religion, beſides thoſe on which the euchariſt is adminiſtered; i. e. ſuch as thoſe on which the hoſt is expoſed.

ANTIMENSIUS, an ancient officer in the Greek church, whoſe buſineſs was to introduce and place the communicants at the euchariſt.

ANTIMERIA, in grammar, denotes a figure by which one part of ſpeech is uſed for another; e. g. velle ſuum cuique eſt, for voluntas ſui cuique eſt; alſo populus late rex, for populus late regnans.

Antimeria, in a more reſtrained ſenſe, imports a figure, by which the noun is repeated inſtead of the pronoun.

The antimeria is frequent in the Hebrew, and is ſometimes retained in our verſion of the Old Teſtament, accordingly: e. g. Hear my voice, ye wives of Lamech; for my wives. Gen. ch. iv. ver. 23.

ANTIMETABOLE, in rhetoric, denotes a figure which ſets two things in oppoſition to each other.

This figure is twice exemplified in an apophthegm of Muſonius; which, on account of its excellence, is called aureum monitum, the golden maxim or precept; and of which the following is a tranſlation:

"Allowing the performance of an honourable action to be at-
"tended with labour; the labour is ſoon over, but the honour
"immortal: whereas, ſhould even pleaſure wait on the com-
"miſſion of what is diſhonourable, the pleaſure is ſoon gone, and
"the diſhonour eternal."

ANTIMETATHESIS, in rhetoric, is the inverſion of the parts or members of an Antitheſis. Such is that of Cicero, in Verrem, lib. iv. cap. 52. "Compare this peace with that war; the arrival of this governor with the victory of that general; his profligate troops with the invincible army of the other; the luxury of the former with the temperance of the latter; you will ſay, that Syracuſe was founded by him who took it; and taken by him, who held it when founded."

ANTIMONARCHICAL, in politics, is an appellation given to whatever oppoſes monarchy, or kingly government.

Antimonarchical is frequently uſed in the ſenſe of republican.

ANTIMONARCHOMACHI, or Antimonarchomachists, denote the maintainers of monarchical or abſolute power veſted by divine right in the perſons of princes. In which ſenſe, antimonarchomachi ſtand oppoſed to monarchomachi.

ANTIMONIALS, in medicine, denote preparations of antimony; or remedies of which antimony is the principal ingredient.

ANTIMONIATED, implies a medicine, or any thing elſe tinged with the qualities of antimony.

ANTIMONY, in natural hiſtory, is a mineral ſubſtance of a metalline nature; having all the ſeeming characters of a real metal, excepting malleability. It is a compound of a ſhining needle like ſtriæ: its maſſes have no determinate figure. It is made up of a ſemi-metallic ſubſtance, called its regulus, united with ſulphur. It is found in moſt parts of Europe.

There are two kinds of antimony; 1. Antimony native, or mineral, which is in the ſame ſtate as when dug out of the earth. 2. Antimony fuſed, ſo called, becauſe it has been actually fuſed, to ſeparate it from adhering to ſtones and earth. This operation which ought rather to be called liquation than fuſion, conſidering theſe words in their metallurgic ſenſe, is made in great perfection where it is dug.

Antimony is the ſtibium of the ancients; by the Greeks called *ςιμμι*. The reaſon of its modern denomination, antimony, is uſually referred to Baſil Valentine, a German monk, who, as the tradition relates, having thrown ſome of it to the hogs, obſerved, that, after purging them violently, they immediately grew fat upon it. This made him think, that, by giving his fellow-monks a like doſe, they would be the better for it. The experiment, however, ſucceeded ſo ill, that they all died of it; and the medicine, thenceforward, was called antimony, q. d. anti-monk.

Antimony *Ores*, are frequently found in fiſſures and veins at different depths, and often near the very ſurface, and variouſly accompanied with ſpars, cryſtals, ſulphurs, and other ſubſtances.

Antimony, *Ore of*, the way of running down antimony out of its ore by the aſſayers, ſee Syſtem of Metallurgy.

The moſt ready method of fuſing antimony, yet known, is by means of that mineral ſubſtance called cawk. A lump of this, of the bigneſs of a wallnut, thrown red-hot into a pound of antimony in fuſion, converts almoſt the whole ſubſtance of it into glaſs, fifteen ounces of clear and fine glaſs being thus produced; and what is very remarkable, the cawk itſelf never melts in the metal.

Antimony is ſuppoſed, by many chemiſts, to contain the ſeminal principles of all kind of metals; and accordingly the character by which it is denoted in their writings, is the ſame with the character of the earth; to denote that antimony is a kind of microſcoſm.

The modern uſes of antimony are very numerous, and important.

It is a common ingredient in ſpecula, or burning concaves, ſerving to give the compoſition a finer texture. It makes a part in bell metal; and renders the ſound more clear.

It is mingled with tin to make it more hard, white, and ſounding; and with lead, in the caſting of printers letters, to render them more ſmooth and firm.

It is alſo a general help in the melting of metals, and eſpecially in the caſting of cannon balls.

It is likewiſe made uſe of for the purifying and heightening the colour of gold. See Syſtem of Chemistry.

Antimony, at firſt, was of ſervice only in the compoſition of paint. Scripture deſcribes it to us as a ſort of paint, with which the women blacken their eye-brows. Jezebel underſtanding that Jehu was to enter Samaria, painted her eyes with antimony, or, according to the Hebrew, "put her eyes in antimony." As large black eyes were thought the fineſt, thoſe of both ſexes, who were careful of their beauty, rubbed their eyes, eye-lids, and round the eyes, with a needle dipped in a box of paint made of antimony, with a deſign of blackening them.

At this day the women of Syria, Aribia, and Babylonia, anoint and blacken themſelves about the eyes; and both men and women put black upon their eyes in the deſert, to preſerve them from the heat of the ſun, and the piercing of its rays.

M. Darvieux relates that the Arabian women border their eyes with a black colour made of tutty, which the Arabians call rehel. They draw a line of this kind of blacking without the corner of their eyes, to make them appear larger.

Iſaiah, in his enumeration of the ſeveral ornaments belonging to the daughters of Sion, has not forgot the needles which they made uſe of in painting their eyes and eye-lids.

Ezekiel, deſcribing the irregularities of the Jewiſh nation under the idea of a debauched woman, ſays, that ſhe bathed, and perfumed herſelf, and that ſhe anointed her eyes with antimony. Job ſhews ſufficiently how much antimony was in eſteem, by calling one of his daughters a veſſel of antimony, or a box to put paint in, *cornu ſtibii*.

Before the fourteenth century, antimoy had no place in medicine. But, about that time, Baſil Valentine, having found a method of preparing and correcting the dangerous qualities of its ſulphur, publiſhed a book, intituled Currus triumphalis Antimonii, in which he maintained it to be a certain remedy for all diſeaſes. Yet it remained in general neglect, till about the beginning of the ſixteenth century, when it was brought into practice by Paracelſus.

The parliament of Paris, immediately upon this reſtoration, condemned the uſe of it in form; and a phyſician, named Beſnier, having been found a delinquent, he was expelled the faculty.

To enumerate the various eſſences and compounds which bear the name of antimony would be improper in this place, as they will reſpectively have their deſcription under the heads or ſyſtems of PHARMACY and CHEMISTRY.

ANTINŒIA, in antiquity, were annual ſacrifices, and quinquennial games, in memory of Antinous the Bythinian.

ANTINOMIANS, or ANOMIANS, in church hiſtory, denote certain heretics, who firſt appeared about the year 1535, and ſo called becauſe they rejected the law as of no uſe under the goſpel diſpenſation, with other doctrines equally abſurd.

Moſt authors as well as lexicographers, date their origin from John Agricola, their leader, in 1538; but according to the moſt authentic records of hiſtory, I find this date an Anachroniſm, and the pretended founder of the ſect a ſtigma, on a wrong perſon.

ANTINOMY, in a general ſenſe, implies an oppoſition or contraſt to all laws; hence an outlaw is uſually ſtiled an antinomy.

ANTINOUS, in aſtronomy, implies the upper part of the conſtellation Aquila, or the eagle.

ANTIOCHIAN *Sect*, in literature, denotes the 5th branch of the ancient academies, which was founded by Antiochus, a cotemporary of Cicero's.

ANTIOPE, in mythology, the daughter of Micteus, debauched by Jupiter.

ANTIOCHIAN *Epocha*, in chronology, denotes a period for computing time from the proclamation of liberty, granted to the city of Antioch, about the time of the battle of Pharſalia.

ANTI-PÆDO-BAPTISTS, in the hiſtory of the Chriſtian church, denote thoſe ſectariſts who deny baptiſm to be ſufficient during an infantile ſtate, to be emolled in the faith of Chriſt.

ANTIPARALLELS, in geometry, imply thoſe lines which form the ſame angles, with two other lines, cutting them the contrary ways, to that of the parallel lines.

ANTIPATHY, in the natural order of the paſſions, implies an averſion of one body to another, in contradiſtinction to ſympathy.

Several authors endeavour to account for the antipathy between animals, by the following rule: As effluvia and ſpirituous ſteams proceed from the bodies of all creatures, ſome of which diſagree with others, they excite hatred and anger in each other.

In the modern philoſophic definition of ſyſtem, antipathy, with many other eſſential cauſes of animal nature, are explored for the purpoſes of the phyſiologiſt; but with what degree of certainty it is needleſs to remark, as the whole amounts to no more than a repelling power! Thus the hypotheſis falls to the ground, and the learned ranks with the unlearned, becauſe his doctrines can only be founded on principles of unerring truth; namely, that he acts, or performs, agreeably to the propenſities of nature, inculcated by habit: Thus, for inſtance, one man ſhrinks at the ſight of a reptile, whilſt another approaches it undiſturbed, merely becauſe the latter is well acquainted with its nature, whilſt the former never, probably, beheld it before, and in idea conceived an horror at ſuch an object, unſuitable to the emotions it ſhould have incited.

ANTIPATHY, in ethics, implies the contraſt that may be drawn between reaſon, or the action of the mind, and inclination, or the action of the body.

ANTIPATHY, in painting, or other fine arts, denotes the oppoſed quality of colours, or light and ſhade.

ANTIPASCHA, in church ritual, denotes the firſt Sunday after Eaſter, or Dominica in Albis.

ANTIPELARGIA, in ancient law, denotes the duty of children to provide for the age and infirmities of their parents.

ANTIPERISTALTIC, in anatomy, implies the motion of the inteſtines, contradiſtinguiſhed from that of the periſtaltic motion.

ANTIPERISTASIS, in philoſophy, implies an imaginary intention, or heightening of any quality by the oppoſition of its contrary; thus cold is ſaid to augment the heat of the fire; a doctrine which every philoſopher can readily refute.

ANTIPHONA, in muſic, denotes a kind of chant made in the Roman Catholic church. The antiphonæ were ſo named, becauſe in their origin, they were ſung with two choruſſes, which anſwered each other alternately, and the pſalms, and hymns ſung in the church were comprehended under this name.

At preſent the ſignification of this term may be defined, ſhort paſſages drawn from Scripture, which are applicable to the feaſt which is then celebrating, and which preceding, the pſalms and cautics direct their intonation: The name of Antiphona is alſo preſerved in ſome hymns ſung in honour of the bleſſed Virgin Mary.

ANTIPHERNA, in the Greek laws, denoted a marriage ſettlement, which is now denominated a jointure.

ANTIPHONARY, in church ſervice, implies all that part of divine worſhip, which requires the ſolemnity of harmony.

ANTIPHONY, in muſic, was a name which the ancient Greeks gave to that kind of ſymphony, which was performed by divers voices, or by different inſtruments to the octave or double octave, in oppoſition to that which was executed in ſingle uniſon, and which they called homophony.

ANTIPHRASIS, in rhetoric, denotes an ironical expreſſion, or mode of ſpeech contrary to the meaning of the words, as ſimply to ſay one thing and mean another.

ANTIPODES, in geography, denote thoſe inhabitants of the globe which live diametrically oppoſite to each other.

The antipodes lie under oppoſite meredians and oppoſite parallels; in the ſame degree of latitude but of oppoſite denominations, the one north and the other ſouth; their heat, cold, their length of days and nights, are alike, but the ſeaſons oppoſite, for the longeſt day with one is the ſhorteſt with the other, et vice verſa. For a further explanation of this term, ſee Syſtem of GEOGRAPHY.

ANTIPOPE, in the Romiſh church, implies, a perſon elected pope in irregular manner, in oppoſition to another.

ANTIPORTICO, in architecture, implies the porch or entrance into an edifice.

ANTIPROBABILISM, in ſcience, imports a poſition which admits of doubts, in contradiſtinction to that which admits of none.

ANTIPROBOLE, in law, implies a rhetorical figure, which denotes an admiſſion of a crime or what we modernly define pleading guilty.

ANTIPROPEMPTICON, in poetry, implies a farewell poem, previous to a long journey.

ANTIPSORA, in pharmacy, denotes a medicine, good againſt the itch.

ANTIPTOSIS, in rhetoric, ſignifies a figure, by which one caſe is put for another.

ANTIQUARE, in the Roman law, denoted much the ſame as a negative to a new ſtatute in our parliament, as it is implied a voice of diſſent to a new law, or rejecting its principles.

Hence obſolete laws in theſe days are called antiquare, or antiquated laws.

ANTIQUARIUM, in antiquity, denoted a chamber to keep antiquities in.

ANTIQUARY, implies a perſon who ſtudies and ſearches after monuments and remains of antiquity; as old medals, books, ſtatues, ſculptures, and inſcriptions; and, in general, all curious pieces that may afford any light into antiquity.

There was an ancient college of antiquarics erected in Ireland by Ollamh Fodhla, 700 years before Chriſt, for compoſing a hiſtory of that country: and to this, ſay the Iriſh hiſtorians, it is owing that the hiſtory and antiquities of that kingdom may be traced back beyond thoſe of moſt other nations.

There is a ſociety of antiquaries in London, and another in Edinburgh, incorporated by the king's charter.

ANTIQUARY is alſo uſed by ancient writers for the keeper of the antiquarium or cabinet of antiquities. This officer is otherwiſe called Archæota, or antiquary of a king, a prince, a ſtate, or the like.

ANTIQUATED, denotes ſomething obſolete, or out of date.

ANTIQUE, in a general ſenſe, denotes ancient; but the term is chiefly uſed by ſculptors, painters, and architects, to denote ſuch pieces of their different arts as were made by the ancient Greeks and Romans.

ANTIQUE is ſometimes contradiſtinguiſhed from ancient, which ſignifies a leſs degree of antiquity.

ANTIQUITIES, a term implying all teſtimonies, or authentic accounts that have come down to us of ancient nations.

Antiquities form a very extenſive ſcience, including, "an hiſtorical knowledge of the edifices, magiſtrates, offices, habiliments, manners, cuſtoms, ceremonies, worſhip, and other objects worthy of curioſity, of all the principal ancient nations of the earth."

ANTIQUITY ſignifies times, or ages long ſince paſt.

ANTIQUITY alſo denotes the works or monuments of antiquity.

ANTIQUITY likewiſe expreſſes the great age of a thing; and in this ſenſe we ſay the antiquity of a family, the antiquity of a kingdom, &c.

ANTIRRHINUM, ſnap-dragon, or calves-ſnout, a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, Perſonatæ. For the characters, ſee Syſtem of BOTANY. There are 14 ſpecies of the antirrhinum, 10 of which are natives of Britain, viz. the cymbalaria, or ivy-leaved toad-graſs; the elatine, or ſharp-pointed fluellin; the ſpurium, or round-leaved fluellin; the arvenſe, or corn blue toad-flax; the repens, or creeping toad-flax; the monoſpermum, or ſweet-ſmelling toad-flax: the linaria, or common yellow toad-flax; the minus, or leaſt toad-flax; the majus, or greater ſnap-dragon; and the orontium, or leaſt ſnap-dragon. The linnria is ſaid to be cathartic and diuretic.

ANTISAGOGE, in rhetoric, ſignifies a figure ſynonymous with conceſſion.

ANTISCII, denote people who live on different ſides of the equator, whoſe ſhadows at noon are projected oppoſite ways.

ANTISCORBUTICS, in pharmacy, are medicines good in ſcorbutic caſes.

ANTISEPTICS, an appellation given to ſuch ſubſtances as reſiſt putrefaction.

The following table from Dr. Pringle, exhibits a comparative view of the antiſceptic virtue of ſalts; the common ſea ſalt being reckoned equal to unity.

Sea-ſalt	1	Saline mixture	3
Sal gemmæ	1	Nitre	4
Tartar vitriolated	2	Salt of hartſhorn	4
Spiritus Mindereri	2	Salt of wormwood	4
Tartarus ſolubilis	2	Borax	12
Sal diureticus	2	Salt of amber	20
Crude ſal ammoniac	3	Alum	30

Some reſinous and other ſubſtances were found to be 12 times more antiſceptic than ſea ſalt; ſuch are myrrh, aſafætida, terra japonica, and aloes.

Two grains of camphor is equivalent to ſixty grains of that ſalt. An infuſion of a few grains of Virginian ſnake-root, in powder, exceeds twelve times its weight of ſea-ſalt. Camomile flowers have nearly the ſame extraordinary quality. The Jeſuits bark has it alſo. Beſides theſe, pepper, ginger, ſaffron, contrayerva-root, are twelve times more antiſeptic than ſea-ſalt.

Dried ſage, rhubarb, the root of the wild valerian, mint, angelica, ground ivy, ſenna, green tea, red roſes, wormwood, muſtard, and horſe-radiſh, were likewiſe found more antiſeptic than the ſtandard.

Antiſeptics are preſcribed in all putrid, malignant, and peſtilential caſes.

It is to be remarked, however, that different kinds of them are to be given in different diſeaſes, and even in different ſtages of the ſame diſeaſe. Thus, the bark is a ſpecific in a gangrene, when the veſſels are relaxed, and the blood reſolved or diſpoſed to putrefaction; but will fail, if the veſſels are too full, or the blood be too thick. With the ſame caution is the bark to be uſed in wounds, viz. chiefly in caſes of abſorbed matter, when it infects the humours, and brings on a hectic fever.

ANTISPASMODICS, in pharmacy, are medicines proper for the cure of ſpaſms and convulſions. Opium, balſam of Peru, and the eſſential oils of many vegetables, are the principal in this claſs of medicines.

ANTISPASTUS, in poetry, denotes a foot conſiſting of four ſyllables, the firſt and fourth ſhort, and the ſecond and third long.

ANTISTASIS, in oratory, implies a defence of an action from the conſideration that had it been omitted worſe would have enſued.

ANTISTES, or Antistæ, in antient and modern orders of divine worſhip, both Pagan and Jewiſh, as well as Chriſtian, denotes the heads of the church.

ANTISTIGMA, in grammar, implies the notation of a ſentence which requires tranſpoſition.

ANTISTŒCHON, in grammar, implies the uſing of one letter inſtead of another; as *olli* for *illi*.

ANTISTROPHE, in grammar, a figure by which two things mutually depending on one another, are reeiprocally converted; as, the ſervant of the maſter, the maſter of the ſervant.

Antistrophe, among lyric poets, denotes that part of a ſong and dance in uſe among the ancients, which was performed before the altar, in returning from weſt to eaſt; in oppoſition to ſtrophe.

ANTISYLLOGISM, in logic, inſers a contrary concluſion to that of another ſyllogiſm.

ANTITACTÆ, in church hiſtory, ſignify a branch of gnoſtics, who held, that God was good and juſt, but that a creature had created evil; and conſequently that it is our duty to oppoſe this author of evil, in order to avenge God of his adverſary.

ANTITHENAR, in anatomy, a name given to the adductor incicis.

ANTITHESIS, in rhetoric, implies a contraſt or oppoſition of words or ſentiments. Such is that of Cicero, in the ſecond Catilinarian: "On one ſide ſtands modeſty, on the other impudence; on one fidelity, on the other deceit; here piety, there ſacrilege; here continency, here luſt, &c."

Antithesis is ſometimes uſed for controverſy. In this ſenſe, we meet with antithetic method, antithetic diſcourſes, &c.

ANTITRAGUS Musculus, in anatomy, a muſcle of the ear.

ANTITRINITARIANS, thoſe who deny the Trinity, and teach that there are not three perſons in the Godhead.

Thus the Samoſatenians, who do not believe the diſtinction of perſons in God; the Arians, who deny the divinity of the word; and the Macedonians, who deny that of the Holy Spirit, are all properly Antitrinitarians.

Among the moderns, Antitrinitarians are particularly underſtood of Socinians, called alſo Unitarians.

ANTITYPE, a Greek word, properly ſignifying a type or figure correſpondent to ſome other type.

There are two places in the New Teſtament, viz. in the Epiſtle to the Hebrews, ix. 24. and in St. Peter, 1 Ep. iii. 21. where this word occurs, and its genuine import has been much controverted.

The former ſays, that "Chriſt is not entered into the holy places made with hands, which are αντιτυπα, the figures or antitypes of the true, now to appear in the preſence of God for us."

In the latter paſſage, the Apoſtle, ſpeaking of Noah's flood, and the deliverance only of eight perſons in the ark from it, ſays, Ω και ημας αντιτυπον νυν σωζει βαπτισμα, *baptiſm, being an antitype to that, now ſaves us; not putting away the filth of the fleſh, but the anſwer of a good conſcience towards God, &c.*

The meaning is, that righteouſneſs, or the anſwer of a good conſcience towards Cod, now ſaves us by means of the reſurrection of Chriſt, as formerly righteouſneſs ſaved thoſe eight perſons by means of the ark, during the flood.

Here it ſignifies a general ſimilitude of circumſtances; and the particle ω, *whèreunto*, refers, not to the immediate antecedent, υδατος, *water*, but to all that precedes.

Antitype, among the ancient Greek fathers, and in the Greek liturgy, is alſo applied to the ſymbols of bread and wine in the Sacrament. Hence it hath been argued, by many Proteſtants, that the Greeks do not really believe the doctrine of tranſubſtantiation; becauſe they call the bread and wine *antitypes*, αντιτυπα, q. d. figures, ſimilitudes; and this even after the conſecration.

ANTLER, in the manege, implies a ſtart or branch of a deer's attire.

Brow Antler, denotes the branch next the head; and

Bes Antler, the branch next above the brow-antler.

ANTLIA, in ancient mechanics, is ſuppoſed to be the ſame with our pump. Hence the phraſe, *in antliam condemnari*, according to the critics, denotes a kind of puniſhment, by which criminals were condemned to drain ponds, ditches, or the like.

ANTŒICI, in geography, thoſe inhabitants of the earth who live under the ſame meridian, and at the ſame diſtance from the equator; the one north, and the other ſouth.

They have the ſame longitude; and their latitude is alſo the ſame, but of a different denomination.

They are in the ſame ſemicircle of the meridian, but oppoſite in parallels. They have preciſely the ſame hours of the day and night, but oppoſite ſeaſons. If the antœici both turn their faces towards the equator, the ſtars and planets will riſe to me on the right hand, and to the other on the left.

ANTOMOSIA, in ancient law, denoted the oaths of the proſecutor and the delinquent in criminal caſes.

The former alledged on oath the whole of his charge, and the latter denied on oath either the whole or part of it; then the judges proceeded to conſider of both claims, the one of guilt and the other of innocence, and decided on the merirs by circumſtantial evidence.

ANTONIAN Waters, in the materia medica, a mineral ſpring of Germany, remarkably well taſted, and good againſt various complaints proceeding from the foulneſs of the blood.

ANTONOMASIA, implies a form of ſpeech, in which, for a proper name, is put the name of ſome dignity, office, profeſſion, ſcience, or trade; or when a proper name is put in the room of an appellative.

Thus a king is called, his Majeſty; a nobleman, his Lordſhip; a wiſe man, Solomon; and a grave man, Cicero. Hence the appellatives, an Engliſhman, Iriſhman, Frenchman, &c. as derivatives from their country, profeſſion, &c.

ANTOPHYLLUS, in botany, denotes the fruit of the clove tree.

ANTOSIANDRIANS, imply a ſect of rigid Lutherans, who oppoſe the doctrine of Oſiander relating to juſtification.

ANTRUM, among anatomiſts, denotes ſeveral cavities of the body: as the antrum high-morianum, or that in the maxillary or jaw bone; antrum pylori, or that at the bottom of the pylorus, &c.

ANUBIS, in mythology, a ſymbolical deity of the Egyptians who regarded as the faithful companion of Oſiris and Iſis. Temples and prieſts were conſecrated to him, and his image was borne in all religious ceremonies. He was repreſented with a dog's head; and frequently under the figure of a dog.

ANUS, in anatomy, ſignifies the lower extremity of the inteſtinum rectum, or orifice of the fundament.

ANVIL, implies a ſmith's utenſil, ſerving to place the iron on it, to be hammered or forged.

The face of the anvil, muſt be very flat and ſmooth, without flaws, and ſo hard that a file will not touch it.

At one end there is a pike, or beak-iron, for the rounding of hollow work. The whole is uſually mounted on a firm wooden block.

Forged anvils are better than thoſe of caſt work, and the beſt have the upper part made of ſteel.

AONIDES, in mythology, is one of the many appellations of the muſes; ſo called from Aonia, a part of ancient Bœotia.

AORASIA, or Aoritia, in antiquity, implies the inviſibility of the gods.

The opinion of the ancients was, that they never ſhowed themſelves face to face, but were known from their backs as they withdrew.

AORIST, or Aoristus, among grammarians, denotes a tenſe peculiar to the Greek and French languages, comprehending all the tenſes.

AORISTIA, in the ſceptic philoſophy, denotes that ſtate of the mind in which we neither aſſert or deny any thing poſitively, but only ſpeak of things as appearing to us in ſuch a manner.

The aoriſtia is one of the great points of ſcepticiſm, to which the philoſophers of that denomination had continual recourſe by way of explication, or ſubterfuge.

AORTA, in anatomy, implies the great artery which riſes immediately from the left ventricle of the heart, and is from thence diſtributed to all parts of the body.

It is divided into two grand trunks, diſtinguiſhed by the epithets aſcending and deſcending.

AOUTA, in commercial diſtinctions, is the name of the paper mulberry-tree at Otaheite, in the South Sea, from which a cloth is manufactured, that is worn by the principal inhabitants.

APACHES, denote a people of New Mexico in North America. They are brave, reſolute, and warlike, fond of liberty, and the inveterate enemies of tyranny and oppreſſion.

APÆDUSIA, in literature, denotes an ignorance of ſcience. The term apædeutæ was particularly uſed among the French in the time of Huet: when the men of wit at Paris were divided into two factions, one called by way of reproach apædeutæ, and the others eruditi.

The apædeutæ are repreſented by Huet, as perſons who, finding themſelves either incapable, or unwilling to undergo a ſevere courſe of ſtudy in order to become truly learned, conſpired to decry learning, and turn the knowledge of antiquity into ridicule, thus making a merit of their own incapacity.

The apædeutæ in effect were the men of pleaſure; the eruditi the men of ſtudy.

APAGMA, in ſurgery, denotes the thruſting of a bone or joint out of its proper place or ſocket.

APAGOGE, in logic, ſynonymous with Abduction.

Apagoge, in the Athenian law, the carrying a criminal taken in the fact to the magiſtrate. If the accuſer was not able to bring him to the magiſtrate it was uſual to take the magiſtrate along with him to the houſe where the criminal lay concealed, or defended himſelf.

Apagoge, in mathematics, denotes a progreſs from one propoſition to another.

APAGOGICAL Demonstration, in mathematical ſciences, implies an indirect way of proof, by ſhewing the abſurdity of the contrary.

APANAGE, or Appennage, in the French laws, are lands aſſigned by a ſovereign for the ſubſiſtence of his younger ſons, which revert to the crown upon the failure of male iſſue in that branch to which the lands are granted.

APANTHROPY, in medicine, a love of ſolitude, and an averſion to the company of mankind.

Apanthropy is by ſome reckoned among the ſymptoms, by others among the ſpecies or degrees, of melancholy; and alſo paſſes for an ill indication in lencophlegmatic caſes.

APARINE, in botany, a ſynonyme of the utricularia and ſeveral other plants.

APARITHMESIS, in rhetoric, denotes the anſwer to the protaſis or propoſition itſelf. Thus, if the protaſis be, *Appellandi tempus nomerat*, the aparithmeſis, is *At tecum anno plus vixi*. It ſometimes implies a circum locum.

APARTISMENUS, in ancient poetry, an appellation given to a verſe, which comprehended an entire ſentence in itſelf.

This is ſometimes alſo written, apartemenus, i. e. ſuſpended, as not needing any following verſe.

APARTMENT, in a legal ſenſe, implies that part of an houſe containing the neceſſary conveniencies to reſide in, as a dwelling in every reſpect fully complete.

APATHY, among the ancient philoſophers, implied an utter privation of paſſion, and an inſenſibility of pain.

The ſtoics affected an entire apathy: they conſidered it as the higheſt wiſdom to enjoy a perfect calmneſs or tranquility of mind, incapable of being ruffled by either pleaſure or pain.

The primature chriſtians adopted the term apathy to expreſs a contempt of all earthly concerns, ſuch as the goſpel preſcribes.

APATURIA, in antiquity, a ſolemn feaſt celebrated by the Athenians in honour to Bacchus.

APAULIA, in antiquity, implies the third day after marriage. It was thus called, becauſe the bride, returning to her father's houſe, lodge apart from the bridgroom.

APE, in zoology is the general Engliſh name of a very numerous race of animals, the natural hiſtory of which is given at large under the article Simia: comprehending apes, monkeys, and baboons.

Sea Ape, a name given by Steller to a marine animal he ſaw on the coaſt of America, which he deſcribes as follow: "The head appeared like that of a dog, with ſharp and upright ears, large eyes, and with both lips bearded: the body round and conoid; the thickeſt part near the head: the tail forked; the upper lobe the longeſt: the body covered with thick hair, grey on the back, rediſh on the belly. It ſeemed deſtitute of feet. It was extremely wanton, and played a multitude of monkey-tricks. It ſometimes ſwam on one ſide, ſometimes on the other ſide of the ſhip, and gazed at it with great admiration. It made ſo near an approach to the veſſel, as almoſt to be touched with a pole; but if any body moved, it inſtantly retired. It would often ſtand erect for a conſiderable ſpace, with one-third of its body above water; then dart beneath the ſhip, and appear on the other ſide; and repeat the ſame thirty times together. It would frequently ariſe with a ſea-plant, not unlike the bottle-gourd, toſs it up, and catch it in its mouth, playing with it numberleſs fantaſtic tricks."

APEEK, in the marine, implies, perpendicular to the anchor: a ſhip is ſaid to be in this ſituation when the cable is drawn ſo tight into the bow as to bring her directly over the anchor, ſo that the cable bears right down from the ſhip's ſtem.

APELLA, among phyſicians, is a name given to thoſe whoſe prepuce is either wanting or ſhrunk, ſo that it can no longer cover the glans.

APENE, in antiquity, a kind of chariot wherein the images of the gods were carried in proceſſion on certain days, attended with a ſolemn pomp, ſongs, hymns, and dancing.

APENNIS, in ancient law, ſignified a record given to a perſon who had loſt deeds, papers, or writings, by fire or other caſualty; in which caſe the record bore teſtimony of the event, ſo that the original writings could be legally diſpenſed with.

APEPSIA, or Apepsy, in medical language, implies indigeſtion. A mixture of muſtard-ſeed, with the columbo root, is of admirable utility in complaints of this kind; particularly where acidity and flatulence prevail much in the primæ viæ.

APER, implies a ſynonyme of the boar, in zoology; the faber or doree, in ichthyology, and to the tajacu, in natural hiſtory.

APEREA, in zoology, is a ſmall ſpecies of the American rabbit, little bigger than a rat.

APERIENS *Palpebram Rectus*, in anatomy, implies the muſcle of the eye-lid.

APERIENTS, in the materia medica, are ſuch medicines as facilitate the circulation of the humours, by removing obſtructions.

The five aperient roots of the ſhops are ſmallage, fennel, aſparagus, parſley, and butcher's broom.

APERNE, in antiquity, ſynonymous with Apene.

APERTIONS, in architecture, ſignify every opening in a building, and are ſynonymous with apertures.

APERTURA Tabularum, in law, denotes the breaking open or unſealing a laſt will and teſtament, after the deceaſe of the teſtator.

APERTURE, implies the opening or cleft in any continuous ſubject.

Aperture, in geometry, is the ſpace between two right lines which meet in a point and form an angle.

Aperture, in optics, is a round hole in a turned bit of wood or plate of tin, placed within the ſide of a teleſcope or microſcope, near to the object-glaſs, by means of which more rays are admitted, and a more diſtinct appearance of the object is obtained.

Apertures, in architecture, ſignify doors, windows, chimneys, &c.

APETALOSE, or Apetalous, among botaniſts, is an appellation given to ſuch plants as have no flower-leaves.

APEUCTICTIC, in divine poetry, implies an hymn to the Deity, to avert ſome threatened evil.

APEX is the vertex or ſummit of any thing, whoſe top is of a globular form.

Apex, in antiquity, denotes the creſt of a helmet, alſo a kind of cap worn by the Flamens.

Apex, among grammarians, denotes the mark of a long ſyllable, falſely called a *long accent*.

APHANES, in botany, is a genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 35th order, Senticoſæ. The eſſential characters are theſe: the calyx is divided into eight parts; there is no corolla; the ſeeds are two, and naked. There is only one ſpecies, the arvenſis or parſley-piert, a native of Britain. It is extremely common in corn-fields.

APHASIA, in the ſceptic philoſophy, denotes a ſtate of doubt, in which a perſon not knowing what to determine on, it is beſt for him to be ſilent.

In this ſenſe, aphaſia ſtands oppoſed to phaſis, under which are included both aſſertion and negation.

APHÆRESIS, in grammar, ſignifies a figure, by which a letter or ſyllable is cut off from the beginning of a word. Thus *ciconio*, by aphæreſis, is written *conia*; *contemnere*, *temnere*; *omittere*, *mittere*, &c. and contradiſtinguiſhed from a retrenchment at the end of a word, which is called an apocope.

Aphæresis, in medicine, denotes a neceſſary removal of ſomething that is noxious. In ſurgery, if ſignifies an operation by which ſomething ſuperfluous is taken away.

APHEBA, in rhetoric, implies a ſimplicity of diction in a diſcourſe.

APHELIUM, or Aphelion, in aſtronomy; is that point in any planit's orbit, in which it is fartheſt diſtant from the ſun, being that end of the greater axis of the elliptical orbit of the planet moſt remote from the focus where the ſun is.

APHERNOUSLI, in natural hiſtory, a trivial name for the wild Alpinian pine.

APHETERIA, in ancient military art, an engine to conduct the battering ram in beſieging a fortreſs.

APHILANTHROPY, in phyſic, denotes a ſpecies of melancholy inſanity.

APHIOCEM, in pharmacy, implies a ſleeping doſe, previous to an operation of ſome danger on the human body. It alſo implies a kind of vegetable ſyrup drawn from the buds of trees by the Arabs, which has much the ſame intoxicating quality of opium.

APHIS, in zoology, the puceron, vine-fretter, or plant-louſe, a genus of inſects belonging to the order of inſecta hemiptera.

The roſtrum or beak of the aphis is inflected; the antennæ or feelers are longer than the thorax; the wings four, erect, or are wanting; the feet are of the ambulatoy kind; and the belly often ends in two horns, from which is ejected that moſt delicate juice called honey-dew.

There are 33 ſpecies of the aphis, all of them inhabitants of particuiar plants, from which their trivial names are taken; as, aphis ribis, ulmi, roſæ, &c.

Linnæus ſays that there ſeem to be a greater variety of plants producing aphides than there are different ſorts of this inſect.

The plum-tree has two ſorts very diſtinct from each other: one of a yellowiſh green the other of a bluiſh green, amelled with white, and the ſhape more oblong.

On the gooſeberry and currant buſhes the ſame aphides may be found; but each of theſe is inhabited by two very different ſpecies: one of a duſky green, with a ſhort plump body; the other of a paler green the body more taper, and tranſverſely wrinkled.

The roſe-tree, ſupports not leſs than three diſtinct ſpecies: the largeſt is of a deep green, the ſecond ſort is of a paler green, and the third ſort is of a pale red.

The extraordinary nature of theſe inſects have for ſome time paſt juſtly excited the wonder and attention of naturaliſts.

In a letter from the celebrated Mr. Trembley to Mr. Bonnet, dated at the Hague, the 27th January 1741, he thus expreſſes himſelf: "I formed, ſince the month of November, the deſign of rearing ſeveral generations of ſolitary pucerons, in order to ſee if they would all equally bring forth young. In caſes ſo remote from uſual circumſtances, it is allowed to try all ſorts of means; and I argued with myſelf, Who knows, but that one copulation might ſerve for ſeveral generations? This "*who knows*," to be ſure, was next to avouching nothing; but as it came from Mr. Trembley, it was ſufficient to perſuade Mr. Bonnet that he had not gone far enough in his inveſtigation. If the fecundity of aphides was owing to the ſecret copulation ſuggeſted by Mr. Trembley; this copulation ſerved at leaſt five or more ſucceſſive generations. Mr. Bonnet therefore reared to the amount of the tenth generation of ſolitary aphides, and had the patience to keep an account of the days and hours of the births of each generation. In ſhort, it was diſcovered, That they are really diſtinguiſhed by ſexes: that there are males and females amongſt them, whoſe amours are the leaſt equivocal of any in the world: that the males are produced only in the tenth generation, and are but few in number; that theſe, ſoon arriving at their full growth, copulate with the females; that the virtue of this copulation ſerves for ten generations; that all theſe generations, except the firſt (from the fecundated eggs) are produced viviporous; and all the individuals are females, except thoſe of the laſt generations, among whom, as we have already obſerved, ſome males make their appearance, to lay the foundations of a freſh ſeries. Theſe circumſtances have been confirmed by other naturaliſts. In particular, we have a curious and accurate detail of them by Dr. Richardſon of Rippon, in the Philoſophical Tranſactions, Vol. XI. Art. 22, an extract of which we ſhall here inſert, in order to give the reader as full an inſight into the nature of theſe ſingular inſects, as can be done by a mere detail of facts in themſelves utterly unaccountable.

"The great variety of ſpecies which occur in the inſects now under conſideration, may make an enquiry into their particular nature, ſeem not a little perplexed; having them, however, ſkilfully reduced under their proper genus, the difficulty is by this means conſiderably diminiſhed. All the inſects comprehended under any diſtinct genus, we may reaſonably ſuppoſe to partake of one general nature; and, by diligently examining any of the particular ſpecies, may thence gain ſome inſight into the nature of all the reſt. With this view I have choſen, out of the various ſorts of aphides, the largeſt of thoſe found on the roſe-tree; not only as its ſize makes it the more conſpicuous, but as there are few others of ſo long a duration. This ſort, appearing early in the ſpring, continues late in the autumn; whilſt ſeveral are limited to a much ſhorter term, in conformity to the different trees and plants from whence they drew their nouriſhment.

1. "If at the beginning of February the weather happens to be ſo warm as to make the buds of the roſe-tree ſwell and appear green; ſmall aphides are frequently to be found upon them, not larger than the young ones in ſummer when firſt produced. But there being no old ones to be found at this time of the year, which in ſummer I had obſerved to be viviparous, I was formerly not a little perplexed by ſuch appearances, and almoſt induced to give credit to the old doctrine of equivocal generation. That the ſame kind of animal ſhould at one time of the year be viviparous, and at another time oviparous, was an opinion I could then by no means entertain. This, however, frequent obſervation has at laſt convinced me to be fact; having found thoſe aphides, which appear early in the ſpring, to proceed from ſmall black oval eggs which were depoſited on the laſt years ſhoots in autumn: though, when it happens that the inſects make too early an appearance, I have obſerved the greateſt part to ſuffer from the ſharp weather that uſually ſucceeds, by which means the roſe-trees are ſome years in a manner freed from them.

"Thoſe which withſtand the ſeverity of the weather ſeldom come to their full growth before the month of April; at which time they uſually begin to breed, after twice caſting off their exuviæ or outward covering. It appears then that they are all females, which produce each of them a very numerous progeny, and that without having intercourſe with any male inſect. As I obſerved before, they are viviparous; and what is equally uncommon, the young ones all come into the world backwards. When they firſt come from the parent, they are enveloped by a thin membrane, having in this ſituation the appearance of an oval egg; which, I apprehend, muſt have induced Reaumur to ſuſpect that the eggs diſcovered by Bonnet were nothing more than mere abortions. Theſe egg-like appearances adhere by one extremity to the mother; while the young ones contained in them extend the other; by that means gradually drawing the ruptured membrane over the head and body to the hind feet. During this operation, and for ſome time after, by means of ſomething glutinous, the fore part of the head adheres to the vent of the parent. Being thus ſuſpended in the air, it ſoon frees itſelf from the membrane in which it was confined, and, after its limbs are a little ſtrengthened, is ſet down on ſome tender ſhoot, and then left to provide for itſelf.

2. "In the ſpring months, there appear on the roſe-trees but two generations of aphides, including thoſe which immediately proceed from the laſt year's eggs; the warmth of the ſummer adds ſo much to their fertility, that no leſs than five generations ſucceed one another in the interval. One is produced in May, which caſts off its covering; while the months of June and July each ſupply two more, which caſt off their covering three or four times, according to the different warmth of the ſeaſon. This frequent change of the outward covering is the more extraordinary, as it is the ofteneſt repeated when the inſects come the ſooneſt to their growth; which I have ſometimes obſerved to happen in ten days, where warmth and plenty of nouriſhment have mutually conſpired. From which conſiderations I am thoroughly convinced that theſe various coverings are not connate with the inſect; but that they are, like the ſcarf-ſkin, ſucceſſiively produced.

"Early in the month of June, ſome of the third generation which were produced about the middle of May, after caſting off their laſt covering, diſcover four erect wings, much longer than their bodies: and the ſame is obſervable in all the ſucceeding generations, which are produced during the ſummer months; without, however, diſtinguiſhing any diverſity of ſex, as is uſual in ſeveral other kinds of inſects. For ſome time before the aphides come to their full growth, it is eaſy to diſcover which of them will have wings, by a remarkable fullneſs of the breaſt, which, in the others, is hardly to be diſtinguiſhed from the body. When the laſt covering is rejected, the wings, which were before folded up in a very narrow compaſs, gradually extend themſelves in a moſt ſurpriſing manner, till their dimenſions are at laſt very conſiderable. But theſe winged ones have the peculiarity, that the number of them does not ſeem ſo much to depend on their original ſtructure, as on the quantity or quality of the nouriſhment with which they are ſupplied: it being frequently obſerved, that thoſe on a ſucculent ſhoot have few or none with wings among them, while others of the ſame generation, on a leſs tender branch, are moſt of them winged; as if only the firſt rudiments of wings were compoſed in the former, while nature thought proper to expand them in the latter, that they might be more at liberty to ſupply their wants.

"The increaſe of theſe inſects in the ſummer-time is ſo very great, that, by wounding and exhauſting the tender ſhoots, they would frequently ſuppreſs all vegetation, had they not many enemies which reſtrain them. To enumerate the variety of other inſects that in their worn and fly ſtate are conſtantly deſtroying them, would exceed the bounds of the preſent deſign: there is one however, ſo ſingular in the manner of executing its purpoſe, that I cannot paſs by it without ſome further notice. This is a very ſmall black ichneumon fly, with a ſlender body and very long antennæ, which darts its pointed tail into the bodies of the aphides, at the ſame time depoſiting an egg in each. This egg produces a worm, which feeds upon the containing inſect till it attains its full growth; when it is uſually changed to that kind of fly from whence it came. In this, however, it is ſometimes prevented by another ſort of ſmall black fly, which wounds this worm through its pearl-like habitation; and by laying one of its eggs therein, inſtead of the former fly, produces its own likeneſs. I muſt, however, further obſerve, notwithſtanding theſe inſects have many enemies, they are not without friends; if we may conſider thoſe as ſuch who were very officious in their attendance, for the good things they expect to reap thereby. The ant and the bee are both of this kind, collecting the honey in which the aphides abound; but with this difference, that the ants are conſtant viſitors, the bee only when flowers are ſcarce. To which let me alſo add, that the ants will ſuck in the delicious nectar while the aphides are in the act of diſcharging it from the anus; but the bees only collect it from the leaves on which this honey-dew has fallen.

3. " In the autumn I find three more generations of aphides to be produced; two of which make their appearance in the month of Auguſt, and the third uſually appear before the middle of September. As the two firſt differ in no reſpect from thoſe which we meet with in ſummer, it would be waſting time to dwell any longer upon them; but the third, differing greatly from all the reſt, demands our giving it a more ſerious attention. Though all the aphides which have hitherto appeared were females, in this tenth generation are found ſeveral male inſects; not that they are by any means ſo numerous as the females, being only produced by a ſmall number of the former generation. To which I muſt further add, that I have obſerved thoſe which produce males, previouſly to have produced a number of females; which in all reſpects reſembling thoſe already deſcribed, I ſhall decline taking into any further conſideration.

" The females have at firſt altogether the ſame appearance with thoſe of the former generations: but in a few days their colour changes from a green to a yellow, which is gradually converted into an orange colour before they come to their full growth. They differ likewiſe in another reſpect, at leaſt from thoſe which occur in the ſummer, that all thoſe yellow females are without wings. The male inſects are, however, ſtill more remarkable, their outward appearance readily diſtinguiſhing them from the females of this and all other generations. When firſt produced, they are not of a green colour like the reſt, but of a reddiſh brown; and have afterwards, when they begin to thicken about the breaſt, a dark line along the middle of the back. Theſe male inſects come to their full growth in about three weeks time, and then caſt off their laſt covering; the whole inſect being, after this operation, of a bright yellow colour, the wings only excepted. But after this they ſoon change to a darker yellow, and in a few hours to a very dark brown; if we except the body, which is ſomething lighter coloured, and has a reddiſh caſt. They are all of the winged ſort; and the wings, which are white at firſt, ſoon become tranſparent, and at length appear like very fine black gauze.

" The males no ſooner come to maturity than they copulate with the females; in which act they are readily diſcovered, as they remain in conjunction for a conſiderable time, and are not eaſily diſturbed. The commerce between them continues the whole month of October, and may be obſerved at all times of the day, though I have found it moſt frequent about noon: eſpecially when the weather is moderately warm, and the ſun overcaſt. The females, in a day or two after their intercourſe with the males, I have obſerved to lay their eggs; which they uſually do near the buds, when they are left to their own choice. Where there are a number crowded together, they of courſe interfere with each other; in which caſe they will frequently depoſite their eggs on others parts of the branches, or even on the ſpines with which they are beſet."

APHLASTUM, in the antient navigation, was a wooden ornament, ſhaped like a plume of feathers, faſtened on the gooſe or ſwan's neck, uſed by the ancient Greeks in the heads of their ſhips.

It ſeems alſo to have had this further uſe, viz. by the waving of a party-coloured ribband faſtened to it, to indicate from what quarter the wind blew.

APHONIA, among phyſicians, ſignifies a ſuppreſſion or total loſs of voice.

APHORISM, implies a maxim or principle of ſcience; which comprehends a great deal in a few words. The term is chiefly uſed in medicine and law.

APHRACTI, in the ancient military art, denotes open veſſels without decks or hatches, furniſhed only at head and ſtern with croſs planks, on which the men ſtood to fight.

APHRODISIA, in antiquity, denotes feſtivals kept in honour of Venus, by the Cyprians.

APHRODISIACS, among phyſicians, denotes medicines which create an inclination to venery.

APHRODISIUS, in chronology, denotes the 11th month of the Bythinian year, commencing on the 25th of July.

APHRODITA, in zoology, is an inſect of the order of vermes molluſca, the body of which is oval, with many ſmall protuberances on each ſide, which ſerve as ſo many feet: the mouth is cylindrical at one end of the body, and capable of being retracted, with two briſtly tentacula.

There are four ſpecies, viz. 1. The aculeata, or ſea-mouſe, with 32 tentacula or feet, an inhabitant of the European ſeas, and are often found in the belly of the cod-fiſh. 2. The ſcabra, of an oblong ſhape, ſcabrous on the back, with 20 tentacula; inhabits the Belgic ſea. 3. The ſquamata, with 24 feet, and ſcaly on the back; inhabits the European ocean. 4. The imbricata, is very like the former, only its ſcales are more glabrous; inhabits the Northern ocean.

APHRODITARIUM, in pharmacy, denotes drying medicines, compounded of dry qualities, and conſequently taken in powders.

APHRODITE, in mythology, one of the names of Venus, derived from *αφρος*, *froth*, becauſe ſhe is ſuppoſed to have been produced from the froth of the ſea.

APHRONITRE, in natural hiſtory, is a name given by the ancients to a particular kind of natrum.

APHROSELENOS, in natural hiſtory, a ſynonyme of Selenites, or lapis ſpecularis.

APHTHÆ, in medicine, imply ſmall ſuperficial ulcers ariſing in the mouth.

APHUA *Cobites*, in ichthyology, the ſame with ſea-leach.

APHYLLANTHES, in botany, a leafleſs flower, or blue montpellier pink, a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 5th order, Tetrapetaloidæ. In character it is the ſame as the juncus, or ruſh, except a calyx of ſix petals.

There is only one ſpecies, the Monſpelienſes, a native of France. The ſtalk is round, ſmooth, without a joint or knot, naked, and tolerably firm; at its top ſtands a ſingle and very beautiful blue flower, ariſing from a kind of compound imbricated cup.

APIARIA, in entomology, ſignifies a ſpecies of the attelabus, or two-winged autumn parſley fly.

APIARY, denotes a place where bees are kept.

APIASTELLUM, in botany, is ſynonymous with baum and bryony.

APIASTER, in ornithology, is the trivial name of a ſpecies of the merops.

APIASTRUM, in botany, was a ſynonyme with the ancients for good and evil plants, e. g. the balm as good, and water crowfoot, as evil. The one was of an healing quality, and the other deadly poiſon.

APICES, in botany, the ſame with Antheræ.

APIOS, the botanic name for the whole ſpecies of ſpurge: alſo a denomination given to the glycine of Linnæus.

APIS, in aſtronomy, implies a ſouthern conſtellation, containing four ſtars, two of which are of the 4th, and two of the 5th magnitude.

APIS, or BEE, in zoology, is a genus of inſects belonging to the order of inſecta hymenoptera. The mouth is furniſhed with two jaws, and a proboſcis infolded in a double ſheath; the wings are four, the two foremoſt covering thoſe behind when at reſt: in the anus or tail of the females and working bees there is a hidden ſting.

They are diſtinguiſhed into ſeveral ſpecies, each of which has its peculiar genius, talent, manners, and diſpoſition. Variety prevails in the order of their architecture, and nature of their materials.

Some live in ſociety, and ſhare the toils; ſuch are the common bee and drone. Others dwell and work in ſolitude, building the cradles of their families; as the leaf-cutter bee does with the roſetree leaf; the upholſterer with the gaudy tapeſtry of the corn-roſe; the maſon-bee with a plaſter, the wood piercer with ſawduſt. All are employed in their little hermitage, with the care of providing for the wants of their poſterity. The ſpecies enumerated by Linnæus are 55; the following of which are the moſt remarkable: viz.

1. The floriſomnis, or black bee with a cylindrical incurvated belly, having too tooth-like protuberances at the anus, and a kind of prickles on the hind-legs. This bee ſleeps in flowers.

2. The dentata, or ſhining green bee, with black wings, and a kind of teeth on the hind thighs.

3. The variegata: the breaſt and belly are variegated with white and black ſpots; the legs are of an iron colour.

4. The roſtrata is diſtinguiſhed by the upper lip being inflected and of a conical ſhape, inveſted with bluiſh belts. They build their neſts in high ſandy grounds, and there is but one young in each neſt.

5. The ferruginea, or ſmooth black bee, with the feelers, mouth, belly, and feet, of an iron colour.

6. The carioſa is a yellowiſh hairy bee; and the feet and front are of a bright yellow colour. It builds in the rotten trees of Europe.

7. The braſilianorum, or pale-red hairy bee, with the baſis of the thighs black. It is very large covered with a teſtaceous ſkin; a native of America.

8. The lapidaria, or red hairy bee, with a yellow anus, builds in holes of rocks.

9. The terreſtris is black and hairy, with a white belt round the breaſt, and a white anus: it builds very deep in the earth.

10. The violacea is a red hairy bee, with bluiſh wings; a native of Europe.

The violacea is ſaid to perforate trees, and hollow them out in a longitudinal direction; and build their cells at the bottom of theſe holes.

11. The muſcorum, or yellow hairy bee with a white belly, builds in moſſy grounds. The ſkill diſplayed by theſe builders is admirable.

12. The centuncularis, leaf-cutter, or black bee, having its belly covered with yellow down; makes its neſt of leaves curiouſly plaited in the form of a matt or quilt. There are ſeveral varieties of theſe, all equally induſtrious.

13. The mellifica, or domeſtic honey-bee; the particulars concerning this valuable ſpecies are ſo numerous and intereſting that they are given in due form under the article BEE.

In the Philoſophical Tranſactions, N°. 172, there is an account of a ſpecies of honey-bee found in America, very different in form and manners from the common European bee.

Their combs are compoſed of a ſeries of ſmall bottles or bladders of wax, of a duſky brown or blackiſh colour; and each of theſe is much of the ſize and ſhape of a Spaniſh olave.

They hang together in cluſters, almoſt like a bunch of grapes, and are ſo contrived, that each of them has its aperture, while the bees are at work upon it; but as ſoon as it is filled with honey, this aperture is cloſed, and they leave it, and go to work upon another veſſel. They are ſagacious in chooſing the moſt ſecure retreats, becauſe their honey is ſo delicious a bait, that they are hunted after by many animals; having no power to defend themſelves, having no ſtings as our bees have.

APITES *Vinum*, in commerce and huſbandry, implies perry, or pear wine, of which it is a ſynonyme.

APIUM, parſley, a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, Umbellatæ. The fruit is of an oval ſhape, and ſtreaked; the involucrum conſiſts of one leaf; and the petals are inflected. There are only two ſpecies of apium; the petroſelinum, or common parſley, a native of Sardinia; and the graveolens, or ſmallage, a native of Britain: the culture of both which are well known.

The root of parſley is one of the five aperient roots, and in this intention is ſometimes made an ingredient in apozems and diet-drinks.

The ſeeds are an ingredient in the electuary of bay-berries.

Common parſley is reckoned an effectual cure for the rot in ſheep, provided they are fed with it twice a week for two or three hours each time.

APIVORUS, in ornithology, is a ſynonyme of a ſpecies of falco.

APLUDA, a genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 4th order Gramina. For the characters, ſee Syſtem of BOTANY.

There are three ſpecies of apluda, viz. the mutica, ariſtata, and zengites, all natives of the Indies.

APLUSTRA, or APLUSTRE, in the marine, implied the antique method of decorating the ſhips head with a ſhield, flag, or enſign, according to the name it bore, whether male or female.

APNŒA, in medical language, implies a ſudden ſuffocation, or loſs of breath by noxious vapour, or a paroxiſm.

APOBATERION, in antiquity, implies a valedictory ſpeech made by a perſon on departing out of his own country, and addreſſed to his friends or relations.

APOBATHRÆ, in antiquity, were ſtep ladders to get on ſhipboard.

APOBEE, in botany, expreſſes the Guinea phraſe for the corn marygold.

APOBOMIOI, in ancient rites, implied a ſacrifice offered on the earth, without raiſing an altar.

APOCALYPSE, REVELATION, the name of one of the ſacred books of the New Teſtament, containing revelations concerning ſeveral important doctrines of Chriſtianity. The word is Greek, and derived from αποκαλυπτω, to *reveal* or *diſcover*.

This book, according to Irenæus, was written about the year 96 of Chriſt, in the iſland of Patmos, whither St. John had been baniſhed by the emperor Domitian.

The Greek fathers called the author St. John the Divine by way of eminence, to diſtinguiſh him from the other evangeliſts.

This ſacred book conſiſts of twenty-two chapters. The three firſt are an inſtruction to the biſhops of the ſeven churches of Aſia Minor; the fifteen following chapters contain the perſecutions which the church was to ſuffer from the Jews, heretics, and Roman emperors, Next, St. John propheſies of the vengeance of God, which he will exerciſe againſt thoſe perſecutors, the Roman empire, and the city of Rome; which, as the Proteſtants ſuppoſe, he deſcribes under the name of Babylon, the great whore, ſeated upon ſeven hills. In the laſt place, the 19th, 20th, 21ſt, and 22d chapters, deſcribe the triumph of the church over its enemies, the marriage of the lamb, and the happineſs of the church triumphant.

Sir Iſaac Newton in ſpeaking of this ſacred book, obſerves: "It is a part of this propheſy, that it ſhould not be underſtood before the laſt age of the world; and therefore it makes for the credit of the propheſy, that it is not yet underſtood, The folly of interpreters has been to foretel times and things by this propheſy, as if God deſigned to make them prophets. By this raſhneſs they have not only expoſed themſelves, but brought the prophecy alſo into contempt. The deſign of God was much otherwiſe: he gave this and the prophecies of the Old Teſtament, not to gratify mens curioſities, by enabling them to foreknow things: but that, after they were fulfilled, they might be interpreted by the events; and his own providence, not the interpreters, be then maniſeſted thereby to the world. And there is already ſo much of the prophecy fulfilled, that as many as will take pains in this ſtudy, may ſee ſufficient inſtances of God's providence."

APOCARITES, in eccleſiaſtical hiſtory, denotes the opinion of ſeveral ſectaries, who ſuppoſed the human ſoul is derived immediately from the ſubſtance of the Deity.

APOCATASTASIS, in aſtronomy, implies the return of a planet to the point from which its orbit commences.

In medicine, it denotes the ſubſiding of a diſeaſe or complaint.

In law, it denotes to reſtore property to the lawful proprietor.

In divinity, it denotes the propitiation that Chriſt made to God his father for the redemption of the world by his death.

APOCATHARSIS, in pharmacy, denotes an expurgation.

APOCHA, in law, denotes a receipt for monies paid, to ſtand as a voucher for the debtor againſt the creditor for a ſettlement of accounts.

APOCOPE, among grammarians, is a figure which cuts off a letter or ſyllable from the end of a word; as ingeni for ingenii.

APOCRISARIUS, in eccleſiaſtical antiquity, denotes a ſort of reſident in an imperial city, in the name of a foreign church or biſhop, whoſe office was to negociate, as proctor, at the emperor's court, in all eccleſiaſtical cauſes in which his principals might be concerned.

The title and quality of apocriſary became at length appropriated to the Pope's agent, or Nuncio, as he is now called; who reſided at Conſtantinople, to receive the Pope's diſpatches, and the emperor's anſwers.

APOCRISIS, in literary productions, denotes an anſwer, be the cauſe of enquiry what it may.

APOCRUSTICS, in medicine, is the ſame with repellents.

APOCRYPHA, or APOCRYPHAL BOOKS, denote ſuch books as are not admitted into the canon of Scripture, being either not acknowledged as divine, or conſidered as ſpurious.

When the Jews publiſhed their ſacred books, they gave the appellations of canonical only to ſuch as they then made public, and ſuch as were ſtill retained in their archives they called apocryphal, for no other reaſon than they were not public; ſo that they might be really ſacred and divine, though not denominated as ſuch.

Thus, in reſpect of the Bible, all books were called apocryphal which were not inſerted in the Jewiſh canon of Scripture.

The Proteſtants do not only reckon thoſe books to be apocryphal which are eſteemed ſuch in the church of Rome, as the prayer of Manaſſeh king of Judath, the third and fourth books of Eſdras, St. Barnabas's epiſtle, the book of Hermos, the addition at the end of Job, and the 151ſt Pſalm; but alſo Tobit, Judith, Eſter, the book of Wiſdom, Jeſus the ſon of Sirach, Baruch the prophet, the Song of the Three Children, the hiſtory of Suſannah, the hiſtory of Bell and the Dragon, and the firſt and ſecond books of Maccabees.

It is now pretended that theſe books were not received by the Jews, or ſo much as known to them. None of the writers of the New Teſtament cite or mention them: neither Philo nor Joſephus ſpeak of them.

The Chriſtian church was for ſome ages an utter ſtranger to theſe books. Origen, Athanaſius, Hilary, Cyril of Jeruſalem, and all the orthodox writers, who have given catalogues of the canonical books of Scripture, unanimouſly concur in rejecting theſe out of the canon. And for the New Teſtament, they are divided in their opinions, whether the epiſtle to the Hebrews, the epiſtle of St. James, and the ſecond epiſtle of St. Peter, the ſecond and third epiſtles of St. John, the epiſtle of St. Jude, and the Revelations, are to be acknowledged as canonical or not.

The ſeveral epiſtles abovementioned, and the book of Revelations, are allowed by all the reformed churches to be parts of the canon of the New Teſtament.

The apocryphal books, however, according to the ſixth article of the church of England, are to be read for example of life and inſtruction of manners; but it doth not apply them to eſtabliſh any doctrine.

APOCYNUM, or DOGSBANE, a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order Contortæ. The eſſential characters; are the corolla is bell ſhaped, and the filaments are five, alternate with the ſtamina.

There are 11 ſpecies, of which the following are the moſt remarkable.

1. The venetum, with an upright herbaceous ſtalk, grows on a ſmall iſland in the ſea near Venice.

There are two varieties of this; one with a purple, and the other with the white flower. The roots creep very much, and by them only it is propagated; for it ſeldom produces any ſeeds.

2. The ſpecioſſimum, with large flowers, is a native of Jamaica in the Savannahs, whence it has the name of Savannah flower, by which it is generally known in that iſland.

3. Cordatum with a climbing ſtalk.

4. The villoſum, with hairy flowers and a climbing ſtalk. Theſe were diſcovered at La Vera Cruz in New Spain, by Dr. William Houſton, who ſent their ſeeds to England. They are both climbers and mount to the tops of the talleſt trees.

All the ſpecies of this plant abound with a milky juice, which flows out from any part of their ſtalks and leaves when they are broken: this is generally ſuppoſed to be hurtful if taken inwardly but doth not bliſter the ſkin when applied to it as the juice of ſpurge and other acrid plants.

APODECTÆ, in antiquity, was a denomination given to ten general receivers appointed by the Athenians to receive the public revenues, taxes, debts, and the like; who alſo had a power to decide controverſies ariſing in relation to money and taxes, all but thoſe of the moſt difficult nature and higheſt concern, which were reſerved to the courts of judicature.

APODECTÆI, in the Athenian government, were officers appointed to ſee that the meaſures of corn were juſt.

APODES, in a general ſenſe, denotes things without feet.

Apodes, in the Linnæan ſyſtem, is the name of the firſt order of fiſhes, or thoſe which have no belly-fins.

APODICTICAL, among philoſophers, is a term importing a demonſtrative proof, or ſyſtematical method of teaching.

APODOSIS, in rhetoric, makes the third part of a complete exordium, being properly the application, or reſtriction of the protaſis. It is the ſame with what is otherwiſe called axioſis; and ſtands oppoſed to protaſis: e. g. protaſis, all branches of hiſtory are neceſſary for a ſtudent; cateſceue, ſo that, without theſe, he can never make any conſiderable figure; apodoſis, but literary hiſtory is of a more eſpecial uſe, which recommends it, &c. &c.

APODYTERIUM, in the ancient baths, implied the apartments were perſons dreſſed and undreſſed themſelves

APOGEE, in aſtronomy, denotes that point in the orbit of a planet, which is at the greateſt diſtance from the earth.

The apogee of the ſun is that part of the earth's orbit which is at the greateſt diſtance from the ſun; and conſequently the ſun's apogee, and the earth's aphelion, are one and the ſame point.

APOGIATURA, in muſic, is a ſmall note inſerted by the practical muſician between two others.

The ſuperior apogiatura is ſuppoſed to affect love, affection, pleaſure, &c. It ſhould be made pretty long, giving it more than half the length of the time of the note it belongs to, and obſerving to ſwell the ſound by degrees.

The inferior apogiatura, has the ſame qualities with the ſuperior, only that is more confined, as it can be made only when the melody raiſes the interval of a ſecond or third, obſerving always to make a beat on the following note.

APOLIDES, in antiquity, denoted perſons who were condemned for life to the public works, or exiled into ſome iſland, and thus diveſted of the privileges of Roman citizens.

APOLISTÆ, in law, ſignifies the policy of diſarming the lower claſs of people in times of tumult, to avoid danger to the health of the ſtate.

APOLLINARIAN Games, in Roman antiquity, were thoſe inſtituted in the year of Rome 542. The occaſion of them was a kind of oracle delivered by the prophet Marcus after the fatal battle at Cannæ, declaring, that to expel the enemy, and cure the people of an infectious diſeaſe which then prevailed ſacred games were to be annually performed in honour of Apollo; the prætor to have the direction of them, and the decemviri to offer ſacrifices after the Grecian rite. The ſenate ordered that this oracle ſhould be obſerved the rather, becauſe another of the ſame Marcus, in which he had foretold the overthrow at Cannæ, had come true; for this reaſon they gave the prætor 12,000 aſes out of the public caſh to defray the ſolemnity. It was annually obſerved on the 5th of July.

APOLLO, in mythology, was a Pagan deity worſhipped by the Greeks and Romans.

Apollo had a variety of other names, either derived from his principal attributes, or the chief places where he was worſhipped.

He was called the Healer from his enlivening warmth and cheering influence.

Pæan, from the peſtilential heats: to ſignify the former, the ancients placed the graces in his right hand; and for the latter, a bow and arrows in his left.

Nomius, or the ſhepherd, from fertilizing the earth, and thence ſuſtaining the animal creation.

Delius, from his rendering all things manifeſt.

Pythius, from his victory over Python.

Lycias, Phœbus, and Phaneta, from his purity and ſplendor.

As Apollo is almoſt always confounded by the Greeks with the ſun, it is no wonder that he ſhould be dignified with ſo many attributes.

The power of healing diſeaſes being chiefly given by the ancients to medicinal plants and vegetable productions, it was natural to exalt into a divinity the viſible cauſe of their growth. Hence he was alſo ſtyled the god of Phyſic. Whether Apollo was ever a real perſonage, or not many have doubted. And Voſſius has taken great pains to prove this god to be only a metaphorical being, and that there never was any other Apollo than the ſun.

APOLLONIA, in antiquity, implies feaſts ſacred to Apollo, celebrated annually by the Egilations.

APOLLYON, in Scripture, is a Greek word which ſignifies the deſtroyer, and anſwers to the Hebrew *abaddon*.

St. John in the Revelations (ix. 11.) ſays, that an angel having opened the bottomleſs pit, a thick ſmoke iſſued out of it; and with this ſmoke locuſts, like horſes, prepared for battle, and commanded by the angel of the bottomleſs pit, called in Hebrew *abaddon*, but in the Greek *apollyon*.

APOLOGETIC, Apologetical, in rhetoric, implies ſomething ſaid or written, by way of excuſe or apology, for any action or perſon.

APOLOGUE, *Apologus*, in literature, ſignifies an ingenious method of conveying inſtruction by means of a feigned relation, called a moral fable.

The only difference between a parable and an apologue is, that the former, being drawn from what paſſes among mankind, requires probability in the narration; whereas the apologue, being taken from the ſuppoſed actions of brutes, or even of things inanimate, is not tied down to the ſtrict rules of probability.

Æſop's fables are a model of this kind of writing.

APOLOGY, is a Greek term, literally importing an excuſe or defence of ſome perſon or action.

APOLYSSIS, in a general ſenſe, implies a releaſe from any thing that confines or controuls a perſon: hence the word may be applied to almoſt all the common offices of life, including every art and ſcience,

APOMELI, among ancient phyſicians, denotes a decoction of honey and vinegar, much uſed as a detergent, promoter of ſtool, urine, &c.

APOMYOS Deus, in the Heathen mythology, was a name under which Jupiter was worſhipped at Elis, and Hercules as well as Jupiter at the Olympic games. The uſual ſacrifice was a bull.

APONEUROSIS, among phyſicians and anatomiſts, denotes the expanſion of a nerve or tendon in the manner of a membrane. It alſo implies the cutting off a nerve; and, finally, for the tendon it ſelf.

APONIA, in medical language, implies a freedom from pain, whether in the ſtate of the diſeaſe, or the mode of adminiſtring remedies or medicines.

APONOGETON, or Zannichellia, a genus of the digynia order, belonging to the heptandria claſs of plants, which has no Engliſh name. The calyx is an oblong omentum; there is no corolla; and the capſulæ are three ſeeded. There are two ſpecies, natives of the Indies.

APOPEMPTIC, in ancient poetry, was a hymn addreſſed to a ſtranger on his departure from a place to his own country.

APOPHASIS, denotes a figure in rhetoric, by which the orator, ſpeaking ironically, ſeems to wave what he would plainly inſinuate; as, "Neither will I mention thoſe things, which, if I ſhould, you notwithſtanding could neither confute nor ſpeak againſt them."

APOPHLEGMATIZANTS, in pharmacy, are medicines proper to clear the head from ſuperfluous phlegm.

APOPHTHEGM, in oratory, implies a ſhort, ſententious and inſtructive remark, pronounced by a perſon of diſtinguiſhed character.

APOPHYGE, in architecture, is a concave part or ring of a column, lying above or below the flat member.

APOPHYSIS, in anatomy, implies a protuberant ſtate of a bone, in jutting out beyond its proper limits.

APOPLECTIC, among phyſicians, denotes any thing that relates to an apoplexy.

APOPLEXY, in medical language, implies a diſtemper in which the patient is ſuddenly deprived of all his ſenſes, and of voluntary motion.

APORIA, is a figure in rhetoric, by which the ſpeaker ſhows, that he doubts where to begin.

Thus Cicero ſays, "Whether he took them from his fellows more impudently, gave them to a harlot, more laſciviouſly, removed them from the Roman people more wickedly, or altered them more preſumptuouſly, I cannot well declare."

APORON, or Aporime, denotes a problem difficult to reſolve, and which has never been reſolved, though it be not, in itſelf, impoſſible.

Such we conceive the quadrature of the circle; the duplicature of the cube; the triſection of an angle, &c.

APORRHOEA, or Aporrhoes, in phyſics and philoſophy, imply noxious effluvia flying off from morbid bodies.

APOSIOPESIS, in rhetoric, alſo called reticency, and ſuppreſſion; a figure, by which a perſon really ſpeaks of a thing, at a time when he makes a ſhew as if he would ſay nothing of it.

It is commonly uſed to denote the ellipſis.

This figure is of uſe to keep up the grandeur and ſublimity of a diſcourſe.

APOSITION, in the materia medica, imports a loathing of aliment.

APOSPHACELLISIS, in ſurgery, denotes a mortification by means of keeping the bandage too tight, on a wounded member of the body.

APOSPHRAGISMA, in antiquity, was the figure or impreſſion of a ſeal.

APOSTACY, or APOSTASY, in theology, imports the abandoning the true religion. The primitive Chriſtian church diſtinguiſhed ſeveral kinds of Apoſtacy. The firſt, of thoſe who went over entirely from Chriſtianity to Judaiſm; the ſecond, of thoſe who mingled Judaiſm and Chriſtianity together; and the third, of thoſe who complied ſo far with the Jews as to communicate with them in many of their unlawful practices, without making a formal profeſſion of their religion. But the fourth ſort was of thoſe who, after having been ſometimes Chriſtians, voluntarily relapſed into Paganiſm.

APOSTASIS, in medicine, the ſame with abſceſs.

APOSTATE, in eccleſiaſtical hiſtory, denotes one who deſerts his religion.

Among the Romaniſts, it ſignifies a man who, without a legal diſpenſation, forſakes a religious order of which he had made profeſſion. Hence,

APOSTATA CAPIENDO, in the Engliſh law, a writ that formerly lay againſt a perſon who, having entered into ſome order of religion, broke out again, and wandered up and down the country.

A POSTERIORI, in grammar, is the ſame with demonſtration.

APOSTIL, in matters of literature, the ſame with a marginal note.

APOSTLE, in Scripture language, implies a meſſenger ſent upon a ſpecial errand, Rom. xvi. 7. 2 Cor. viii. 23.

It is applied firſt to Chriſt Jeſus, who was ſent from Heaven to aſſume our nature, and work out our ſalvation, with authority to execute his prophetical and all his other offices, and to ſend forth his Apoſtles to publiſh the goſpel, Heb. iii. 1.

Secondly, to a miniſter immediately ſent from Chriſt to preach the goſpel, Matth. x. ii. Gal. i. 1.

APOSTLE properly ſignifies a meſſenger or perſon ſent by another upon ſome buſineſs; and hence, by way of eminence, denotes one of the diſciples commiſſioned by Jeſus Chriſt to preach the goſpel.

Our bleſſed Lord ſelected twelve out of the number of his diſciples to be inveſted with the apoſtleſhip. Their names were Simon Peter, Andrew, James the greater, John, Philip, Bartholomew, Thomas, Matthew, James the leſs, Jude ſirnamed Lebbeus or Thaddeus, Simon the Canaanite, and Judas Iſcariot. Of theſe Simon, Andrew, James the greater, and John, were fiſhermen; and Matthew a publican, or receiver of the public revenues: of what profeſſion the reſt were, we are not told in Scripture; though it is probable they were fiſhermen.

After the apoſtles had exerciſed their miniſtry for twelve years in Paleſtine, they reſolved to diſperſe themſelves in different parts of the world, and agreed to determine by lot what parts each ſhould take. According to this diviſion, St. Peter went into Pontus, Galatia, and thoſe other provinces of the Leſſer Aſia. St. Andrew had the vaſt northern countries of Scythia and Sogdiana allotted to his portion. St. John's was partly the ſame with Peter's, namely the Leſſer Aſia. St. Phillip had the Upper Aſia aſſigned to him, with ſome parts of Scythia and Colchis. Arabia Felix fell to St. Partholomew's ſhare. St. Matthew preached in Chaldæa, Perſia, and Parthia. St. Thomas preached likewiſe in Parthia; as alſo to the Hercanians, Bactrians, and Indians. St. James the leſs continued in Jeruſalem, of which church he was biſhop. St Simon had for his portion Egypt, Cyrene, Libya, and Mauritania; St. Jude, Syria and Meſopotamia; and St. Matthias, who was choſen in the room of the traitor Judas, Cappadocia and Colchis. Thus, by the diſperſion of the apoſtles, chriſtianity was very early planted in a great many parts of the world. We have but very ſhort and imperfect accounts of their travels and actions.

St. Paul is frequently called the apoſtle by way of eminence; and the apoſtle of the Gentiles, becauſe his miniſtry was chiefly made uſe of for the converſion of the Gentile world, as that of St. Peter was for the Jews, who is therefore ſtiled the apoſtle of the circumciſion.

The ſeveral apoſtles are uſually repreſented with their reſpective badges or attributes: St. Peter with the keys; St. Paul with a ſword; St. Andrew with a croſs or ſaltier; St. James minor with a fuller's pole; St. John with a cup, and winged ſerpent flying from it; St. Bartholomew with a knife; St. Philip with a long ſtaff, whoſe upper end is formed into a croſs; St. Thomas with a lance; St. Matthew with a hatchet; St. Matthias with a battle-ax; St. James major with a pilgrim's ſtaff and a gourd-bottle; St. Simon with a ſaw; and St. Jude with a club.

The appellation is given in like manner to thoſe perſons who firſt planted the Chriſtian faith in any place. Thus Dionyſius of Corinth is called the Apoſtle of France; Xavier the Apoſtle of the Indies, &c. In the Eaſt Indies the Jeſuit miſſionaries are alſo called Apoſtles.

APOSTLE is alſo uſed among the Jews for a kind of officer anciently ſent into provinces in their juriſdiction, as a commiſſary, to ſee that the laws were duly obſerved, and to receive the monies collected for the reparation of the temple, and the tribute payable to the Romans. Theſe Apoſtles were a degree below the officers of the ſynagogues called Patriarchs, and received their commiſſions from them. Some authors obſerve, that St. Paul had borne this office; and that it is this he alludes to in the beginning of the epiſtle to the Galatians: as if he had ſaid, Paul, no longer an apoſtle of the ſynagogue, nor ſent thereby to maintain the law of Moſes, but now an apoſtle and envoy of Jeſus Chriſt, &c.

APOSTLES *Creed*, in the Chriſtian religion, implies a formula, or ſummary of faith, drawn up by the apoſtles themſelves; who, during their ſtay at Jeruſalem, ſoon after our Lord's aſcenſion, agreed upon this creed, as a rule of faith, and as a word of diſtinction by which they were to know friends from foes.

APOSTOLARE, APOSTOLICARE, *Apoſtolizing*, in church hiſtory, denotes the being preferred to the dignity of pope; modernly termed the apoſtolic chair.

APOSTOLATE, in a general ſenſe, implies a miſſion.

In this ſenſe, Olearius has a diſcourſe concerning the apoſtolate of Chriſt.

APOSTOLATE more properly denotes the office of an apoſtle, or that of a biſhop.

In this ſenſe we meet with ſeveral letters, petitions, requeſts, &c. directed to biſhops under the title of your Apoſtolate, or Apoſtolatus Veſter.

But as the title Apoſtolicus had been appropriated to the Pope, ſo that of Apoſtolate became at length reſtrained to the ſole dignity of the popedom.

APOSTOLI, in law, denote thoſe letters miſſive which are demanded in caſes of appeal.

APOSTOLIC, APOSTOLICAL, ſomething that relates to the apoſtles, or deſcends from them.

APOSTOLIC, in the primitive church, was an appellation given to all ſuch churches as were founded by the apoſtles; and even to the biſhops of thoſe churches, as being the reputed ſucceſſors of the apoſtles. Theſe were confined to four, viz. Rome, Alexandria, Antioch, and Jeruſalem.

In proceſs of time, the biſhop of Rome growing in power above the reſt, and the three patriarchates of Alexandria, Antioch, and Jeruſalem, falling into the hands of the Saracens, the title apoſtolical was reſtrained to the pope and his church alone. Though ſome of the popes, and St. Gregory the Great, not contented to hold the title by this tenure, began, at length, to inſiſt, that it belonged to them by another and peculiar right, as being the ſucceſſors of St. Peter. The country of Rheims in 1049 declared that the pope was the ſole apoſtolical primate of the univerſal church. And hence a great number of apoſtolicals, apoſtolical ſee, apoſtolical nuncio, apoſtolical notary, apoſtolical brief, apoſtolical hamber, apoſtolical vicar, &c.

APOSTOLICAL *Fathers* is an appellation uſually given to the writers of the firſt century, who employed their pens in the cauſe of Chriſtianity.

APOSTOLIANS, in church hiſtory, were a ſect of the Mennonites, which firſt ſprung up in the year 1664, and derived its name from Apoſtool, one of the Mennonite miniſters at Amſterdam.

APOSTOLICI, or APOSTOLICS, in eccleſiaſtical hiſtory, was a name aſſumed by three different ſects, on account of their pretending to imitate the manner and practice of the apoſtles.

The firſt apoſtolici, apotactitæ, or apotactici, roſe out of the Encratitæ, and Cathari, in the third century. They made profeſſion of abſtaining from marriage, and the uſe of wine, fleſh, money, &c.

Sagarelli was the founder of the ſecond ſect; he obliged his followers to go from place to place as the apoſtles did, cloathed in white, with long beards, diſhevelled hair, and bare heads, accompanied with women, whom they called their ſpiritual ſiſters. They likewiſe renounced all kinds of property and poſſeſſions, inveighed againſt the growing corruption of the church of Rome, predicted its overthrow, and the eſtabliſhment of a new church on its ruin. Sagarelli was burnt alive at Parma in the year 1300, and was afterwards ſucceeded by Dulcinus, who added to the character of an apoſtle thoſe of a prophet and a general, and carried on a bloody and dreadful war for the ſpace of two years againſt Raynerius, biſhop of Vercelli; he was at length defeated, and put to death in a barbarous manner in the year 1037.

This ſect ſubſiſted till the beginning of the fifteenth century, when it was totally extirpated under the pontificate of Boniface XI.

The other branch of apoſtolici were of the twelfth century; they condemned marriage, preferring celibacy, and calling themſelves the chaſte brethren and ſiſters; though each was allowed a ſpiritual ſiſter, with whom he lived in a domeſtic relation, and on this account they have been charged with concubinage: they held it unlawful to take an oath; they ſet aſide the uſe of baptiſm; and in many things imitated the Manichees.

APOSTOLICUM is a peculiar name given to a hymn, on the articles of the Chriſtian faith, anciently uſed in churches.

APOSTOLORUM *Unguentum*, or Apoſtles ointment, in pharmacy, implies a compound of 12 mixtures, of a detergent or cleanſing nature.

APOSTROPHE, in rhetoric, is a figure by which a perſon who is either abſent or dead is addreſſed as if he was preſent.

This figure is, in boldneſs, a degree lower than the addreſs to perſonified objects; as it requires a leſs effort of imagination to ſuppoſe perſons preſent who are dead or abſent, than to animate inſenſible beings and direct our diſcourſe to them. The poems of Oſſian abound with the moſt beautiful inſtances of this figure. "Weep on the rocks of roaring winds, O Maid of Iniſtore! Bend thy fair head over the waves, thou fairer than the ghoſt of the hills when it moves in a ſun-beam at noon over the ſilence of Morven! He is fallen! Thy youth is low; pale beneath the ſword of Cuchullin!"

Apostrophe, in grammar, ſignifies the contraction of a word by the uſe of a comma: as call'd for called, tho' for though.

APOTACTITÆ, or **Apotactici**, in church hiſtory, were an ancient ſect, who affecting to follow the evangelical counſels of poverty, and the examples of the apoſtles and primitive Chriſtians, renounced all their effects and poſſeſſions.

APOTEICHISMUS, in the ancient military art, was a kind of line of circumvallation drawn round a place in order to beſiege it; which was alſo called periteichiſmus.

This anſwered to what are called lines of contravallation and circumvallation among the moderns.

APOTELESMA, **Apotelesmatica**, **Apotelesmata**, or **Apotelism**, in aſtrological calculation, ſeverally imply the act of foretelling future events, by conſulting the planets and aſpects. Hence, the caſting of nativities is called the ſcience of Apoteliſm; and the profeſſors of this deluſive art, Apoteleſmatici.

APOTHECARY, ſignifies one who practiſes the art of pharmacy.

In London, the apothecaries are one of the city companies; having been incorporated by a charter from king James I. procured at the ſolicitation of Dr. Mayerne and Dr. Aitkins; till that time they only made a part of the grocers company: plums, ſugar, ſpice, Venice treacle, mithridate, &c. were ſold in the ſame ſhop and by the ſame perſon.

The reaſon of ſeparating them was, that the medicines might be better prepared. By an act made in the ninth year of George I. they are exempted from ſerving upon juries, or in ward and pariſh offices, and are held in perpetuity with reſpect to their chartered rights.

They are obliged to make up their medicines according to the formulas preſcribed in the college diſpenſatory; and are liable to have their ſhops viſited by the cenſors of the college, who are empowered to deſtroy ſuch medicines as they think not good.

They have a hall in Black Friars, where there are two fine laboratories, out of which all the ſurgeons cheſts are ſupplied with medicines for the royal Britiſh navy.

To his majeſty belong two apothecaries: the ſalary of the firſt, is 320l. and that of the ſecond, 275l. beſides, to the houſehold belong two likewiſe.

Apothecary, *Apothecarius*, in hiſtory, denotes a ſhop-keeper, or ware-houſe keeper.

Apothecarius alſo denotes a ſtore-keeper or officer appointed to have the direction of a magazine, granary, &c. In which ſenſe apothecarii is ſometimes rendered by horearii and rationarii.

APOTHEOSIS, in antiquity was an heathen ceremony, by which their emperors and great men were placed among the gods.

After the apotheoſis, or deification and conſecration, temples, altars, and images, were erected to the new deity; ſacrifices, &c. were offered, and colleges of prieſts inſtituted.

The ceremony was as follows:

After the body of the deceaſed had been burnt with the uſual ſolemnities, an image of wax, exactly reſembling him, was placed on an ivory couch, where it lay for ſeven days, attended by the ſenate and ladies of the higheſt quality in mourning; and then the young ſenators and knights bore the bed of ſtate through the via ſacra to the old forum, and from thence to the campus martius, where it was depoſited upon an edifice built in form of a pyramid. The bed being thus placed amidſt a quantity of ſpices and other combuſtibles, and the knights having made a ſolemn proceſſion round the pile, the new emperor, with a torch in his hand, ſet fire to it, whilſt an eagle, let fly from the top of the building, and mounting in the air with a firebrand, was ſuppoſed to convey the ſoul of the deceaſed to heaven; and thenceforward he was ranked among the gods.

APOTHERAPIA, in phyſic, denotes a complete cure.

Apotherapia, in the gymnaſtic art, ſignifies the laſt part of all regular exerciſe, viz. unction with oil, before as well as after bathing. The deſign of this was partly to cleanſe the ſkin from any filth it might have contracted during the exerciſe, and partly to remove wearineſs.

APOTOME, in geometry, is the difference between two incommenſurable lines.

Euclid, lib. 10, def. 3. aſt. prop. 85, diſtinguiſhes Apotomes into 1ſt, 2d, 3d, 4th, 5th, and 6th, in the proportions following, viz.

The 1ſt is, when there are two numbers, ſuch, that the greater is a rational one, and the difference between their ſquares is a ſquare number.

The 2d is, when the leaſt number is rational, and the ſquare root of the difference of the ſquares of the two numbers has a ratio in numbers to the greateſt number.

The 3d is, when the two numbers are both irrational, and the ſquare root of the difference of their ſquares has a ratio in numbers to the greateſt number.

The 4th is, when the greateſt number is rational, and the ſquare root of the difference of the ſquares of the two numbers has not a ratio to that.

The 5th is, when the leaſt number is rational, and the ſquare root of the difference of the two numbers has not a ratio in numbers to the greateſt number.

The 6th is, when the numbers are irrational, and the ſquare root of the difference of their ſquares has not a ratio in numbers to the greateſt number.

The doctrine of Apotomes, as laid down by Euclid, in his 10th book, is a very curious ſubject, and extremely beneficial, as well as indiſpenſably neceſſary to be peruſed by all perſons who would wiſh to lay down geometrical elements; as from it may be deduced the poſſibility or impoſſibility of the quadratures of curvelineal figures, and perhaps lineal ſolutions of Diophantus's problems, and others of a ſimilar kind.

Apotome, in muſic, is the difference between a greater and leſſer ſemi-tone; expreſſed by the ratio as 128 is to 125.

The minor apotome is the interval of two ſounds, whoſe diſtinction is from 2025 to 2048, an interval ſtill leſs ſenſible to the ear than the preceding, which uſually bears the name of the Apotome major.

Thoſe graces require a peculiar delicacy in the ear, yet they are only natural harmony:

> For when nat'ral charms, unadorn'd by art,
> Emerges from its ſhell, —wond'ring where it lives:
> It flutters round; expands the heart;
> And feels the ſenſe that nature gives.

APOTROPÆA, in ancient poetry, were verſes compoſed for averting the wrath of incenſed deities; hence the deities invoked for averting any threatened misfortune were called Apotrepeans.

APOZEM, in medicine, the ſame with decoction.

APPARATUS, in arts and manufactures, denote a complete ſet of inſtruments, or utenſils, belonging to any artiſt or machine.

Apparatus, in ſurgery, implies the operation of cutting for the ſtone. For which there are three ſorts of apparatus, viz. the ſmall, great, and high.

Apparatus is alſo uſed as a title of ſeveral books compoſed in form of catalogues, bibliothecas, dictionaries, &c. for the eaſe and conveniency of ſtudy.

APPAREILLE, in fortification, ſignify the ſlope that leads to the platform of the baſtion.

APPAREILLES, imply eaſy aſcents to the works of a fortification.

APPARENT, in a general ſenſe, ſignifies that which is viſible to the eyes, or obvious to the underſtanding.

Apparent, among mathematicians and aſtronomers, denotes things as they appear to us, in contradiſtinction from real or true; thus we ſay, the apparent diameter, diſtance, magnitude, place, figure, &c. of bodies.

Apparent Heir, in law, no inheritance can veſt, nor can any perſon be the actual complete heir of another, till the anceſtor is previouſly dead. Before that time the perſon who is next in the line of ſucceſſion is called an heir apparent, or heir preſumptive.

Heirs apparent are ſuch, whoſe right of inheritance is indefeaſible, provided they outlive the anceſtor; as the eldeſt ſon or his iſſue, who muſt by the courſe of the common law be heirs to the real property, lands or houſes, of the father whenever he happens to die.

Heirs preſumptive are ſuch, who, if the anceſtor ſhould die immediately, would in the preſent circumſtances of things be his heirs: but whoſe right of inheritance may be defeated by the contingency of ſome nearer heir being born, as a brother or nephew, whoſe preſumptive ſucceſſion may be deſtroyed by the birth of a ſon, or daughter, whoſe preſent hopes may be hereafter cut off by the birth of a ſon. Nay, even if the eſtate hath deſcended, by the death of the owner, to a brother, a nephew, or daughter; in the former caſes, the eſtate ſhall be diveſted and taken away by the birth of a poſthumous child; and, in the latter, it ſhall alſo be totally diveſted by the birth of a poſthumous ſon.

APPARITION, in a general ſenſe, denotes ſimply the ſhadow or appearance of a thing.

In a more limited ſenſe, it implies a ſpectre or ghoſt.

Several inſtances of apparitions occur in the bible: and that of Samuel raiſed by the witch of Endor, has occaſioned many diſputes.

As partial darkneſs, or obſcurity, is the moſt powerful means by which the ſight is deceived; night is therefore the proper ſeaſon for apparitions. Indeed the ſtate of the mind, at that time, prepares it for the admiſſion of thoſe deluſions of the imagination.

The fear and caution which muſt be obſerved in the night; the opportunity it affords for cutting off many pleaſing trains of ideas, which objects in the light never fail to introduce, are all circumſtances of terror: and perhaps, ſo much of our happineſs depends upon our ſenſes, that the deprivation of any one may be attended with proportionable horror and uncaſineſs.

Mr. Hobbes has ingeniouſly accounted for the ſpectre which is ſaid to have appeared to Brutus. "We read," ſays he, "of M. Brutus, that at Philippi, the night before he gave battle to Auguſtus Cæſar, he ſaw a fearful apparition, which is commonly related by hiſtorians as a viſion; but, conſidering the circumſtances, one may eaſily judge it to have been but a ſhort dream. For ſitting in his tent, penſive and troubled with the horror of his raſh act, it was not hard for him, ſlumbering in the cold, to dream of that which moſt affrighted him; which fear, as by degrees it made him wake, ſo it muſt needs make the apparition by degrees to vaniſh: and having no aſſurance that he ſlept, he could have no cauſe to think it a dream, or any thing but a viſion."

APPARATOR, in the Roman law, was a general term to comprehend all attendants of judges and magiſtrates appointed to receive and execute their orders.

Apparitor, in Engliſh eccleſiaſtical law, is a meſſenger that ſerves the proceſs of a ſpiritual court.

Alſo a beadle in an univerſity who carries the mace, is called by the ſame name.

APPARURA, in the old huſbandry, as well as in law deſcription and hiſtorical records, denoted the tackle, or furniture of any ſort of inſtrument uſed in cultivating the ground, and in a particular ſenſe indicated the plough uſed in fallowing the land previous to ſeed ſowing.

APPAUMEE, in heraldry, denotes one hand extended, with the full palm appearing, and the thumb and fingers at full length.

APPEAL, in law, is the removal of a cauſe from an inferior to a ſuperior court, when a perſon thinks himſelf aggrieved by the ſentence of the court below.

Appeals lie from all the ordinary courts of juſtice to the houſe of lords.

In eccleſiaſtical caſes, if an appeal is brought before a biſhop, it may be removed to the archbiſhop; but, if before an archdeacon, to the court of arches, and thence to the archbiſhop; and afterwards to the king in chancery.

Appeal, in criminal crown law, denotes an accuſation by a private ſubject againſt another, for ſome heinous crime; demanding puniſhment on account of the particular injury ſuffered, rather than for the offence againſt the public. For the particular caſes in which an appeal will lie, ſee Syſtem of Common Law, under the head Crown Law.

APPEARANCE, in a general ſenſe, implies the exterior ſurface of a thing, or that which immediately ſtrikes the ſenſes.

Appearance, in law, ſignifies a defendant's filing a common or ſpecial bail, on any proceſs iſſued out of a court of judicature.

APPEASING, in a general ſenſe, implies all ways, means, and methods of reducing the maladies of body and mind: hence appeaſing remedies, appeaſing orations, &c. &c.

APPELLANT, in a general ſenſe, one who appeals.

Appellants, in church hiſtory, ſignifies an appellation given to ſuch of the catholic clergy as appeal from the conſtitution unigenitus to a general council.

APPELLATION, the name by which any thing is known or diſtinguiſhed when ſpoken of. Nothing can be more foreign to the original meaning of many words and proper names, in the Engliſh language, than their preſent appellations. Who, for example, when the crier of a court calls out, "O yes, O yes," would ſuppoſe that it was a proclamation commanding the talkers to become hearers, being the French word *Oyez*, "liſten," retained in our courts ever ſince the pleadings were held in law French? Or would any perſon ſuppoſe that the head-land on the French coaſt, near Calais, called by our ſeamen Blackneſs, could be ſo titled from its French name of *Blanc*.

King Henry the Eighth having taken the town of Bullogne in France, the gates of which he brought to Hardes in Kent, where they are ſtill remaining, the flatterers of that reign highly magnified this action, which, Porto Bello like, became a popular ſubject for ſigns; and the port or harbour of Bullogne, called *Bullogne mouth*, was accordingly ſet up at a noted inn in Holborn; the name of the inn long out-living the ſign and fame of the conqueſt, an ignorant painter employed by a no leſs ignorant landlord, to paint a new one, repreſented it by a bull and a large gaping human mouth (anſwering to the vulgar pronunciation of *Bull and Mouth*). The ſame piece of hiſtory gave being to the *Bull and Gate*, originally meant for Bullogne gate, and repreſented by an embattled gate or entrance into a fortified town.

The *barber's pole* has been the ſubject of many conjectures; ſome conceiving it to have originated from the word *poll*, or head, with ſeveral other conceits as far-fetched, and as unmeaning: but the true intention of that party-coloured ſtaff was to ſhow that the maſter of the ſhop practiſed ſurgery, and could open a vein as well as mow a beard; ſuch a ſtaff being to this day, by every village-practitioner, put into the hand of a patient undergoing the operation of phlebotomy. The white band which encompaſſes the ſtaff, was was meant to repreſent the fillet, thus elegantly twined about it.

Nor were the chequers (at this time a common ſign of a public-houſe) leſs expreſſive, bein[illegible] repreſentation of a kind of draught-board called tables, and [illegible]ed that tha game might be played there. From their colour which was red, and the ſimiliarity to a lattice, it was corruptly called the *red lettuce*, which word is frequently uſed by ancient writers to ſignify an alſehouſe.

The Spectator has explained the ſign of the *bell ſavage inn* plauſibly enough, in ſuppoſing it to have been originally the figure of a beautiful female found in the woods, called in French *la belle ſauvage*. But another reaſon has ſince been aſſigned for that appellation, namely, that the inn was once the property of Lady Arabella Savage, and familiarly called Bell Savage's inn, probably repreſented, as at preſent, by a bell and a ſavage or wild man, which was a rebus for her name; rebuſſes being much in faſhion in the 16th century, of which the bolt and tun is an inſtance.

The *three blue balls* prefixed to the doors and windows of pawnbrokers ſhops, by the vulgar humorouſly enough ſaid to indicate that it is two to one that the things pledged are ever redeemed, was in reality the arms of a ſet of merchants from Lombardy, who were the firſt that publicly lent money on pledges. They dwelt together in a ſtreet, from them named Lombard ſtreet, in London, and alſo gave their name to another at Paris. The appellation of Lombard was formerly all over Europe conſidered as ſynonymous to that of uſurer.

At the inſtitution of yeomen of the guards, they uſed to wait at table on all great ſolemnities, and were ranged near the buffets; this procured them the name of buffetiers, not very unlike in ſound to the jocular appellation of beef-eaters, now given them; though probably it was rather the voluntary miſnomer of ſome wicked wit, than an accidental corruption ariſing from ignorance of the French language.

APPELLATIVE Names, in grammar, in contradiſtinction to proper names, are ſuch as ſtand for univerſal ideas, or a whole rank of beings, whether general or ſpecial; e. g. Fiſh, Bird, Man, City, River, are common or appellative names; and ſo are Trout, Eel, Lobſter; for they all agree to many individuals, and ſome to many ſpecies.

APPELLEE, among lawyers, is the perſon againſt whom an appeal is brought.

APPENDANT, in law, implies any thing that is inheritable, belonging to ſome more worthy inheritance; as an advowſon, common, or court, may be appendant to a manor land, office, &c. but land cannot be appendant to land, for both are corporeal inheritances; and one thing corporeal cannot be appendant to another.

APPENDICULA, in grammatical conſtruction, denotes a ſmall appendix, or abſtract heads, of a performance already read or written.

APPENDIX, in literature, is a ſupplement alphabetically added at the end of a work, to render it more complete.

APPERCEPTION, or **Adperception**, is a term uſed by Leibnitz and his followers for conſciouſneſs.

APPETITE, in a general ſenſe, indicates the deſire of enjoying ſome object, ſuppoſed to be conducive to our happineſs.

When this inclination is guided by reaſon, and proportioned to the intrinſic value of the object, it is called rational appetite; but on the other hand it is denominated ſenſitive appetite, when we have only a blind propenſity to a thing, without determinate ideas of the good qualities for which we deſire it.

Appetites are paſſions directed to general objects, in contradiſtinction to paſſions directed to particular objects, which retain their proper name. Thus we ſay, an appetite for fame, for glory, for conqueſt, for riches; but we ſay, the paſſion of love, of gratitude, of envy, &c.

Appetite may be alſo diſtinguiſhed from paſſion, ſince the latter has no exiſtence till a proper object be preſented; whereas the former exiſts firſt, and then is directed to an object.

Appetite, in medicine, is a painful ſenſation, accompanied with a deſire to eat or drink.

An exceſſive appetite is called by phyſicians bulimy, or fames canina; a defect or loſs of it, anorexy; and that after things improper for food, pica.

APPLAUSE, in a general ſenſe, implies, an approbation, ſignified by clapping the hands, as now practiſed in theatres. Applauſe, in antiquity, differed from Acclamation, as the latter was articulate, and performed with the voice, the former with the hands.

Applause, among the Romans, was an artificial muſical kind of noiſe, made by the audience to expreſs their ſatisfaction.

There were three ſpecies of applauſe, denominated from the different noiſes made in them; viz. Bombus, Imbrices, and Teſtæ; the firſt was a noiſe made either by the hands or mouth; the ſecond and third, by beating on a ſort of ſounding veſſels placed in the theatres for this purpoſe.

APPLE, the fruit of the pyrus malus.

Apple *of the Eye*, a name not unfrequently given to the pupil.

Apples *of Love*, the ſame as Lycopersicon.

Mad Apples, the ſame as Melongena.

Applicate, Applicata, or Ordinate, in geometry, denotes a right line drawn acroſs a curve, ſo as to be biſected by its diameter.

APPLICATION, in a general ſenſe, is the laying two things together, in order to diſcover their agreement or diſagreement.

Application, in geometry, implies diviſion, or applying one quantity to another, whoſe areas (but not figures) ſhall be the ſame; or, for transferring a given line into a circle, or other figure, ſo that its ends ſhall be in the periameter of the figure.

Application, in theology, ſignifies the act by which our Saviour tranſfers to us, what he has purchaſed by his holy life and death.

Accordingly, it is by this application of the merits of Chriſt, that we are to be juſtified, and intitled to grace and glory.

The ſacraments are the ordinary means by which it is effected.

APPOGIATURA, in muſic, implies the ſame as Apogiatura.

APPOINTEE, a foot-ſoldier in the French army, who, for his long ſervice and bravery, receives pay above private centinels.

Appointee, in heraldry, is the ſame as Aguiſée: thus we ſay, a croſs appointée, to ſignify that with two angles at the end cut off, ſo as to terminate in points.

APPOINTMENT, in a general ſenſe, imports the ſame as Assignation.

Appointment, in a particular ſenſe, denotes a penſion or ſalary given by princes to perſons of worth and parts, in order to retain them in their ſervice.

Appointments differ from wages; as the latter are fixed and ordinary, but the former are annual gratifications, granted by brevet for a time uncertain, and are paid out of the privy purſe.

APPORTIONMENT, or Apportionamentum, in law, implies the dividing of a rent into parts, in the ſame manner as the land from which it iſſues is divided.

However, conditions are always entire, and cannot be ſubjected to apportionment by any act of the party; neither can a contract be apportioned ſo as to ſubject a man to two actions.

APPOSAL *of Sheriffs*, in law, denotes a debit entry againſt them in the exchequer.

APPOSER, in common or eccleſiaſtical law, ſignifies an examiner. In the court of exchequer there is an officer called the Foreign Appoſer.

APPOSITION, in grammar, ſignifies the placing of two or more ſubſtantives together in the ſame caſe, without any copulative conjunction between them; as, *Ardebat*, *Alexim*, *delicias domini*.

APPRAISER, in trade, denotes a perſon who rates or values goods, &c.

They are generally employed in caſes of death, executions brought in upon goods, or of ſtock to be turned over from one perſon to another, or divided between copartners; and are called Sworn Appraiſers, from their taking an oath to do juſtice between party and party.

APPRAISING, the act of rating or valuing goods by an appraiſer.

APPREHENSION, in logic, denotes the ſimple attention of the mind to an object preſented to our imagination, without paſſing a judgment or making any inference.

Apprehension likewiſe indicates an inadequate idea; and thus it is applied to our knowledge of God, in contradiſtinction to comprehenſion.

Apprehension, in law, ſignifies the ſeizing a criminal, in order to bring him to juſtice.

APPRENTICE, in the legal acceptation of the word, implies one who is bound by covenant to ſerve a tradeſman or artificer a certain time, upon condition of the maſter's inſtructing him in his art or myſtery. See Syſtem of Law.

Anciently, benchers in the inns of court were called *apprentices of the law*, in Latin *apprenticii juris nobiliores*; as appears by Mr. Selden's note on Forteſcua: and ſo the learned Plowden ſtyles himſelf. Sir Henry Finch, in his *Nomotechnia*, writes himſelf, *apprentice dë lev:* Sir Edward Coke in his *Inſt.* ſays, *Apprenticii legis*, in pleading, are called *homines conſiliarii et in lege periti*; and in another place, *apprentices* and in other, counſellors at law.

Apprentices indentures and articles of clerkſhip, pay of duty ſix ſhillings. Pariſh indentures are excepted, and pay ſixpence only, by 5 W. 3. c. 21. For fees given with apprentices, clerks, or ſervants, bound or articled by indentures, from 1l. to 50l. maſters pay for every pound ſixpence; and for fees above 50 l. one ſhilling in the pound. 8 Ann, c. 9.

APPRENTICESHIP, the ſervitude of an apprentice, or the duration of his indenture. See Syſtem of Law.

APPROACH, or Approaching, in a general ſenſe, the acceding or coming together of two or more bodies or things.

Approaches, in fortification, the works thrown up by the beſiegers, in order to get nearer a fortreſs, without being expoſed to the enemy's cannon.

APPROACHING, in the manege, is a term uſed to expreſs ſuch devices as are contrived for the getting within ſhot of ſhy birds.

The beſt method of approaching is by means of three hoops tied together at proper diſtances according to the height of the man that is to uſe it, and having boughs of trees tied all round it, with cords to hang it over his ſhoulders; a man getting into this, conceals himſelf, and approaches by degrees towards his game in the form of a moving buſh. Geeſe, ducks, and teal, quit the waters in the evening, and paſs the night in the fields; but at the approach of morning they return to the water again, and even when on the water they will retire to great diſtances, on the approach even of a horſe or cow, ſo that the buſineſs of the ſtalking horſe is of little uſe; but this device of approaching by the moving buſh ſucceeds tolerably well with them.

Approaching, in gardening, is the inoculating or ingrafting the ſprig of one tree into another, without cutting it off the parent-tree.

APPROBATION, in morality, is a ſtate or diſpoſition of the mind, wherein we put a value upon, or become pleaſed with, ſome perſon or thing.

Approbation, in a moral ſenſe, is a principle of benevolence by which we are determined to approve of every kind affection either in ourſelves or others; and all publicly uſeful actions, which we imagine to flow from ſuch affection, without any view to our own private happineſs.

Approbation, in literature, implies the recommendation of books, by perſons qualified or authoriſed to judge of them. Hence, the learned bodies of public critics or reviewers who report the merits of every publication in England.

APPROPRIATION, in the canon law, implies a ſevering of a benefice eccleſiaſtical to the proper and perpetual uſe of ſome religious houſe.

APPROVEMENT, in ancient records of hiſtorical facts, imply the ſame as the modern word improvement.

In law, it denotes the incloſing part of a common by the lord of the manor.

If, however, there be not ſufficient common left to the tenant, he may have a writ of aſſize and recover triple damages: or he he may without enquiry break down the fence of the encloſure, as an action againſt the ſtatute.

APPROVER, in law, denotes a perſon who, confeſſing felony in himſelf, appealeth or impeach his accomplices. This proof was anciently either by battle, or by the country, at the choice of the appellee.

Approvers *of the King*, are thoſe who have the letting of the king's demeſnes in ſmall manors, &c. In the ſtatute of the 1ſt of Ed. 3. c. 8. ſheriffs are called the king's approvers.

Approver, or Appruare, is particularly uſed in ancient law, for a bailiff or land-ſteward, appointed to have the care of a manor, to improve it, for the benefit of his maſter.

APPROXIMATION, in arithmetic and algebra, indicates the coming nearer to a root, or quantity ſought, without expecting to find it exactly.

APPULSE, in aſtronomy, is the approach of any planet to a conjunction with the ſun, or a ſtar. It is a ſtep towards a tranſit, occultation, conjunction, eclipſe, &c.

APPURTENANCES, in law, denote the ſeveral rights, members, and privileges, appertaining to a thing already in poſſeſſion, whether corporeal as hamlets, or commonage; or incorporeal, as matters of liberty annexed to a meſſuage or tenement in occupation. Hence, a right of fiſhing in a particular river, ſtream or pond; or a ſeat in a church, booth on a green, &c. are ſaid to be appurtenances of a farm taken for a leaſe of lives or years.

APRICOT, in botany, the ſame as Prunus.

APRIL, in chronology, is the fourth month of the year, according to the common computation; but the ſecond, according to that of the aſtronomers. It contains 30 days. The word is derived from *aprilis*, of *aperio*, "I open;" becauſe the earth, in this month, begins to open her boſom for the production of vegetables.

A PRIORI, in rhetoric, implies a kind of demonſtration.

APRON, in naval architecture, is a piece of curved timber fixed behind the lower part of the ſtern, immediately above the foremoſt end of the keel.

Apron is alſo a name given to a platform or flooring of plank, raiſed at the entrance of a dock, againſt which the dock-gates are ſhut.

Apron, in gunnery, is a piece of lead which covers the touch-hole of a great gun.

APSINTHUM, or Absinthiatum, in medicine, denotes a ſtrengther of the ſtomach.

APSIS, or Absis, ſignifies the bowed or arched roof of a houſe, room, or oven, &c. as alſo the ring or compaſs of a wheel.

Apsis, in eccleſiaſtical writers, denotes an inner part in the ancient churches, in which the clergy ſat, and where the altar was placed.

Apsis, amounts to the ſame with what is otherwiſe called Choir, Concha, Camera, and Preſbyterium; and ſtands oppoſite to the nave or body of the church.

Apsis likewiſe denoted the biſhop's ſeat, in ancient churches.

Apsis alſo implies a reliquary, or caſe, in which the relics of ſaints were anciently kept.

Apsis, in aſtronomy, is a term uſed indifferently for either of the two points of a planet's orbit, where it is at the greateſt or leaſt diſtance from the ſun or earth; and hence the line connecting thoſe points is called the line of the apſides.

The apſis at the greateſt diſtance from the ſun is called the aphelion, and at the greateſt diſtance from the earth apogee; and that at the leaſt diſtance from the ſun is termed the perihelion, and at the leaſt diſtance from the earth the perigee.

APSERTIDES, the ſame as ABSORUS.

APTERA, in the Linnæan ſyſtem, denotes the ſeventh order of inſects, comprehending ſuch as have no wings, making together 14 genera, or families, and 297 ſpecies, or different kinds, in their common-wealth of nature.

APTHANE, a title anciently given to the higher degrees of nobility in Scotland.

APTITUDE, ſignifies the natural diſpoſition any thing hath to ſerve in its place. Thus, oil hath an aptitude to burn, and water to extinguiſh fire.

APTITUDE, or APTNESS, in philoſophy, implies the talents of the mind, for a promptitude or diſpoſition to learn things with eaſe and expedition.

In which ſenſe *aptneſs* amounts to the ſame with what the Greeks call *ευμαθια*, *bona indoles*, and we ſometimes *docility*.

APTOTE, among grammarians, is an undeclinable noun, or one which has no variation of caſes.

APUA, in ichthyology, denote ſynonymies of the vera, phalerica, and pilchard.

APUS, in ornithology, denotes a ſpecies of the ſwallow.

APUS, in entomology, denotes a ſpecies of the monaculus order of inſects.

APUS, *Avis Indica*, in aſtronomy, is a conſtellation of the ſouthern hemiſphere, placed near the pole, between the triangulum auſtrale and the chameleon, ſuppoſed to repreſent the bird of Paradiſe.

APYCNI SUONI, in muſic, are ſounds diſtant one or more octaves, and yet concord.

APYCNOS, in muſic, is ſaid to be of the diatonic genus, on account of its having ſpacious intervals, in compariſon of the chromatic and enharmonic.

APYRENOS, in natural hiſtory, denotes fruit of the nut kind, which have no kernel; hence, the popular name of blind, or barren nuts.

APYREXY, among phyſicians, denotes the intermiſſion of a fever.

APYROI, in ancient religious rites, were altars, on which ſacrifices were offered without fire, contradiſtinguiſhed from Empyroi, or thoſe on which fire was kindled to conſume the oblation.

APYROMETALLUM, in metallurgy, a technical term for gold or any pure metal, which reſiſts the force of fire.

APYRON, in chemiſtry, denotes any ſubſtance which is produced natural, which uſually requires fire in the proceſs of its production or manufactory.

APYROUS, in phyloſophy, is a word generally applied to denote that property of ſome bodies, by which they reſiſt the moſt violent fire without any ſenſible alteration.

Apyrous bodies are diſtinguiſhed from thoſe which are refractory.

Refractory ſubſtances are thoſe which cannot by violent heat be fuſed, whatever other alteration they may ſuſtain.

But a body, properly ſpeaking, apyrous, can neither be fuſed by heat, nor can undergo any other change.

AQUA, in experimental philoſophy, is a term uſed by phyſicians, chemiſts, &c. to denote medicines, or menſtruums, in a liquid form, diſtinguiſhed from each other by peculiar epithets, as Aqua Alexiteria, Aqua Aluminoſa, Aqua Mirabilis, &c.

AQUA *Extincta*, or *Extinguiſhed Water*, is aquafortis, into which ſome river-water has been poured, to qualify it, and render it leſs corroſive.

Its uſe is to get the ſilver from the aquafortis that ſerved to part gold from it.

AQUA *Fortis*, is a nitrous acid of a certain ſtrength, from its diſſolving power: and that which is concentrated and ſmoking, is called ſpirit of nitre.

The aquafortis uſed by dyers, braſs-founders, &c. is not only weaker than ſpirit of nitre, but contains a portion of vitriolic acid.

The nitrous acid, expelled by the vitriolic, will riſe in red fumes, and paſs into the receiver.

The vitriolic acid, uniting with the alkaline baſis of the nitre, forms vitriolated tartar; but, if more vitriolic acid than is requiſite to ſaturate the alkali, the ſurplus riſes with the nitrous acid. Aquafortis, therefore, is a mixture of theſe two acids.

AQUA *Marina*, ſignifies the beryl; it is ſo called on account of its ſea-green colour.

AQUA *Regia*, is a compound of nitrous and marine acid, in different proportions according to the purpoſe for which it is intended.

A pure aqua regia may be made by ſimply mixing the two acids.

Aqua regia is particularly uſed as a menſtruum for gold it diſſolves all other metals, except ſilver.

The gold diſſolved in aqua regia is, in fact, diſſolved in the dephlogiſticated marine acid only, which, being deprived of its phlogiſton by the nitrous acid, recovers it from the gold, and thus renders gold ſoluble; for metals are not ſoluble in acids until they loſe a part of their phlogiſton.

AQUA *Secunda*, is aquafortis diluted with pure water. It is employed in ſeveral arts, to clean the ſurface of metal, ſtones, and various other purpoſes.

AQUA *Vitæ*, or ſtrong ſpirit, is commonly underſtood brandy, ſpirit of wine, or any other liquid of ſtrength.

AQUÆDUCT, in hydraulics and architecture, implies a ſtructure formed for conveying water from one place to another, over grounds that are unequal. The word is compounded of the Latin ſubſtantive *aqua* water, and *ductus* a channel, by which that water may be conducted.

Architects diſtinguiſh two kinds of aquæducts; the viſible, and the ſubterranean. The viſible is conſtructed in valleys or marſhes, and protracted in longitude or latitude, as the ſituation requires. They are compoſed of adminicula for ſupporting the arches and confining the ſtream, and of arcades. The ſubterranean is formed, by piercing the mountains, and conducting them below the ſurface of the earth; built of ſtone, and covered above with vaults, or with flat ſtones, which may be termed flags; theſe flags ſhelter the waters from the heat of the ſun.

AQUAGE, in levelling, implies the race or courſe of a mill-ſtream, previous to its entrance into the damn for the head, where the ſluice riſes to let the water paſs to the water wheel. It alſo denotes any courſe where water has a deſcent, ſo as to run towards the ſea.

AQUALICULUS, in anatomy, is the pubes or region of the human body, where the privy members are placed at the termination of the trunk, or upper parts of the thighs.

AQUAMANILIS, in church hiſtory, denotes the laver uſed in the primitive days of Chriſtianity to waſh the hands in, on the entrance into the porch of a church, to ſignify a cleanſing from ſin; but this cuſtom, as a relick of Judaiſm, has been long ſince deſervedly laid aſide.

AQUARIANS, in eccleſiaſtical hiſtory, were Chriſtians in the primitive church who conſecrated water in the euchariſt inſtead of wine; under the pretence of abſtinence and temperance; holding it unlawful to eat fleſh or drink wine.

AQUARIUS, or the water-carrier, in aſtronomy, is the 11th ſign in the zodiac, reckoning from Aries; from which alſo the 11th part of the ecliptic takes its name. The ſun moves through Aquarius in the month of January; it is marked thus, ♒.

In mythology, the poets feign, that Aquarius was Ganymede, whom Jupiter carried to heaven, to ſerve as a cup-bearer, inſtead of Hebe, whence the name. But naturaliſts hold, that the ſign was ſo called, becauſe, when it appears in the horizon, the weather uſually proves rainy.

The ſtars in the conſtellation Aquarius, in Ptolemy's catalogue, are 45; in Tycho's 41; in Hevelius's 47; in Flamſtead's 108. The latter account ſeems to be neareſt the truth.

AQUATIA, AQUITICA, or AQUATICUM, in law, were formerly repreſented a tenant's right to the fiſhery or watering of a certain river, ſtream, pond, or lake. Hence, all ancient grants, by deed, had the aquatia mentioned as a neceſſary parcel of the habendum.

AQUARTIA, in botany, a genus of the tetrandria monogynia claſs; whoſe calyx is companulated; the corolla rotated, with linear diviſions; and the berry is four-ſeeded. There is but one ſpecies, the aculeata, a native of America.

AQUATIC, in natural hiſtory, is an appellation given to ſuch things as live or grow in the water.

AQUATINTA, in the fine arts, is a method of etching on copper, lately invented, by which a ſoft and beautiful effect is produced, reſembling a fine drawing in water colours or Indian ink.

Previous to the operation upon the plate, the followig powder muſt be prepared. Take of aſphaltum and fine tranſparent roſin, equal parts, ſuppoſe two ounces of each, and pound them ſeparately; through a muſlin ſieve, which may be formed with part of a chip-box of three or four inches in diameter, ſift upon a ſheet of paper a thin ſtratum of the aſphaltum, above which ſift a ſimilar layer of the roſin, and upon this another layer of aſphaltum, continuing theſe alternate layers till both of the powders are exhauſted: then paſs the mixture through the ſieve upon the paper once or twice, or till both appear to be ſufficiently incorporated; when the powder is ready for uſe. Some, inſtead of the above mixture, uſe gum ſandarach pounded. The main proceſs is then to be purſued as follows:

A copper-plate being poliſhed in the uſual way, lay the etching ground upon it, and etch the outlines of your deſign in the manner directed under the article ETCHING: the ground is then to be ſoftened with a little greaſe, and wiped off with a piece of rag; leaving, however, as much greaſe upon the plate as to dim the copper; then ſift the powder upon the ſurface of the plate; after which, ſtrike the other ſide of it pretty ſmartly againſt the edge of the table, in order to diſcharge it of the looſe powder; this done, with a hand-vice hold the back of the plate over a chaffing-diſh of charcoal fire, till it become ſo hot as to give pain upon being touched with the back of the hand; and the powder which adhered to the greaſe will now be fixed to the plate.

The plate being then ſuffered to cool, take turpentine varniſh mixed with ivory black; and with a hair-pencil dipt in it, cover all the lights or places where there is no work or ſhades. A rim or border of bees-wax is now to be raiſed round the plate: then having reduced the aquafortis to a proper ſtrength by vinegar or water, you pour it on, and let it ſtand five minutes for the firſt or lighteſt ſhade: after which, pour it off; and having waſhed the plate with water, ſet it on edge to dry: then with the varniſh ſtop up your light ſhades, pour on the equafortis for the ſecond tint, and let it ſtand five minutes more; proceeding in the ſame manner for every tint till you produce the darkeſt ſhades. If a bold open ground is wanted in any part, this requires an after-operation.

The ground muſt be laid as the other, by ſifting on the powder; this powder is to be much coarſer, and the plate muſt be much more heated, in order that the particles of the powder may ſpread, and form ſmall circles: even good clean roſin will do by itſelf.

In etching landſcapes, the ſky and diſtant objects are alſo performed by a ſecond operation, and the powder is ſifted upon the plate with a finer ſieve.

If the trees or any part of the fore-ground require to be higher finiſhed, the plate muſt be entirely cleanſed from greaſe with bread, and a ground laid in the common way of etching; when you may finiſh as highly and neatly as you pleaſe with the needle or point, by ſtippling with dots, and biting up thoſe parts, or by a r ling-wheel.

This art is kept as ſecret as poſſible by thoſe who practiſe it; and it is believed that no particular explanation or directions, before the preſent, except by one author, have been communicated to the public.

AQUEOUS, in a general ſenſe, implies a thing partaking of the nature of water.

AQUILA, in ornithology, a ſynonyme of the eagle.

Aquila, the eagle, in aſtronomy, is a conſtellation of the northern hemiſphere; uſually joined with Antinous. The ſtars in the conſtellation Aquila and Antinous, in Ptolemy's catalogue, are 15; in Ticho's, 19; in Heveius's, 42; in the Britannic catalogue 71.

Aquila, in chemiſtry, expreſſes ſynonymies of the ſeveral operations and ſubſtantives which are occaſionally joined to this epithet.

AQUILEGIA, columbine, a genus of the pentagynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, Multiſiliquæ. It has no calyx; the petals are five, with a horn-like nectarium inſerted between each; and there are five ſeparate capſules. There are four ſpecies:

1. The vulgaris, or wild columbine, with blue flowers, grows wild in England.

2. The alpina, with long oval flowers, grows naturally in Yorkſhire.

3. The inverſa, or garden columbine; there are great varieties, both in colour, fulneſs of the flowers, and form. Theſe are commonly called roſe-columbines; the colours are cheſnut, blue, red, and white, and ſome are finely variegated with two colours.

4. The canadenſis, or Canada columbine, preſerved in the gardens of the curious, though not at all remarkable for its beauty.

Theſe plants are all propagated by ſowing the ſeeds, or parting the old roots; but the former method is chiefly practiſed, for the old roots are very apt to degenerate.

Columbine has been looked upon as aperient; and was formerly in great eſteem among the common people for throwing out the ſmall-pox and meaſles.

AQUILICIUM, or Aquiliciana, in Roman antiquity, were ſacrifices performed in times of exceſſive drought, to obtain rain of the gods.

AQUILIFEER, in the Roman armies, denoted the officer who carried the ſtandard on which the eagle was repreſented.

AQUILINE, denotes ſomething reſembling an eagle; thus, an aquiline noſe is one bent ſomewhat like an eagle's beak.

AQUILUS, among the ancients, was a dark or duſky colour, approaching to black.

AQUIMINARIUM, in antiquity, is a kind of luſtral veſſel, in which the Romans carried their holy water for expiation, and other religious offices.

AQUIQUI, a ſynonyme of the king monkey of Brazil, in South America,

ARA Thuribuli, or the Altar of Incence, in aſtronomy, a ſouthern conſtellation, not viſible in our hemiſphere, conſiſting of nine ſtars.

Ara, or Altar, in aſtronomy, is a ſouthern conſtellation, containing eight ſtars.

ARAB, or Arabian Horse, is the ſame as Equus.

ARABESQUE or Arabesk, is ſomething done after the manner of the Arabians.

Arabeſque, Groteſque, and Moreſque, are terms applied to paintings, in which there are no human or animal figure but which conſiſt wholly of imaginary foliages, plants, ſtalks, &c.

The words take their riſe from hence, that the Moors, Arabs, and other Mahometans, uſe theſe kinds of ornaments; their religion forbidding them to make any images or figures of men or animals.

ARABIC, is ſynonymous with Arabian, which, in a general ſenſe, includes every thing that partakes of the country of Arabia, or the Arabs. Moſt authors ſuppoſe the language to have originated from the Hebrew.

ARABICI, in eccleſiaſtical hiſtory, were a ſect who ſprung up in Arabia, about the year 207, whoſe diſtinguiſhing tenet was, that the ſoul died with the body, and alſo roſe again with it.

ARABIS, baſtard tower-muſtard, in botany, a genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, Siliquoſæ. The generic mark conſiſts in four nectiferous glands, which lie on the inſide of each leaf of the calyx.

There are 8 ſpecies; but none of them remarkable for their beauty or other properties. Only one of theſe, the thaliana or mouſe-ear, is a native of Britain.

ARABIS, in botany, is a ſynonyme of the town muſtard.

ARABISM, *Arabiſmus*, an idiom peculiar to the Arabic language.

ARABIST, ſignifies a perſon ſkilled in the learning and languages of the Arabians.

ARABLE Lands, imply thoſe which are fit for tillage, or have been formerly tilled.

ARABUM Lepra, in the deſcription of maladies, is ſynonymous with Leproſy.

ARACARI, in zoology, is a ſynonyme of the Brazilian woodpecker.

ARACHIS, in botany, is a genus of the diadelphia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, Papillionacæ. There is only one ſpecies, the hypogæa, an annual plant, and a native of Braſil and Peru. The ſtalks are long, trail upon the ground, and are furniſhed with winged leaves, compoſed of four hairy lobes each. The flowers are produced ſingly on long pedunculs; they are yellow, of the pea kind, and each contains ten round ſhaped ſtamina, nine of which are tied together, and the upper one ſtands off.

In the centre is an awl-ſhaped ſtylus, crowned with a ſimple ſtigma. The germen is oblong, and becomes an oval oblong pod, containing two or three oblong blunt ſeeds.

This plant is cultivated in all the American ſettlements for the ſeeds, which make a conſiderable part of the food of the ſlaves. The manner of perfecting them is very ſingular: for as the flowers fall off, the young pods are forced into the ground by a natural motion of the ſtalks, and there they are entirely buried, and not to be diſcovered without digging for them; from whence they have taken the name of ground-nuts.

ARACHNE, in fabulous hiſtory, was a young maid of Lydia, ſaid to have been the inventreſs of ſpinning.

ARACHNOIDES, in anatomy, is an appellation given to ſeveral membranes; as the tunic of the cryſtalline humour of the eye, the external lamina of the pia mater, and one of the coverings of the ſpinal marrow.

ARACK, Abrack, or Rack, a ſpirituous liquor imported from the Eaſt Indies, uſed by way of dram and in punch.

The word arack, is an Indian name for ſtrong waters of all kinds. But what we underſtand by arack, is really no other than a ſpirit procured by diſtillation from a vegetable juice called toddy, which flows by inciſion out of the cocoa-nut tree, like the birch-juice procured among us.

Toddy is a pleaſant drink by itſelf, when new, and purges thoſe who are not uſed to it; and, when ſtale, it is heady, and makes good vinegar.

The Goa arack is made from toddy, the Batavia arack from rice and ſugar; and there is likewiſe a kind of ſhrub from which arack is made.

The Parier arack made at Madraſs, and the Columbo and Quilone arack at other places, being fiery hot ſpirits, are little valued by the Europeans, and therefore rarely imported; though highly prized among the natives.

The manner of making the Goa arack is thus: The juice of the trees is not procured in the way of tapping, as we do; but the operator provides himſelf with a parcel of earthern pots, with bellies and necks like our ordinary bird-bottles: he then makes faſt a number of theſe to his girdle, and any way elſe that he commodiouſly can about him.

Thus equipped, he climbs up the trunk of a cocoa tree; and when he comes to the boughs, he takes out his knife, and cutting off one of the ſmall knots or buttons, he applies the mouth of the bottle to the wound, faſtening it to the bough with a bandage; in the ſame manner he cuts off other buttons, and faſtens on his pots, till the whole number is uſed: this is done in the evening, and deſcending from the tree, he leaves them till the next morning; when he takes off the bottles, which are moſtly filled, and empties the juice into the proper receptacle.

This is repeated every night, till a ſufficient quantity is produced; and the whole being then put together, is left to ferment, which it ſoon does.

When the fermentation is over, and the liquor or waſh is become a little tart, it is put into the ſtill, and a fire being made, the ſtill is ſuffered to work as long as that which comes over has any conſiderable taſte of ſpirit.

The liquor thus procured is the low wine of arack; and this is ſo poor a liquor, that it will ſoon corrupt and ſpoil, if not diſtilled again, to ſeparate ſome of its phlegm; they therefore immediately after pour back this low wine into the ſtill, and rectify it to that very weak kind of proof-ſpirit, in which ſtate we find it. The arack we meet with, notwithſtanding its being of a proof-teſt, according to the way of judging by the crown of bubbles on it, holds but a ſixth, and ſometimes but an eighth, part of an alcohol or pure ſpirit; whereas our other ſpirits, when they ſhow that proof, are generally eſteemed to hold one half pure ſpirit.

There is a paper of obſervations on arack, in the Melanges d'Hiſtoire Natur. tome v. p. 302. By fermenting, diſtilling, and rectifying the juice, of the American maple, which has much the ſame taſte as that of the cocoa, the author ſays, he made arack not in the leaſt inferior to any that comes from the Eaſt-Indies; and thinks the juice of ſycamore and of the birch trees would equally anſwer the end.

Beſides the common ſorts of Goa and Betavia arack, there are two others leſs generally known; theſe are the bitter arack and the black arack.

Arack is alſo the name of a ſpirituous liquor made by the Tartars of Tunguſia, of mare's milk, left to ſour, and afterwards diſtilled twice or thrice between two earthen pots cloſely ſtopped, from whence the liqour runs through a ſmall wooden pipe. It is more intoxicating than brandy.

ARACUS, in botany, is a ſynonyme of the ſtrangle, or wild vetch, common to this country, in hedges and on banks, and in corn-fields.

ARACUCUS Aromaticus, in natural hiſtory, implies the ſame as Vanilla, which is a principal ingredient in the making of chocolate.

ARADOS, in medicine, denotes any ſort of perturbation occaſioned by a derangement of the animal ſyſtem, including every cauſe in the liſt of malady.

ARÆOMETER, an inſtrument wherewith to meaſure the denſity or gravity of fluids.

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ARANEA, the ſpider; a genus of inſects belonging to the order of aptera, or inſects without wings. All the ſpecies of ſpiders have eight legs, with three joints in each, and terminating in three crooked claws; they have eight eyes, two before, two behind, and the reſt on the ſides of the head. In the fore-part of the head, at the mouth, there is a pair of ſharp crooked claws or forceps: theſe ſtand horizontally; and, when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth. A little below the point of each claw, there is a ſmall hole, through which Leewenhoek ſuppoſes the ſpider emits a kind of poiſon. Theſe claws are the weapons with which they kill flies, &c. for their food. The belly or hinder part is ſeparated from the head and breaſt by a ſmall thread-like tube. The ſkin or outer ſurface is a hard poliſhed cruſt.

Spiders have five tubercles or nipples at the extremity of the belly, whoſe apertures they enlarge or contract at pleaſure. It is through theſe apertures that they ſpin a gluey ſubſtance with which their bellies are full. They fix the end of their threads by applying theſe nipples to any ſubſtance, and the thread lengthens in proportion as the animal recedes from it. They can ſtop the iſſuing of the threads by contracting the nipples, and re-aſcend by means of the claws on their feet, much in the ſame manner as ſome men warp up a rope. When the common houſe-ſpider begins her webs, ſhe generally chooſes a place where there is a cavity, ſuch as the corner of a room, that ſhe may have a free paſſage on each ſide, to make her eſcape in caſe of danger. Then ſhe fixes one end of her thread to the wall, and paſſes on to the other ſide dragging the thread along with her (or rather the thread follows her as ſhe proceeds), till ſhe arrives at the other ſide, and there fixes the other end of it. Thus ſhe paſſes and repaſſes, till ſhe has made as many parallel threads as ſhe thinks neceſſary for her purpoſe. After this, ſhe begins again and croſſes theſe by other parallel threads, which may be called the woof. Theſe are the toils or ſnares which ſhe prepares for entangling flies, and other ſmall inſects, which happen to light upon it. But, beſides this large web, ſhe generally weaves a ſmall cell for herſelf, where ſhe lies concealed watching for her prey. Betwixt this cell and the large web ſhe has a bridge of threads, which, by communicating with the threads of the large one, both give her early intelligence when any thing touches the web, and enables her to paſs quickly in order to lay hold of it. There are many other methods of weaving peculiar to different ſpecies of ſpiders; but as they are with a hand-vice hold the back of the plate over a chaffing-diſh of charcoal fire, till it become ſo hot as to give pain upon being touched with the back of the hand; and the powder which adhered to the greaſe will now be fixed to the plate.

The plate being then ſuffered to cool, take turpentine varniſh mixed with ivory black; and with a hair-pencil dipt in it, cover all the lights or places where there is no work or ſhades. A rim or border of bees-wax is now to be raiſed round the plate: then having reduced the aquafortis to a proper ſtrength by vinegar or water, you pour it on, and let it ſtand five minutes for the firſt or lighteſt ſhade: after which, pour it off; and having waſhed the plate with water, ſet it on edge to dry: then with the varniſh ſtop up your light ſhades, pour on the equafortis for the ſecond tint, and let it ſtand five minutes more; proceeding in the ſame manner for every tint till you produce the darkeſt ſhades. If a bold open ground is wanted in any part, this requires an after-operation.

The ground muſt be laid as the other, by ſifting on the powder; this powder is to be much coarſer, and the plate muſt be much more heated, in order that the particles of the powder may ſpread, and form ſmall circles: even good clean roſin will do by itſelf.

In etching landſcapes, the ſky and diſtant objects are alſo performed by a ſecond operation, and the powder is ſifted upon the plate with a finer ſieve.

If the trees or any part of the fore-ground require to be higher finiſhed, the plate muſt be entirely cleanſed from greaſe with bread, and a ground laid in the common way of etching; when you may finiſh as highly and neatly as you pleaſe with the needle or point, by ſtippling with dots, and biting up thoſe parts, or by a r ling-wheel.

This art is kept as ſecret as poſſible by thoſe who practiſe it; and it is believed that no particular explanation or directions, before the preſent, except by one author, have been communicated to the public.

AQUEOUS, in a general ſenſe, implies a thing partaking of the nature of water.

AQUILA, in ornithology, a ſynonyme of the eagle.

Aquila, the eagle, in aſtronomy, is a conſtellation of the northern hemiſphere; uſually joined with Antinous. The ſtars in the conſtellation Aquila and Antinous, in Ptolemy's catalogue, are 15; in Ticho's, 19; in Heveius's, 42; in the Britannic catalogue 71.

Aquila, in chemiſtry, expreſſes ſynonymies of the ſeveral operations and ſubſtantives which are occaſionally joined to this epithet.

AQUILEGIA, columbine, a genus of the pentagynia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, Multiſiliquæ. It has no calyx; the petals are five, with a horn-like nectarium inſerted between each; and there are five ſeparate capſules. There are four ſpecies:

1. The vulgaris, or wild columbine, with blue flowers, grows wild in England.

2. The alpina, with long oval flowers, grows naturally in Yorkſhire.

3. The inverſa, or garden columbine; there are great varieties, both in colour, fulneſs of the flowers, and form. Theſe are commonly called roſe-columbines; the colours are cheſnut, blue, red, and white, and ſome are finely variegated with two colours.

4. The canadenſis, or Canada columbine, preſerved in the gardens of the curious, though not at all remarkable for its beauty.

Theſe plants are all propagated by ſowing the ſeeds, or parting the old roots; but the former method is chiefly practiſed, for the old roots are very apt to degenerate.

Columbine has been looked upon as aperient; and was formerly in great eſteem among the common people for throwing out the ſmall-pox and meaſles.

AQUILICIUM, or Aquiliciana, in Roman antiquity, were ſacrifices performed in times of exceſſive drought, to obtain rain of the gods.

AQUILIFEER, in the Roman armies, denoted the officer who carried the ſtandard on which the eagle was repreſented.

AQUILINE, denotes ſomething reſembling an eagle; thus, an aquiline noſe is one bent ſomewhat like an eagle's beak.

AQUILUS, among the ancients, was a dark or duſky colour, approaching to black.

AQUIMINARIUM, in antiquity, is a kind of luſtral veſſel, in which the Romans carried their holy water for expiation, and other religious offices.

AQUIQUI, a ſynonyme of the king monkey of Brazil, in South America,

ARA Thuribuli, or the Altar of Incence, in aſtronomy, a ſouthern conſtellation, not viſible in our hemiſphere, conſiſting of nine ſtars.

Ara, or Altar, in aſtronomy, is a ſouthern conſtellation, containing eight ſtars.

ARAB, or Arabian Horse, is the ſame as Equus.

ARABESQUE or Arabesk, is ſomething done after the manner of the Arabians.

Arabeſque, Groteſque, and Moreſque, are terms applied to paintings, in which there are no human or animal figure but which conſiſt wholly of imaginary foliages, plants, ſtalks, &c.

The words take their riſe from hence, that the Moors, Arabs, and other Mahometans, uſe theſe kinds of ornaments; their religion forbidding them to make any images or figures of men or animals.

ARABIC, is ſynonymous with Arabian, which, in a general ſenſe, includes every thing that partakes of the country of Arabia, or the Arabs. Moſt authors ſuppoſe the language to have originated from the Hebrew.

ARABICI, in eccleſiaſtical hiſtory, were a ſect who ſprung up in Arabia, about the year 207, whoſe diſtinguiſhing tenet was, that the ſoul died with the body, and alſo roſe again with it.

ARABIS, baſtard tower-muſtard, in botany, a genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, Siliquoſæ. The generic mark conſiſts in four nectiferous glands, which lie on the inſide of each leaf of the calyx.

There are 8 ſpecies; but none of them remarkable for their beauty or other properties. Only one of theſe, the thaliana or mouſe-ear, is a native of Britain.

ARABIS, in botany, is a ſynonyme of the town muſtard.

ARABISM, *Arabiſmus*, an idiom peculiar to the Arabic language.

ARABIST, ſignifies a perſon ſkilled in the learning and languages of the Arabians.

ARABLE Lands, imply thoſe which are fit for tillage, or have been formerly tilled.

ARABUM Lepra, in the deſcription of maladies, is ſynonymous with Leproſy.

ARACARI, in zoology, is a ſynonyme of the Brazilian woodpecker.

ARACHIS, in botany, is a genus of the diadelphia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, Papillionacæ. There is only one ſpecies, the hypogæa, an annual plant, and a native of Braſil and Peru. The ſtalks are long, trail upon the ground, and are furniſhed with winged leaves, compoſed of four hairy lobes each. The flowers are produced ſingly on long pedunculs; they are yellow, of the pea kind, and each contains ten round ſhaped ſtamina, nine of which are tied together, and the upper one ſtands off.

In the centre is an awl-ſhaped ſtylus, crowned with a ſimple ſtigma. The germen is oblong, and becomes an oval oblong pod, containing two or three oblong blunt ſeeds.

This plant is cultivated in all the American ſettlements for the ſeeds, which make a conſiderable part of the ſood of the ſlaves. The manner of perfecting them is very ſingular: for as the flowers fall off, the young pods are forced into the ground by a natural motion of the ſtalks, and there they are entirely buried, and not to be diſcovered without digging for them; from whence they have taken the name of ground-nuts.

ARACHNE, in fabulous hiſtory, was a young maid of Lydia, ſaid to have been the inventreſs of ſpinning.

ARACHNOIDES, in anatomy, is an appellation given to ſeveral membranes; as the tunic of the cryſtalline humour of the eye, the external lamina of the pia mater, and one of the coverings of the ſpinal marrow.

ARACK, Abrack, or Rack, a ſpirituous liquor imported from the Eaſt Indies, uſed by way of dram and in punch.

The word arack, is an Indian name for ſtrong waters of all kinds. But what we underſtand by arack, is really no other than a ſpirit procured by diſtillation from a vegetable juice called toddy, which flows by inciſion out of the cocoa-nut tree, like the birch-juice procured among us.

Toddy is a pleaſant drink by itſelf, when new, and purges thoſe who are not uſed to it; and, when ſtale, it is heady, and makes good vinegar.

The Goa arack is made from toddy, the Batavia arack from rice and ſugar; and there is likewiſe a kind of ſhrub from which arack is made.

The Parier arack made at Madraſs, and the Columbo and Quilone arack at other places, being fiery hot ſpirits, are little valued by the Europeans, and therefore rarely imported; though highly prized among the natives.

The manner of making the Goa arack is thus: The juice of the trees is not procured in the way of tapping, as we do; but the operator provides himſelf with a parcel of earthern pots, with bellies and necks like our ordinary bird-bottles: he then makes faſt a number of theſe to his girdle, and any way elſe that he commodiouſly can about him.

Thus equipped, he climbs up the trunk of a cocoa tree; and when he comes to the boughs, he takes out his knife, and cutting off one of the ſmall knots or buttons, he applies the mouth of the bottle to the wound, faſtening it to the bough with a bandage; in the ſame manner he cuts off other buttons, and faſtens on his pots, till the whole number is uſed: this is done in the evening, and deſcending from the tree, he leaves them till the next morning; when he takes off the bottles, which are moſtly filled, and empties the juice into the proper receptacle.

This is repeated every night, till a ſufficient quantity is produced; and the whole being then put together, is left to ferment, which it ſoon does.

When the fermentation is over, and the liquor or waſh is become a little tart, it is put into the ſtill, and a fire being made, the ſtill is ſuffered to work as long as that which comes over has any conſiderable taſte of ſpirit.

The liquor thus procured is the low wine of arack; and this is ſo poor a liqour, that it will ſoon corrupt and ſpoil, if not diſtilled again, to ſeparate ſome of its phlegm; they therefore immediately after pour back this low wine into the ſtill, and rectify it to that very weak kind of proof-ſpirit, in which ſtate we find it. The arack we meet with, notwithſtanding its being of a proof-teſt, according to the way of judging by the crown of bubbles on it, holds but a ſixth, and ſometimes but an eighth, part of an alcohol or pure ſpirit; whereas our other ſpirits, when they ſhow that proof, are generally eſteemed to hold one half pure ſpirit.

There is a paper of obſervations on arack, in the Melanges d'Hiſtoire Natur. tome v. p. 302. By fermenting, diſtilling, and rectifying the juice, of the American maple, which has much the ſame taſte as that of the cocoa, the author ſays, he made arack not in the leaſt inferior to any that comes from the Eaſt-Indies; and thinks the juice of ſycamore and of the birch trees would equally anſwer the end.

Beſides the common ſorts of Goa and Betavia arack, there are two others leſs generally known; theſe are the bitter arack and the black arack.

ARACK is alſo the name of a ſpirituous liquor made by the Tartars of Tunguſia, of mare's milk, left to ſour, and afterwards diſtilled twice or thrice between two earthen pots cloſely ſtopped, from whence the liqour runs through a ſmall wooden pipe. It is more intoxicating than brandy.

ARACUS, in botany, is a ſynonyme of the ſtrangle, or wild vetch, common to this country, in hedges and on banks, and in corn-fields.

ARACUCUS AROMATICUS, in natural hiſtory, implies the ſame as Vanilla, which is a principal ingredient in the making of chocolate.

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1. The nudicaulis, having a naked ſtalk. This grows three or four feet high; the leaves have two large trifoliate lobes, which are ſawed on their edges. The flower-ſtalks ariſe between theſe, immediately from the root, and are terminated by round umbels of ſmall four-leaved flowers of a whitiſh colour. The roots of this ſpecies were brought over from North America, and ſold here for ſarſaparilla, and it is ſtill uſed as ſuch by the inhabitants of Canada; though it is very different from the true ſort.

2. The ſpinoſa, with a prickled ſtem, is a very ornamental ſhrub, and a native of Virginia. The height to which this tree will grow, if the ſoil and ſituation wholly agree with it, is about twelve feet; and the ſtem, which is of a dark brown colour, is defended by ſharp ſpines, which fall off; even the leaves, which are branching, and compoſed of many wings, and are of a pleaſant green colour, have theſe defenders, which are both crooked and ſtrong, and ſtand as guards to them till the leaves fall off in the autumn. The flowers are produced in large umbels from the ends of the branches: they are of a greeniſh yellow colour; and their general characters indicate their ſtructure. They make their appearance the end of July or beginning of Auguſt; but are not ſucceeded by ripe ſeeds in our gardens.

ARANEA, the ſpider; a genus of inſects belonging to the order of aptera, or inſects without wings. All the ſpecies of ſpiders have eight legs, with three joints in each, and terminating in three crooked claws; they have eight eyes, two before, two behind, and the reſt on the ſides of the head. In the fore-part of the head, at the mouth, there is a pair of ſharp crooked claws or forceps: theſe ſtand horizontally; and, when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth. A little below the point of each claw, there is a ſmall hole, through which Leewenhoek ſuppoſes the ſpider emits a kind of poiſon. Theſe claws are the weapons with which they kill flies, &c. for their food. The belly or hinder part is ſeparated from the head and breaſt by a ſmall thread-like tube. The ſkin or outer ſurface is a hard poliſhed cruſt.

Spiders have five tubercles or nipples at the extremity of the belly, whoſe apertures they enlarge or contract at pleaſure. It is through theſe apertures that they ſpin a gluey ſubſtance with which their bellies are full. They fix the end of their threads by applying theſe nipples to any ſubſtance, and the thread lengthens in proportion as the animal recedes from it. They can ſtop the iſſuing of the threads by contracting the nipples, and re-aſcend by means of the claws on their feet, much in the ſame manner as ſome men warp up a rope. When the common houſe-ſpider begins her webs, ſhe generally chooſes a place where there is a cavity, ſuch as the corner of a room, that ſhe may have a free paſſage on each ſide, to make her eſcape in caſe of danger. Then ſhe fixes one end of her thread to the wall, and paſſes on to the other ſide dragging the thread along with her (or rather the thread follows her as ſhe proceeds), till ſhe arrives at the other ſide, and there fixes the other end of it. Thus ſhe paſſes and repaſſes, till ſhe has made as many parallel threads as ſhe thinks neceſſary for her purpoſe. After this, ſhe begins again and croſſes theſe by other parallel threads, which may be called the woof. Theſe are the toils or ſnares which ſhe prepares for entangling flies, and other ſmall inſects, which happen to light upon it. But, beſides this large web, ſhe generally weaves a ſmall cell for herſelf, where ſhe lies concealed watching for her prey. Betwixt this cell and the large web ſhe has a bridge of threads, which, by communicating with the threads of the large one, both give her early intelligence when any thing touches the web, and enables her to paſs quickly in order to lay hold of it. There are many other methods of weaving peculiar to different ſpecies of ſpiders; but as they are all intended for the ſame purpoſe, it is needleſs to give particular deſcriptions of them.

Dr. Liſter tells us, that attending cloſely to a ſpider weaving a net, he obſerved it ſuddenly to deſiſt in the mid-work; and turning its tail to the wind, it darted out a thread with great violence: this thread, taken up by the wind, was immediately carried to ſome fathoms long; ſtill iſſuing out of the belly of the animal. Afterwards by the ſpider leaped into the air, and the thread mounted her up ſwiftly. After this diſcovery, he made the like obſervation in near thirty different ſorts of ſpiders; and found the air filled with young and old, ſailing on their threads, and doubtleſs ſeizing gnats and other inſects in their paſſage, there being often manifeſt ſigns of ſlaughter, legs and wings of flies, &c. on theſe threads, as well as in their webs below. Dr. Hulſe diſcovered the ſame thing about the ſame time.

He alſo obſerves of thoſe ſailing ſpiders, that they will often dart, not a ſingle thread only, but "a whole ſheaf at once, conſiſting of many filaments; yet all of one length, all divided each from the other, and diſtinct until ſome chance either ſnap them off or entangle them. But for the moſt part you may obſerve, that the longer they grow, the more they ſpread, and appear to a diligent obſerver like the numerous rays in the tail of a blazing ſtar. As for that which carries them away in the air, ſo ſwift off-hand, it is (as I have already hinted) partly their ſudden leap; partly the length and number of the threads projected, the ſtream of the air and wind beating more forcibly upon them; and partly the poſture and management of their feet, which at leaſt, by ſome ſort of them, I have obſerved to have been uſed very like wings or oars, the ſeveral legs (like our fingers) being ſometimes cloſe joined, at other times opened, again bent, extended, &c. according to the ſeveral neceſſities and will of the ſailor. To fly they cannot be ſtrictly ſaid, they being carried into the air by external force; but they can, in caſe the wind ſuffer them, ſteer their courſe, and perhaps mount and deſcend at pleaſure: and to the purpoſe of rowing themſelves along the air, it is obſervable that they ever take their flight backwards; that is, their head looking a contrary way, like a ſculler upon the Thames. It is ſcarce credible to what height they will mount.

Mr. Ray, ſpeaking of the height ſpiders are able to fly, he ſays, "Laſt October I took notice, that the air was very full of webs; I mounted to the top of the higheſt ſteeple on the minſter, in York, and could there diſcern them exceeding high above me."

He further obſerves, that they not only thus ſhoot their heads upward, and mount with it in a line almoſt perpendicular; they alſo project them in a line parallel to the horizon, as may be ſeen by their threads running from one wall to another in a houſe, or from one tree to another in the field, and even from wall to wall acroſs gardens of conſiderable extent.

The matter of which the ſpider's threads are formed, is a viſcid juice, elaborated in the body of the animal, and emitted from papillæ ſituated at the extremity of the belly; which papillæ are furniſhed with numerous apertures that do the buſineſs of wire-drawers, as it wera, in forming the threads. Of theſe apertures, Mr. Reaumur obſerves, there are enough in the compaſs of the ſmalleſt pin's head to yield a prodigious quantity of diſtinct threads. The holes are perceived by their effects: take a large garden-ſpider ready to lay its eggs, and applying the finger on a part of its papillæ, as you withdraw that finger, it will take with it an amazing number of different threads. M. Reaumur has often counted 70 or 80 with a microſcope, but has perceived that there were infinitely more than he could tell. In effect, if he ſhould ſay that each tip of a papilla furniſhed a thouſand, he is perſuaded he would ſay much too little. The part is divided into an infinity of little prominences, like the eyes of a butterfly, &c.

Such is the tenuity of the threads in the larger ſort of ſpiders. But if we examine the young produced by thoſe, we ſhall find that they no ſooner quit their egg than they begin to ſpin. Indeed their threads can ſcarce be perceived, but the webs may: they are frequently as thick and cloſe as thoſe of houſe-ſpiders: and no wonder, there being often four or five hundred little ſpiders concurring to the ſame work. How minute muſt their holes be? the imagination can ſcarce conceive that of their papillæ! The whole ſpider is perhaps leſs than a papilla of the parent, which produced it. But there are even ſome kinds of ſpiders ſo ſmall at their birth, that they are not viſible without a microſcope. There are uſually found an infinity of theſe in a cluſter, and they only appear like a number of red points: and yet there are webs found under them, though well nigh imperceptible. What muſt be the tenuity of one of theſe threds? Mr. Leewenhock has computed that 100 of the ſingle threads of a full grown ſpider, are not equal to the diameter of the hair of his beard. He further calculates, that when young ſpiders firſt begin to ſpin, four hundred of them are not larger than one which is of a full growth; allowing which, four millions of a young ſpider's threads are not ſo big as the ſingle hair of a man's beard.

Garden-ſpiders, particularly the ſhort-legged ſpecies, yield a kind of ſilk which has by ſome been judged ſcarce inferior to that of the ſilk-worm.

The act of generation among ſpiders varies in different ſpecies. As theſe inſects prey upon each other, except during the time of their amours, they dare not come within reach of one another but with the utmoſt caution. They may ſometimes be ſeen ſtretching out their legs, ſhaking the web, and tampering with each other by a ſlight touch with the extremity of their feet; then, in a fright, dropping haſtily down their thread, and returning in a few moments to make freſh trial by feeling. When once both parties are well aſſured of the ſex they have to deal with, the approaches of their feet, in order to feel, become more frequent, confidence takes place, and the inſtant of amorous dalliance enſues. "We cannot," ſays Lyonnet, "but admire how careful they are not to give themſelves up blindly to a paſſion, or venture on an imprudent ſtep, which might become fatal to them." Liſter and Lyonnet, two accurate obſervers, ſay, that the extremity of thoſe arms, or claws, which the ſpider uſes to graſp his prey with, ſuddenly opens, as it were by a ſpring, and lets out a white body, which the male applies beneath the abdomen of the female to fulfil the wiſh of nature. In the water-ſpider, the ſexual organs are ſituated at the hinder parts of the male, are curve, and act as it were by a ſpring; thoſe of the females are diſtinct. Nature by a thouſand varied methods accompliſhes her purpoſe

Spiders frequently change their colour, which varies much, in reſpect to ſeaſon, ſex, age, &c. but they are in general more beautifully variegated in antumn; a ſeaſon not only the moſt opportune and plentiful reſpecting their prey, but the time when they arrive at their greateſt magnitude, and are in their height of vigour.

The ſpecies of aranea enumerated by naturaliſts amount to upwards of 50; of which it may here ſuffice to mention a few of the moſt remarkable.

1. The calycina, with a round pale yellow belly, and two hollow points. It lives in the cups of flowers, after the flower-leaves have fallen off; and catches bees, and other flies, when they are in ſearch of honey.

2. The avicularia, has a convex round breaſt, hollowed tranſverſely in the middle. It is a native of America, and feeds upon ſmall birds, inſects, &c. The bite of this ſpider is as venomous as that of the ſerpent.

3. The ocellata, has three pair of eyes on its thighs. It is about the ſame ſize with the tarantula, of a pale colour, with a black ring round the belly, and two large black ſpots on the ſides of the breaſt. It is a native of China.

4. The ſaccata, has an oval belly, of a duſky iron colour. It lives in the ground, and carries a ſack with its eggs where ever it goes. This ſack it glues to its belly, and will rather die than leave it behind.

5. Diadema is the largeſt ſpider which this country produces. The abdomen is of an oval form, downy, and of a ruddy yellow colour, which is very variable in different ſeaſons; being ſometimes paler, at others very dark coloured. The upper part is beautifully adorned with black and white circles and dots, having a longitudinal band in the middle, compoſed of oblong and oval-ſhaped pearl-coloured ſpots, ſo arranged as to reſemble a fillet, ſimilar to thoſe worn by the Eaſtern kings. The ground upon which this fillet and the white dots are laid, when viewed with a glaſs, and the ſun ſhining thereon, is beautiful and rich beyond all deſcription. There are varieties in colour of this ſpider when younger. It inhabits the birch-tree.

6. The cucurbitina, has a globular yellow belly, with a few black ſpots. It lives in the leaves of trees, and incloſes its eggs in a ſoft net.

7. The labyrinthica, with a duſky oval belly, a whitiſh indented line, and a forked anus. The web of this ſpecies is horizontal, with a cylindrical well or tube in the middle.

8. The fimbriata, has a black oblong belly, with a white line on each ſide, and duſky-coloured legs. It lives in water, upon the ſurface of which it runs with great ſwiftneſs.

9. The holoſericea, has an ovaliſh belly covered with a down-like velvet; at the baſe, or under part, it has two yellow ſpots. It is found in the folded leaves of plants.

10. The viatica, or wanderer, is generally of a yellow colour more or leſs deep. Sometimes it is whitiſh and rather green. The abdomen is large, broad, and almoſt ſquare. The two foremoſt pair of legs are very long, and the hinder ſhort; which makes it walk like a crab. It is found upon plants; and is a lively, active, indefatigable hunter. Without any motion of the head, which is furniſhed with immoveable eyes, it perceives all the flies that hover round about, does not ſcare them, but ſtretches over them its arms furniſhed with feathers, which prove nets in which their wings intangle. It ſits on its eggs; which it often carries about with it, wrapt up in a ball of white ſilk.

11. The aquatica, is of a livid colour, with an oval belly, and a tranſverſe line, and two hollowed points. It frequents the freſh waters of Europe. It can live on land as well as in the water, and comes often on ſhore for its food; it is diſtinguiſhable by its brightneſs. In the water its belly appears covered with a ſilver varniſh, which is only a bubble of air attached to the abdomen by means of the oily humours which tranſpire from its body, and prevent the immediate contact of the water. This bubble of air is made the ſubſtance of its dwelling, which it conſtructs under water; for it fixes ſeveral threads of ſilk, or ſuch fine matter, to the ſtalks of plants in the water; and then aſcending

to the ſurface, thruſts the hinder part of its body above water, drawing it back again with ſuch rapidity, that it attaches underneath a bubble of air, which it has the art of detaining under water, by placing it underneath the threads abovementioned, and which it binds like a covering almoſt all around the air-bubble. Then it aſcends again for another air-bubble; and thus proceeds until it has conſtructed a large aerial apartment under water, which it enters into or quits at pleaſure. The male conſtructs for himſelf one near to the female; and when love invites, he breaks through the thread walls of the female's dwelling, and the two bubbles attached to the bellies of both unite into one, forming one large nuptial chamber. The female is ſometimes laid for a whole day together ſtretched on her back, waiting for the arrival of the male, without motion, and ſeemingly as if dead. As ſoon as he enters and glides over her, ſhe ſeems to be brought to life again, gets on her legs and runs after the male, who makes his eſcape with all poſſible ſpeed. The female takes care of the young, and conſtructs ſimilar apartments on purpoſe for them. The figure of this ſpider has nothing remarkable; and would be overlooked among a crowd of curioſities, if the ſpectator be unacquainted with its ſingular art of conſtructing an aerial habitation under water, and thus uniting together the properties of both elements. It lodges during the winter in empty ſhells, which it dexterouſly ſhuts up with a web.

12. The faſciata, with yellow bands round the belly, and duſky rings on the legs, is a native of Barbary, and is as large as the thumb. It inhabits hedges and thickets: its webs have large meſhes, and it reſides in the centre. The ſnares are ſpread for large flies, waſps, drones, and even locuſts: the leſſer inſects can eſcape through the meſhes. The animal which it entangles is ſoon bound with ſtrong threads; killed by the ſpider's jaws; and partly eat, if the ſpider is hungry; the reſt is concealed under ſome neighbouring dry leaves, covered with a kind of web and a blackiſh glue in great abundance. Its larder is ſaid to be often plentifully ſtored: the young ones live in amity; but when grown up, are mortal enemies. They never meet but they fight with violence, and their battle only ends with the death of the weakeſt. The dead body is carefully ſtored in the larder. Twelve of theſe ſpiders, by way of experiment, were ſhut up together; and, after a battle of eight days, the ſtrongeſt only remained alive.

13. The tarantula, has the breaſt and belly of an aſh-colour; the legs are likewiſe aſh-coloured, with blackiſh rings on the under part; the fangs or nippers are red on the inner ſide, the reſt being blackiſh: two of its eyes are larger than the others, and placed in the front; four other eyes are placed in a tranſverſe direction towards the mouth; the other two are nearer the back: it has two antennæ or feelers. It is a native of Italy, Cyprus, Barbary, and the Eaſt Indies. It lives in bare fields, where the lands are fallow, but not very hard. Theſe ſpiders do not live quite a year. In July they ſhed their ſkin, and proceed to propagation; which, from a mutual diſtruſt, as they frequently devour one another, is a work undertaken with great circumſpection. They lay about ſeven hundred and thirty eggs, which is hatched in the ſpring; but the parent does not live to ſee her progeny. The Ichneumon fly is their moſt formidable enemy.

The bite of the tarantula is falſely repreſented to occaſion an inflammation in the part, which in a few hours brings on ſickneſs, difficulty of breathing, and univerſal faintneſs. The perſon afterwards is affected with a delirium, and ſometimes is ſeized with a deep melancholy. The ſame ſymptoms return annually, in ſome caſes, for ſeveral years; and at laſt terminate in death. Muſic, it has been pretended, is the only cure. A muſician is brought, who tries a variety of airs, till at laſt he hits upon one that urges him to dance; the violence of which exerciſe produces a proportionable agitation of the vital ſpirits, attended with a conſequent degree of perſpiration, the conſequence of which is in general a cure. Such are the circumſtances that have been generally related, and long credited, concerning the bite of this animal. Kircherus, in his Muſurgia, gives a very particular account of the ſymptoms and cure, illuſtrated by hiſtories of caſes. Among theſe, he mentions a girl, who being bitten by this inſect, could be cured only by the muſic of a drum. He then proceeds to relate, that a certain Spaniard, truſting to the efficacy of muſic in the cure of the frenzy occaſioned by the bite of the tarantula, ſubmitted to be bitten on the hand by two of theſe creatures, of different colours, and poſſeſſed of different qualities. The venom was no ſooner diffuſed about his body, than the ſymptoms of the diſorder began to appear; upon which harpers, pipers, and other muſicians, were ſent for, who by various kinds of muſic endeavoured to rouſe him from that ſtupor into which he was fallen: but here it was obſerved that the bites of the two inſects had produred contrary effects; for by one he was incited to dance, and by the other he was reſtrained therefrom; and in this conflict of nature the patient expired. The ſame account is given in his Phonurgia Nova, with the addition of a cut repreſenting the inſect in two poſitions, the patient in the action of dancing, together with the muſical notes of the tune or air by which in one inſtance the cure was effected.

In his Muſurgia, this author, attempting mechanically to account for the cure of the bite of the tarantula by muſic, ſays of the poiſon, That it is ſharp, gnawing, and bilious; and that it is received and incorporated into the medullary ſubſtance of the fibres. With reſpect to the muſic, he ſays, That the ſounds of chords have a power to rarefy the air to a certain harmonical pitch; and that the air thus rarefied, penetrating the pores of the patient's body, affects the muſcles, arteries, and minute fibres, and incites him to dance; which exerciſe begets a perſpiration, in which the poiſon evaporates.

Unſatisfactory as this theory appears, the belief of this ſtrange phenomenon has prevailed among the ableſt of modern phyſicians. Sir Thomas Brown, ſo far from diſputing it, ſays, That ſince many atteſt the fact from experience, and that the learned Kircherus hath poſitively averred it, and ſet down the ſongs and tunes ſolemnly uſed for the cure of the diſeaſe, and ſince ſome alſo affirm that the tarantula itſelf will dance at the ſound of muſic, he ſhall not at all queſtion it.

Baglivi, a native of Apulia, the country where the tarantula is produced, has written a diſſertation *De anatomia, morſu, et effectibus tarantulæ*. In this he deſcribes the region of Apulia where the tarantula is produced, with the anatomy and figure of the inſect and its eggs, illuſtrated by an engraving; he mentions particularly the ſymptoms that follow from the bite, and the cure of the diſeaſe by muſic, with a variety of hiſtories of cures thus wrought.

Ludovicus Valetta, a Celeſtine monk of Apulia, publiſhed at Naples, in the year 1706, a treatiſe upon this ſpider, in which he not only anſwers the objections of thoſe who deny the whole thing, but gives, from his own knowledge, ſeveral inſtances of perſons who had ſuffered this way.

The honourable Mr. Robert Boyle, in his treatiſe of Languid and Unheeded Motions, ſpeaking of the bite of the tarantula, and the cure of the diſeaſe which follows it by means of muſic, ſays, That, having himſelf had ſome doubts about the matter, he was, after ſtrict inquiry, convinced that the relations in the main were true.

Laſtly, Dr. Mead, in his Mechanical Account of Poiſons, has given an eſſay on the tarantula, containing the ſubſtance of the above relations, which he endeavours to confirm by his own reaſoning thereon.

Notwithſtanding the number and weight of theſe authorities, and the general acquieſcence of learned and ingenious men in the opinion that the bite of the tarantula is poiſonous, and that the cure of the diſorder occaſioned by it is effected by muſic, it is beyond doubt a miſtaken notion.

Dr. Serao, an Italian phyſician, has written an ingenious book, in which he has effectually exploded this opinion as a popular error; and in the Philoſophical Tranſactions, N° LX. for the year 1770, p. 236. is a letter from Dominico Cirillo, M. D. profeſſor of natural hiſtory in the univerſity of Naples, wherein, taking notice of Serao's book, he ſays, That having had an opportunity of examining the effects of this animal in the province of Taranto, where it is found in great abundance, he finds that the ſurpriſing cure of the bite of the tarantula by muſic has not the leaſt truth in it; and that it is only an invention of the people, who want to get a little money by dancing when they ſay the tarantiſm begins.

He adds, "I make no doubt but ſometimes the heat of the climate contributes very much to warm their imaginations, and throw them into a delirium, which may be in ſome meaſure cured by muſic; but ſeveral experiments have been tried with the tarantula, and neither men nor animals after the bite have had any other complaint than a very trifling inflammation upon the part, like that produced by the bite of a ſcorpion, which goes off by itſelf without any danger at all. In Sicily, where the ſummer is ſtill warmer than in any part of the kingdom of Naples, the tarantula is never dangerous; and muſic is never employed for the cure of the pretended tarantiſm."

Mr. Swinburn, when in the country of the tarantula, was deſirous of inveſtigating minutely every particular relative to that inſect; but the ſeaſon was not far enough advanced, and no *tarantati* (perſons bitten, or pretending to be bitten, by the tarantula) had begun to ſtir. He prevailed, however, upon a woman who had formerly been bitten, to act the part, and dance the tarantata before him. A great many muſicians were ſummoned, and ſhe performed the dance, as all preſent aſſured him, to perfection. At firſt ſhe lolled ſtupidly on a chair, while the inſtruments were playing ſome dull muſic. They touched, at length, the chord ſuppoſed to vibrate to her heart; and up ſhe ſprang with a moſt hideous yell, ſtaggered about the room like a drunken perſon, holding a handkerchief in both hands, raiſing them alternately, and moving in very true time. As the muſic grew briſker, her motions quickened, and ſhe ſkipped about with great vigour and variety of ſteps, every now and then ſhrieking very loud. The ſcene was far from pleaſant; and, at his deſire, an end was put to it before the woman was tired. Wherever the tarantati are to dance, he informs us, a place is prepared for them, hung round with bunches of graves and ribbons. The patients are dreſſed in white, with red, green, or yellow ribbons, for thoſe are their favourite colours; upon their ſhoulders they caſt a white ſcarf, let their hair fall looſe about their ears, and throw their heads as far back as they can bear it. They are exact copies of the ancient prieſteſſes of Bacchus. The orgies of that god, whoſe worſhip, under various ſymbols, was more widely ſpread over the globe than that of any other divinity, were no doubt performed with energy and enthuſiaſm by the lively inhabitants of this warm climate. The introduction of Chriſtianity aboliſhed all public exhibitions of theſe heatheniſh rites, and the women durſt no longer act a frantic part in the character of Bacchantes. Unwilling to give up ſo darling an amuſement, they deviſed other pretences; and poſſeſſion by evil ſpirits may have furniſhed them with one. Accident may alſo have led them to a diſcovery of the tarantula; and, upon the ſtrength of its poiſon, the Puglian dames ſtill enjoy their old dance, though time has effaced the memory of its ancient name and inſtitution: and this Mr. Swinburn takes to be the origin of ſo ſtrange a practice. If at any time theſe dancers are really and involuntary affected, he ſuppoſes it can be nothing more than an attack upon their nerves, a ſpecies of St. Vitus's dance; and he inclines the more to the idea, as there are numberleſs churches and places throughout theſe provinces dedicated to that ſaint.

Mr. Swinburn ſays, no perſon above the loweſt rank in life was ever ſeized with this malady, nor is there an inſtance of its cauſing death. The length of the dance, and the patient's powers of bearing ſuch exceſſive fatigue in the canicular ſeaſon, prove nothing; becauſe every day, at that time of the year, peaſants may be ſeen dancing with equal ſpirit and perſeverance, though they do not pretend to be ſeized with the tarantiſm. The illneſs may therefore be attributed to hyſterics, exceſſive heat, ſtoppage of perſpiration, and other effects of ſleeping out of doors in a hot ſummer air, which is always extremely dangerous, and ſometimes mortal, in moſt parts of Italy. Violent exerciſe may have been found to be a certain cure for this diſorder, and continued by tradition, though the date and circumſtances of this diſcovery have been long buried in oblivion; a natural paſſion for dancing, imitation, cuſtom of the country, and a deſire of raiſing contributions upon the ſpectators, are probably the real motives that inſpire the tarantati. Before Serao's experiments, the tarantula had been proved to be harmleſs, from trials made in 1693 by Clarizio, and in 1740 at Lucera by other naturaliſts.

The venom of this ſpecies of ſpider can produce no effects but ſuch as are common to all others.

ARAIGNEE, in fortification, a ſynonymous term with Gallery.

ARANEA Concha, or ſpider ſhell, in natural hiſtory, are ſpecies of the murex. The characters are, the lips are digitated; the number of fingers without rule, from 4 to 8.

ARANEUS Marinus, the ſea ſpider, a ſynonyme of the draco marinus.

ARANNEA, in metallurgy, ſignifies the pure ſilver ore adhering to the ſpar, like a cobweb: this runs down in ſmelting at the earlieſt fuſion, i. e. about 42° of heat.

ARAPAUNA, in ornithology, a ſynonyme of the macaw.

ARATO Bafaben, in aſtronomy, implies a fixed ſtar in the head of the dragon.

ARATURA Terræ, in law, denotes an homage in copyhold premiſes due to the lord of the manor, as ſervices in tillage, but more uſually denominated a yoke of oxen or kine, to prepare the fields into fallow.

ARBITRATORS, in law, ſignify two deputed judges, one for the plaintiff, and another for the defendant, but in caſe they do not agree, theſe two depute a third perſon, who is called an umpire, whoſe deciſion or award is final. The high court of chancery very frequently in matters of commercial intereſt, or mercantile tranſactions, refer to this mode of adjuſting litigated points; which is the ſoundeſt policy and greateſt wiſdom to ſettle differences, by perſons profeſſing the ſame occupations, as the perſons who are contending for a legal verdict: for it gives entire ſatisfaction, and begets confidence in the law of the land.

ARBOR, in chemiſtry, implies all ſuch chriſtallizations as reſemble the body, branches or ſtems of trees.

Hence many compoſitions in this art bear that name; deriving the epithet from whatever gives them body for ſuch production.

Arbor, in genealogy, indicates a regular diſpoſition of root, ſtock and branches, ſo as to ſhew the real conſanguinity, affinity and kindred, derived under a particular family increaſe. Theſe well conſidered, and rightly diſtributed in order of claſſification, would, no doubt, prevent many litigations in courts of law.

ARBOREOUS, in natural hiſtory, implies ſomething partaking of the nature of trees; ſuch as fungaſſes, moſſes, ivy, &c.

ARBOUR, or Bower, in gardening, denotes a kind of ſummer-houſe made in a garden, formerly much admired; but the modern taſte has now rejected them, as unwholeſome places of reſort, owing to the too great current of dephlogiſticated effluvia, which muſt neceſſarily ariſe from the ripening fruits and decaying fibres.

ARBUSCULA, in botany, is a trivial name of the elder tree; and a ſynonyme for the whole family of plants, between ſhrubs and trees.

RBUSTUM, in botanical language, implies an orchard or garden ſet with fruit trees.

ARBUTUS, or ſtrawberry tree, in botany, is a genus of the monogynja order, belonging to the decandria claſs, and in the natural order of methodical arrangement, the 18th family, bicornes.

The calyx, in five parts; the corolla ovated, and the fruit, a berry, with five cells. There are ſeven ſpecies.

1. The unedo, or common ſtrawberry tree, a native of Italy, Spain, France, and Ireland; and now common to the gardens of England, and Scotland.

There are four varieties of it; which only can be diſtinguiſhed by their ſize and colour, as produced by leſs or greater pains in culture.

They are all common to the London market, and bear the oblong, the round fruited, the red flowered, and the double bloſſomed ſtrawberries; and may each be propagated by ſeeds or cuttings.

One deſcription is nearly common to all; and their inconſiderable variation is almoſt ſufficiently ſhown in their reſpective appellations

2. The adrachne, or Oriental berry.
3. The bilberry of Arcadia.
4. The bilberry with white leaves.
5. The uva urſa, or bear berries.
6. The acadienſis, or Arcadian berry.
7. The alpina, or mountain ſtrawberry.

The method of cultivation is nearly the ſame in theſe ſpecies as that of the arbutus. However, it is allowed by the moſt experienced gardeners, that the fruit raiſed by ſeeds, are always preforable to thoſe raiſed from cuttings.

ARCA, in zoology, implies a genus of the vermes teſtacea, in the Linnæan claſſification.

ARCACORDIS, in anatomy, a ſynonyme of the pericardium.

ARCADE, in architecture, implies any opening in a wall, over which an arch is made.

ARCANGIS, in the Ottoman armies, ſignify plundering ſcouts, or privileged pillaging ſoldiers, who receive no pay till they ſignalize themſelves by harraſſing and diſtreſſing the enemy: after which they are ranked with the Janizaries.

ARCH, in geometry, implies any part of a curved line, intercepted between two points; hence, arches of a circle, which are, arches of any dimenſion leſs than a ſemicircle.

Arch, in military, or naval departments, ſignifies a concave or vault, in the form of a curve erected to ſupport ſome heavy ſtructure or paſſage.

Arch Angel, in Scripture, implies the meſſenger of God, ſent on an extraordinary occaſion. This high rank of celeſtial dignity is the ſecond order of the third hierarchy.

Arch Triumphal, in univerſal hiſtory, denotes a gate, over which an arch was erected, exactly ſemicircular, adorned with ſculpture and inſcriptions, erected in honour of thoſe heroes who have deſerved a triumph.

ARCHARD, in a mercantile phraſe, implies a bale of pickles; but in a more reſtrained ſenſe, it ſignifies an Eaſt Indian pickle, in much eſtimation throughout India.

ARCHBISHOP, the name of a church dignitary of the firſt claſs. Archbiſhops were not known in the Eaſt till about the year 320; and though there were ſome ſoon after this who had the title, yet that was only a perſonal honour, by which the biſhops of conſiderable cities were diſtinguiſhed. It was not till of late that archbiſhops became metropolitans, and had ſuffragans under them. Athanaſius appears to be the firſt who uſed the title archbiſhop, which he gave occaſionally to his predeceſſor; Gregory Nazianzen, in like manner, gave it to Athanaſius; not that either of them were entitled to any juriſdiction, or even any precedence in virtue of it. Among the Latins, Iſidore Hiſpalenſis is the firſt that ſpeaks of archbiſhops. He diſtinguiſhes four orders or degrees in the eccleſiaſtical hierarchy, viz. patriarchs, archbiſhops, metropolitans, and biſhops.

The archbiſhop, beſide the inſpection of the biſhops and inferior clergy in the province over which he preſides, exerciſes epiſcopal juriſdiction in his own dioceſe. He is guardian of the ſpiritualties of any vacant ſee in his province, as the king is of the temporalities; and exerciſes eccleſiaſtical juriſdiction in it. He is entitled to preſent by lapſe to all the eccleſiaſtical livings in the diſpoſal of his dioceſan biſhop, if not filled within ſix months. He has likewiſe a cuſtomary prerogative, upon conſecrating a biſhop, to name a clerk or chaplain to be provided for by ſuch biſhop; in lieu of which it is now uſual to accept an option. He is ſaid to be enthroned when veſted in the archbiſhopric; whereas biſhops are ſaid to be inſtalled.

The eccleſiaſtical government of England is divided into two provinces, viz. Canterbury and York. Canterbury hath the following ſuffragan biſhoprics appertaining to it, St. Aſaph, Bangor, Bath and Wells, Briſtol, Chicheſter, Litchfield and Coventry, St. David's, Ely, Exeter, Glouceſter, Hereford, Landaff, Lincoln, London, Norwich, Oxford, Peterborough, Rocheſter, Saliſbury, Wincheſter, and Worceſter. To York appertaineth the biſhopric of Carliſle, Cheſter, and Durham; to which may be added the biſhopric of Sodor and Man, whoſe biſhop is not a lord of parliament.

The archbiſhop of Canterbury had anciently, viz. till the year 1152, juriſdiction over Ireland, as well as England, and was ſtyled a *patriarch*, and ſometimes *alterius orbis papa*, and *orbis Britannici pontifex*. Matters were done and recorded in his name thus, *Anno pontificatus noſtri primo*, &c. The firſt archbiſhop of Canterbury was Auſtin, appointed by king Ethelbert, on his converſion to Chriſtianity, about the year 598. He was alſo *legatus natus*. He even enjoyed ſome ſpecial marks of royalty; as, to be patron of a biſhopric, which he was of Rocheſter; and to make knights, coin monies, &c. He is ſtill the firſt peer of England, and the next to the royal family; having precedence of all dukes and all great officers of the crown. It is his privilege, by cuſtom, to crown the kings and queens of this kingdom. He may retain and qualify eight chaplains; whereas a duke is by ſtatute allowed only ſix. He has, by common law, the power of probate of wills and teſtaments, and granting letters of adminiſtration. He has alſo a power to grant licences and diſpenſations in all caſes formerly ſued for in the court of Rome, and not repugnant to the law of God. He accordingly iſſues ſpecial licences to marry, to hold two livings, &c. and he exerciſes the right of conferring degrees. He alſo holds ſeveral courts of judicature; as, ccurt of arches, court of audience, prerogative court, and court of peculiars.

The archbiſhop of York has the like rights in his province as the archbiſhop of Canterbury. He has precedence of all dukes not of the royal blood; and of all officers of ſtate, except the lord high chancellor. He has alſo the rights of a count palatine over Hexamſhire. The firſt archbiſhop of York was Paulinus, appointed by Pope Gregory about the year 622. He had formerly juriſdiction over all the biſhops of Scotland; but in the year 1470, pope Sextus IV. created the biſhop of St. Andrew's archbiſhop and metropolitan of all Scotland.

Scotland, whilſt epiſcopacy prevailed in that country, had two archbiſhops, of St. Andrew's and Glaſgow; of which the former was accounted the metropolitan; and, even before it arrived at the dignity of an archbiſhopric, reſiſted with great ſpirit all the attempts of the archbiſhops of York in England to become the metropolitans of Scotland. The ſees of Argyle, Galloway, and the Iſles, were ſuffragans to Glaſgow; all the others in the kingdom, to St. Andrew's.

Ireland has four archbiſhops; of Armagh, Dublin, Caſhel, and Tuam; the former of whom is primate of all Ireland.

ARCHBISHOPRIC, in eccleſiaſtical geography, a province ſubject to the juriſdiction of an archbiſhop.

ARCHBUTLER, in the German empire, ſignifies the office of cup-bearer to the emperor, which is reckoned the higheſt office in the emperor's gift. This uſually belongs to the king of Bohemia.

ARCHCHAMBERLAIN, in the German empire, is an officer on an equal rank with the great chamberlain of England. This is held by the elector of Brandenburg.

ARCHCHANCELLOR, was an high officer, who in former times preceded over the ſecretaries of the court of Vienna, the capital of the German empire.

Now the office is merely honorary. The archbiſhop of Mentz has that title.

ARCHCANTOR, the chief of a chantery in the Roman catholic church.

ARCHCUNOT, a title formerly given to the earl of Flanders, on account of his great power and riches.

ARCHDEACON, an eccleſiaſtical dignitary or officer next to a biſhop, whoſe juriſdiction extends either over the whole dioceſe or only a part of it. He is uſually appointed by the biſhop himſelf; and hath a kind of epiſcopal authority, originally derived from the biſhop, but now independent and diſtinct from his. He therefore viſits the clergy; and has his ſeparate court for puniſhment of offenders by ſpiritual cenſures, and for hearing all other cauſes of eccleſiaſtical cognizance. There are 60 archdeacons in England.

ARCHDEACON's *Court*, is the moſt inferior court in the whole eccleſiaſtical polity. It is held, in the archdeacon's abſence, before a judge appointed by himſelf, and called his official, and its juriſdiction is ſometimes in concurrence with, ſometimes in excluſion of, the biſhop's court of the dioceſe. From hence, however, ſtatue 24 Hen. VIII. c. 12. there lies an appeal to that of the biſhop.

ARCHDRUID, the chief or pontiff of the antient druids.

ARCHDUKE, a title pecular to the houſe of Auſtria; all the ſons of which are archdukes, and daughters archducheſſes.

ARCHED, in a general ſenſe, implies any thing that is conſtructed, faſhioned, or formed in the ſhape of an arch.

ARCHER, in ancient military art, denotes a perſon who fought with a bow and arrows.

ARCHERS, a kind of militia or ſoldiery armed with bows and arrows. The word is formed of *arcus*, "a bow;" whence *arcuarius*, and even *arquis*, and *arquites*, as they are alſo denominated in the corrupt ſtate of the Latin tongue.

Archers were much employed in former times: but they are now laid aſide, excepting in Turkey and ſome of the Eaſtern countries; where there are companies of archers ſtill ſubſiſting in their armies, and with which they did terrible execution at the battle of Lepanto. As an exerciſe, the practice of archery is ſtill kept up in many places.

In France, the officers who attend the lieutenants de police and provoſts to make captures, ſeizures, arreſts, &c. are called *archers*; though their arms be only halberds or cambines. In this ſenſe they ſay, the *archers* of the *grand prevot de l'hotel*; of the *prevot des marchands*; the city *archers*; the *archers du guet*, or of the watch, &c. Small parties or *archers*, called alſo *gens de marechauſſee*, are continually patrolling on the great roads, to ſecure them againſt robbers. The carriages of Lyons, &c. are always eſcorted by a party of archers. To the diligence of theſe archers, or marſhal's-men, it is partly owing, that perſons now travel in all parts of France in the utmoſt ſecurity; there being fewer robbers on the highway in that whole kingdom in a year than about London in a week.

ARCHERY, the art or exerciſe of ſhooting with a bow and arrow.

In moſt nations the bow was anciently the principal implement of war, and by the expertneſs of the archers alone was often decided the fate of battles and of empires. In this iſland archery was greatly encouraged in former times, and many ſtatutes were made for the regulation thereof; whence it was that the Engliſh archers in particular became the beſt in Europe, and procured them many ſignal victories.

The Artillery Company of London, though they have long diſuſed the weapon, are the remains of the ancient fraternity of bowmen or archers.

Artillery, *artillerie*, is a French term ſignifying *archery*; as the *king's bowyer* is in that language ſtiled *artillier du roy:* and from that nation the Engliſh ſeem to have learnt at leaſt the croſs-bow archery. We therefore find that William the Conqueror had a conſiderable number of bowmen in his army at the battle of Haſtings, when no mention is made of ſuch troops on the ſide of Harold: and it is ſuppoſed that theſe Norman archers ſhot with the arbaleſt, or croſs-bow, in which formerly the arrow was placed in a groove, being termed in French a *quadrel*, and in Engliſh a *bolt*.

Of the time when ſhooting with the long bow firſt began among the Engliſh, at which exerciſe they afterwards became ſo expert, there appear no certain accounts. Their chroniclers do not mention the uſe of archery as expreſsly applied to the croſs-bow, or the long-bow, till the death of Richard I. who was killed by an arrow at the ſiege of Limoges in Guienne, which Hemmingford mentions to have iſſued from a croſs-bow. After this, which happened in 1199, there appear not upon record any notices of archery for nearly 150 years, when an order was iſſued by Edward III. in the 15th year of his reign, to the ſheriffs of moſt of the Engliſh counties for providing 500 white bows and 500 bundles of arrows, for the then intended war againſt France. Similar orders are repeated in the following years; with this difference only, that the ſheriff of Glouceſterſhire is directed to furniſh 500 painted bows as well as the ſame number of white. The famous battle of Creſſy was fought four years afterwards, in which our chroniclers ſtate that we had 2000 archers, who were oppoſed to about the ſame number of the French, together with a circumſtance which ſeems to prove, that by this time we uſed the long-bow, whilſt the French archers ſhot with the arbaleſt. The circumſtance alluded to is as follows: Previouſly to the engagement there fell a very heavy rain, which is ſaid to have much damaged the bows of the French, or perhaps rather the ſtrings of them. Now the long-bow (when unſtrung) may be moſt conveniently covered, ſo as to prevent the rain's injuring it; nor is there ſcarcely any addition to the weight from ſuch a caſe; whereas the arbaleſt is of a moſt inconvenient form to be ſheltered from the weather. As therefore, in the year 1342, orders iſſued to the ſheriffs of each county to provide 500 bows, with a proper proportion of arrows, it ſeems probable that theſe were long-bows, and not the arbaleſt.

At the above-mentioned battle, the Engliſh aſcribed their victory chiefly to the archers. The battle of Poicters was fought A. D. 1356, and gained by the ſame means.

Philip de Comines acknowledges, what our own writers aſſert, that the Engliſh archers excelled thoſe of every other nation; and Sir John Forteſcue ſays, "that the might of the realme of England ſtandyth upon archers." The ſuperior dexterity of their archers gave the Engliſh a great advantage over their capital enemies the French and Scots. The French depended chiefly on their men at arms, and the Scots on their pikemen; but the ranks of both were often thinned and thrown into diſorder by flights of arrows before they could reach their enemies.

Charles I. appears, from the dedication of a treatiſe intitled *The Bowman's Glory*, to have been himſelf an archer; and in the eighth year of his reign he iſſued a commiſſion to the chancellor, lord-mayor, and ſeveral of the privy-council, to prevent the fields near London being ſo incloſed as "to interrupt the neceſſary and profitable exerciſe of ſhooting," as alſo to lower the mounds where they prevented the view from one mark to another.

In 1682 there was a moſt magnificent cavalcade and entertainment

tainment given by the Finſbury archers, when they beſtowed the titles of "duke of Shoreditch," "marquis of Iſlington," &c. upon the moſt deſerving. Charles II. was preſent upon this occaſion; but the day being rainy, he was obliged ſoon to leave the field.

So lately as the year 1753 targets were erected in the Finſbury fields, during the Eaſter and Whitſun holidays; when the beſt ſhooter was ſtiled Captain for the enſuing year, and the ſecond Lieutenant.

As the ſhooting with the long-bow was firſt introduced in England, and practiſed almoſt excluſively for nearly two centuries, ſo it hath occaſioned a peculiar method of drawing the arrow to the ear and not to the breaſt. That this is contrary to the uſage of the ancients is very clear from their reliefs, and from the tradition of the Amazons cutting off one of their paps as it occaſioned an impediment to their ſhooting. The Finſbury archer is therefore repreſented in this attitude of drawing to the ear, both in the *Bowman's Glory*, and in the ſilver badge given by Catharine to the Artillery Company.

Henry VIII. gave the firſt charter to the Artillery Company in the 29th year of his reign, by which they are permitted to wear dreſſes of any colour except purple and ſcarlet, to ſhoot not only at marks but birds, if not pheaſants or herons, and within two miles of the royal palaces. They are alſo enjoined by the ſame charter not to wear furs of a greater price than thoſe of the martin. The moſt material privilege, however, is, that of indemnification from murder, if any perſon paſſing between the ſhooter and the mark is killed, provided the archers have firſt called out *faſt*.

Archery with the long-bow continues to be uſed as a manly exerciſe by the inhabitants of Geneva, and in many parts of Flanders; nor is it totally neglected in Great Britain. There are ſeveral ſocieties of archers in England; the chief of which are, the Woodmen of Arden, and the Toxophilite. But the moſt noted ſociety of this kind, now exiſting, is

The Royal Company of Archers in Scotland. The ancient records of this company having been deſtroyed by fire about the beginning of the preſent century, no authentic traces of their inſtitution now remain. It is ſaid that they owe their origin to the commiſſioners appointed in the reign of James I. of Scotland for enforcing and overſeeing the exerciſe of archery in different counties. Thoſe commiſſioners, who were in general men of rank and power, picking out amongſt the better ſort of people under their cogniſance the moſt expert archers, formed them into a company, and upon perilous occaſions made a preſent of their ſervices to the king as his chief body-guards; in which ſituation they often diſtinguiſhed themſelves for their loyalty, their courage, and ſkill in archery. This rank of the king's principal body-guards, the Royal Company ſtill claim within ſeven miles of the metropolis of Scotland.

Certain it is, that by an act of the privy-council of Scotland in 1677, this Company was recogniſed under the name and title of "His Majeſty's Company of Archers:" and by the ſame act a piece of plate of the value of 20l. ſterling was ordered to be given to be ſhot for by them at their annual parades called Weaponſhawings, and to be called The King's Prize.

At this period the Royal Company conſiſted, as it does at preſent, of the principal nobility and gentry of Scotland. But their unfortunate attachment to anti-revolution principles, upon that event's taking place, put almoſt a period to their exiſtence; their public parades or marches were diſcontinued, and the royal prize was with-held.

Upon the acceſſion of Queen Anne, their former ſplendor was revived; and in the year 1703, they obtained a royal charter, confirming in general terms all their former rights and privileges, and conferring others upon them. But their partiality to the family of Stuart was at various after periods the cauſe of a temporary proſperity and decline.

These unhappy differences of opinion having totally ſubſided, the Royal Company are now more numerous and flouriſhing than ever, and perhaps even more dexterous archers. His preſent Majeſty, as a mark of his royal patronage and approbation, has been pleaſed to revive the royal prize, which for the firſt time was ſhot for upon the 28th of July 1788, by a numerous and reſpectable meeting.

ARCHETYPE, in modelling, implies the firſt model of a work in order to copy it, ſo as to make another exactly like it.

In aſſaying, it denotes the ſtandard weight by which others are adjuſted.

ARCHEUS, in chemiſtry, denotes the predominating principle of things, by which their eſſential qualities are known, fixed, and determined.

ARCHIACOLYTHUS (from *αρχος*, *chief*, and *ακολȣθος*, *miniſter*) an ancient dignity in cathedral churches: the miniſters whereof were divided into four orders or degrees, viz. prieſts, deacons, ſubdeacons, and acolythi; each of which had their chiefs. The chief of the acolythi was called *archiacolythus*.

ARCHIATER, *Archiatrus*, properly denotes the chief phyſician of a prince who retains ſeveral. The word is formed of *αρχη*, *principium*, "chief;" and *ιατρος*, *medicus*, a "phyſician."

ARCHIEROSYNES, in the Grecian antiquity, a high prieſt veſted with authority over the reſt of the prieſts, and appointed to execute the more ſacred and myſterious rites of religion.

ARCHIGALLUS, in antiquity, the high-prieſt of Cybele, or the chief of the eunuch prieſts of that goddeſs, called Galli.

ARCHIGERONTES (from *αρχος*, and *γερων*, *old*), in antiquity, the chiefs or maſters of the ſeveral companies of artificers at Alexandria.

ARCHIGUBERNUS, ARCHIGUBERNETA, or ARCHIGUBERNITES, in antiquity, the commander of the imperial ſhip, or that which the emperor was aboard of.

ARCHIL, ARCHILLA, ROCELLA, ORSIELLE, in natural hiſtory, is a whitiſh moſs which grows upon rocks, in the Canary and Cape Verd iſlands, and yields a rich purple tincture, fugitive indeed, but extremely beautiful. This weed is imported to us as it is gathered. Thoſe who prepare it for the uſe of the dyer, grind it betwixt ſtones, ſo as to thoroughly bruiſe, but not to reduce it into powder; and then moiſten it occaſionally with a ſtrong ſpirit of urine, or urine itſelf mixed with quick-lime: in a few days it acquires a purpliſh red, and at length a blue colour. In the firſt ſtate it is called *Archil*; in the latter, *Lacmus* or *Litmaſe*.

The dyers rarely imply this drug by itſelf, on account of its dearneſs and the periſhableneſs of its beauty. The chief uſe they make of it is, for giving a bloom to other colours, as pinks, &c. This is effected by paſſing the dyed cloth or ſilk through hot water lightly impregnated with the archil. The bloom thus communicated ſoon decays upon expoſure to the air. Mr. Hellot informs us, that by the addition of a little ſolution of tin, this drug gives a durable dye; that its colour is at the ſame time changed towards a ſcarlet; and that it is the more permanent in proportion as it recedes the more from its natural colour.

Prepared archil very readily gives out its colour to water, to volatile ſpirits, and to ſpirit of wine; it is the ſubſtance principally made uſe of for colouring the ſpirits of thermometers. As expoſure to the air deſtroys its colour upon cloth, the excluſion of the air produces a like effect in theſe hermetically ſealed tubes, the ſpirits of large thermometers becoming in the compaſs of a few years colourleſs. M. l'Abbe Nollet obſerves (in the French Memoirs for the year 1742), that the colourleſs ſpirit, upon breaking the tube, ſoon reſumes its colour, and this for a number of times ſucceſſively; that a watery tincture of archil, included in the tubes or thermometers, loſt its colour in three days; and that, in an open deep veſſel, it became colourleſs at the bottom, while the upper part retained its colour.

A ſolution of archil in water, applied on cold marble, ſtrains it of a beautiful violet, or purpliſh blue colour, far more durable than the colour which it communicates to other bodies. Mr. du Fay ſays, he has ſeen pieces of marble ſtained with it, which in two years had ſuffered no ſenſible change. It ſinks deep into the marble, ſometimes above an inch; and at the ſame time ſpreads upon the ſurface, unleſs the edges be bounded by wax or other like ſubſtances. It ſeems to make the marble ſomewhat more brittle.

Linnæus informs us, in the Swediſh Tranſactions for the year 1742, that the true archil moſs is to be found on the weſtern coaſts of England. It has been for a conſiderable time paſt prepared by Meſſrs. Gordons at Leith from a ſpecies found in the Highlands of Scotland.

ARCHILOCHIAN, a term in poetry, applied to a ſort of verſes, of which Archilochus was the inventor, conſiſting of ſeven feet; the four firſt of which are ordinarily dactyls, though ſometimes ſpondees; the three laſt trochees, as in Horace,

Solvitur acris hyems, grata vice veris & Favoni.

ARCHIMANDRITE, in eccleſiaſtical polity, denotes the head or chief of a monaſtery and is ſynonymous with Abbot.

ARCHIPELAGO, in geography, a general term ſignifying a ſea interrupted with iſlands; it is however more eſpecially applied to that lying between Europe and Aſia, which contains the iſlands anciently called Cyclades and Sporades.

ARCHISYNAGOGUS, the chief of the ſynagogue; the title of an officer among the Jews, who preſided in their ſynagogues and aſſemblies. The number of theſe officers was not fixed, nor the ſame in all places; there being 70 in ſome, and in others only one. They are ſometimes called *princes* of the ſynagogue, and had a power of excommunicating ſuch as deſerved that puniſhment.

ARCHITECT, *Architectus*, a perſon who is poſſeſſed of an extenſive knowledge in the art of contriving and forming any compound body; particularly in the art of building; and who makes deſigns, and plans, for edifices of all denominations; and who is capable of directing the ſeveral artificers, or workmen, in the execution thereof.

The following Hiſtory *of the* Origin *and* Progreſs *of* Architecture *is the Production of Mr. Plaw, Architect,* N° 2, *Church Street, Paddington. The* Syſtem *is the Selection and Arrangement of the ſame Gentleman, taken principally from the Works of Sir William Chambers, and the moſt approved Authors on the Subject.*

A NEW SYSTEM of ARCHITECTURE.

THE importance of the profeſſion of an Architect, requires a man to be poſſeſſed of very ſuperior talents; and his practical knowledge, together with his ſtudy, very much matured: a very ingenious man of the profeſſion has frequently declared it neceſſary a perſon ſhould live three common ordinary lives to be in full poſſeſſion of all that is requiſite to make a compleat Architect: yet many bold adventurers from the dogmatic practice of meaſuring artificers works; from the bench; cabinet work and upholſtery; gardening; or a trip to Italy; that do not heſitate to aſſume that character, and to practiſe as a profeſſor; although not really poſſeſſed of either one of the numerous qualifications neceſſary to be underſtood to entitle him to the leaſt claim.

It is a ſcience of ſo extenſive a nature, that, to attain a full knowledge of it, requires the ſkill of an uncommon genius, together with much ſcientific experience, like its rival arts, Painting and Sculpture, (only with much greater variety) and not to be eaſily attained, unleſs nature is uncommonly bountiful in her aid.

Mechanical arts may be learned; and, in one branch only, it requires the ſtudy and practice of many years to become maſter of it.

There are various branches in building, and each (though not equally difficult to comprehend) has its different profeſſors; but the Architect muſt take the whole in view, and have a good general knowledge of them all.

Vitruvius, in his firſt book of Architecture, calls it a ſcience, attended with a great diverſity of ſtudy, and requires a peculiar knowledge to judge of all the branches belonging to it; that it is partly founded on Theory, and partly on Practice.

That the Theory explains and demonſtrates the convenience and proportions requiſite to form the fabric; and the practical conſiſts in the actual and continual Execution of deſigns; and *that*, when united in an Architect, makes *his* abilities the moſt accompliſhed.

Vitruvius proceeds to ſet forth what particular branches of literature are neceſſary to be known and underſtood by the Architect.

He ſays, the Architect muſt underſtand Grammar and Deſigning well; Geometry, Optics, Arithmetic, Hiſtory, Philoſophy, Muſic, Hydraulics, Phyſic, Law, Aſtronomy, &c. though he obſerves it is not poſſible to be an Ariſtarcus in grammar, an Ariſtoxenes in muſic, an Apelles in painting, a Policlete or Miron in ſculpture, or an Hippocrates in phyſic; yet he ſhould be acquainted with as much of thoſe ſciences as to render him capable of forming a judgment upon the uſes of them.

To theſe Vitruvius has added, That the Architect muſt have a ſoul great and daring, without pride or arrogance, juſt and faithful, and, what is moſt important, without avarice; for it is impoſſible that, without Honour and Fidelity, he ſhould do any thing well; he ought to be diſintereſted, not covetous of wealth, not to do any thing to ſully the reputation of an Architect, or what is unworthy of ſo honourable a profeſſion; theſe were the ſentiments of Vitruvius in the time of Auguſtus.

Although it may appear extraordinary that all theſe accompliſhments ſhould center in one man, it is abſolutely neceſſary as many of them ſhould, as poſſible, to approach towards perfection; as the Architect, without ſome knowledge of Grammar, would be contemptible in correſponding or elucidating his deſigns; nor would he be able to conſult authors on the ſubject written in other languages; conſequently, his ideas would be confined, and his taſte depraved.

Deſigning and Drawing are next eſſential to deſcribe the artiſt's ideas on paper, to his employer, and the workmen; Geometry, to conſtruct the works on true principles; Optics, to judge of effects, and the perſpective in all points of view; Arithmetic, to form calculations of the value of works, and the admeaſurement and proportions thereof; Hiſtory, to judge of the claſſical ſtyle and manner of the ancients, according to the various periods of the fluctuation of the arts; Philoſophy, to judge of ſituations proper to build upon, quality of materials, to read men, uſe policy, govern his own temper, and ſubmit himſelf to others; Muſic, to judge of ſounds, and their operations in different conſtructed rooms, and of harmoniac proportions, ſo very applicable to architectural forms; Hydraulics, to manage the neceſſary operations of water; Phyſic, to judge of ſituations and conſtructions ſuitable to the health of mankind, and that the neceſſaries of life are proper, and not wanting; Law, to make agreements, form contracts, to judge of property, and the laws relative to building; Aſtronomy, to arrange the various apartments moſt agreeably to the ſituation and courſe of the ſun, &c.

Beſide theſe, already mentioned by Vitruvius, much more practical knowledge is very eſſential, to judge well of natural and artificial foundations proper to build upon; and of the quality, quantity, and value, of all materials, neceſſary and proper to build with; viz. the Chalk, Lime, Sand, Earth, Brick, Stone, Timber, Tile, Slate, Metals, &c.

To be a good mechanic is a very great and eſſential thing; but it ſhould be blended to ſuperior taſte, to enable the deſigner to judge of effects; for, as Wotton ſays, The Architect's glory conſiſts in the deſignment and idea of the work. His ambition ſhould be to make the form triumph over the matter. A man may be a very ingenious and good mechanic, and fall ſhort of that judgment; he may alſo be in poſſeſſion of a refined taſte, and very ready at deſign, without the other requiſites; they muſt be united to make an Architect capital.

Beſide the many accompliſhments already ſpoken of, an Architect ſhould be ever watchful and attentive to the wants and neceſſaries of life, in every department that can be imagined; if to erect a dwelling, to judge of the ſuite and proportion of rooms, proper for the rank and family for whom it is intended, and the offices to the houſe, with their arrangement and fittings, in the moſt ſuitable manner for exterior ſhow, convenience, and internal concealment. The ſame alſo of buildings of a public nature; he muſt be well acquainted with the uſes, purpoſes, and intentions of the ſtructure; and here he muſt blend a ſuperior elegance of taſte, propriety, affinity, and ornament, with every domeſtic convenience for the Court, Public Offices, College, Cathedral, Theatre, Hall, Priſon, Square, Manſion, Meuſe, Bridge, &c.

I am, therefore, much inclined to agree with the profeſſional gentleman before ſpoken of, that very ſtrict *attention*, *obſervation*, and great number of years, muſt be ſpent to qualify a man to the deſerved title of an Architect.

Amongſt the Architects of Greece, Rome, France, &c. we have the following names handed down to us, as men of great ſkill and eminence in the profeſſion, to many of whoſe works the preſent age is much indebted for their beautiful ideas, judgment of proportion, elegance of ſtyle, and correctneſs of compoſition; viz. Hermogenes, Apollodorus, Tarcheſius, Pytheus, Vitruvius, Scamozzi, Serlio, Palladio, Vignola, Barbaro, Viola, Barozzio, Julius Romanus, Cataneo, Alberti, Perrault, De L'Orme, Le Clerc, Sangello, Bramant, Mich. Angelo, Mau-Clerc, Perault, Blondel, Bernini, Bullant, Cigoli, Berani, Oſio, &c.

Of Architects in England we read of the following:

GUNDULPHUS, an Architect, built the Tower of London, the Cathedral at Rocheſter, &c.

PETER OF COLECHURCH, (a curate of St. Mary Colechurch, London) rebuilt London Bridge of timber, and after deſigned and begun to build the preſent one of ſtone, in 1176, which, it is ſuppoſed, was finiſhed by ELYAS in 1209.

EDWARD FITZODO, or Edward of Weſtminſter, in the reign of Henry the third, was maſter of the works at Weſtminſter Abbey.

PETER CAVALINI, a ſculptor, was the ſuppoſed Architect who built the croſſes erected to the memory of princeſs Eleanor; he was a Roman Sculptor; and from various circumſtances he was diſcovered to be the Architect of the ſhrine of Edward the Confeſſor; he was alſo the inventor of Moſaic, and was in England about the year 1256 to 1260.

JOHN HELPSTONE built the new Tower at Cheſter 1322.

WILLIAM of WYKEHAM, born 1324, rebuilt Windſor Caſtle and Queenborough Caſtle, in Edward the third's reign; was afterward Biſhop of Wincheſter in 1367, and after Lord Chancellor of England; built and founded New College, Oxford, Wincheſter College, &c.

It is to be lamented, that this great man did not pay more regard to the ſcience, to which he owed the greatneſs of his fortune, by eſtabliſhing a foundation for the ſtudy of his own art, for the benefit of others who depended upon it.

In the reign of Edward the third, York Minſter was erected; but by whom the deſign was made, we are ignorant.

ALLAN DE WALSINGHAM was one of the Architects to the Cathedral at Ely.

In the ſame reign WILLIAM REDE, Biſhop of Chicheſter, built the firſt library of Merton College, and alſo the Caſtle at Amberley; it has been aſſerted, that Sir REGINALD BRAY, who was a Knight of the Garter, in Henry the ſeventh's reign, aſſiſted in the ceremony of laying the firſt ſtone of the Chapel at Weſtminſter; and was Architect of the chapel of St. George, at Windſor; but the authority is doubted. See the Antiquities of Windſor Caſtle, page 65.

JOHN DRUEL and ROGER KEYES were employed as Architects by Archbiſhop Chichele about 1402.

RICHARD the Carver, and BROTHER ROWSBY, a monk, were engaged on ſome repairs in the Church of St. Mary, at Stanford, in the reign of Henry the ſixth.

Mr. Walpole obſerves, That names of artiſts in theſe reigns, of which even ſo few records exiſt, are not to be expected; but one, he ſays, he has found, the particulars of whoſe work are expreſſed with ſuch rude ſimplicity, that it may not be unentertaining to the reader to peruſe them: they are extracted from a book belonging to the Church of St. Mary Ratcliffe, at Briſtol.

Memorandum:

That Maſter Cummings hath delivered the 4th day of July, in the year of our Lord, 1470, to Mr. Nicholas Bettes, vicar of Ratcliffe beforeſaid, a new Sepulchre well-gilt, and cover thereto, an image of the Creator ryſing out of the ſame Sepulchre, with all the ordinance that longeth thereto: that is to ſay,

A lath made of timber and ironwork thereto:

Item, Thereto longeth Heven, made of timber, and ſtained cloth.

Item, Hell, made of timber and iron-work, with devils, the number thirteen;

ARCHITECTURE.

Item, Four knights armed, keeping the Sepulchre, with their weapons in their hands; that is to ſay, two ſpeares, two axes, two paves *.

Item, Four pair of angels wings, for four angels, made of timber, and well painted;

Item, The Fadre, the crown and viſage, the bell with a croſs † upon it well-gilt with fine gold;

Item, The Holy Ghoſt, coming out of Heven into the Sepulchre;

Item, Longeth to the angels four chevelers ‡.

This Memorandum is copied from the Minutes of the Antiquarian Society, under the year 1736.

* *Paves:* A pave (in French *pavois* or *talevas*) is a large buckler, forming an angle in front, like the ridge of the houſe, and big enough to cover the talleſt man from head to foot.

† *The bell with the croſs:* Probably the ball or mound.

‡ *Four chevelers:* Chevelures or perukes.

Mr. CLOOS (father of Nicholas Cloos, one of the firſt Fellows of King's College, Cambridge, and afterwards Biſhop of Litchfield) was the Architect of that magnificent building; a ſtandard of beautiful Gothic, or rather Saracenic, Architecture, and Geometrical Knowledge.

Dart's Antiquities of Weſtminſter Abbey, vol. I. p. 32, ſays, The Tomb or Mauſoleum, called Henry the Seventh's Chapel, in Weſtminſter Abbey, was the work of one PETER, a Florentine, as one PETER, a Roman, made the Shrine of Edward the Confeſſor.

PETER, the Florentine abovementioned, was PIETRO TORREGGIANI, a ſculptor, of Florence.

HANS HOLBIEN, the eminent painter, in the reign of Henry the eighth, deſigned the Porch of Wilton Houſe, alſo the Gateway at Whitehall, lately pulled down, &c.

JOHN OF PADUA, an Italian, it is ſuppoſed introduced the improved ſtyle of Roman Architecture.

LAURANCE BRADSHAW, Surveyor of the King's Works.

Sir RICHARD LEA, an Architect.

THOMAS LARKE, a Surveyor of King's College, Cambridge.

JEROME DE TREVISE, an Architect, and alſo an Italian painter.

JOHN SHUTE, a Painter and Architect, publiſhed a book, in folio, 1563, called, The firſt and chief Grounds of Architecture, &c. The author was ſent to Italy in 1550, by the Duke of Northumberland, and ſupported there in his ſtudies, under the beſt Architects.

Stowe mentions one Maſter STICKELS, an excellent Architect of that time, who, in 1596, built, for a trial, a pinnace that might be taken to pieces. Chron. p. 769.

ROBERT ADAMS, Surveyor of the Queen's buildings, ſeems to have been a man of abilities; he publiſhed two plans, one is a large print of Middleburgh, dated 1588, the other of the ſame date, drawn on parchment with a pen, intituled *Thameſis deſcriptio*; ſhewing, by lines croſs the river, how far, and from whence, cannon-balls may obſtruct the paſſage of any ſhip, upon an invaſion from Tilbury to London, with proper diſtances marked for placing the guns.

THEODORE HAVENS, in 1575, built ſome Doric Frontiſpieces, and other works at Caius College, Cambridge; alſo the Monument of Doctor Caius, &c.

In the gallery of Emanuel College is an old picture with an inſcription, recording an Architect of the ſame date with the preceding.

" Effigies RODULPHI SIMONS, Architecti, &c. &c.

JOHN THORPE deſigned or improved moſt of the principal palatial edifices, erected in the reigns of Elizabeth and James the firſt; he left a folio of plans now in Lord Warwick's poſſeſſion.

ANDREW JAMESON, Architect, at Aberdeen, father of George Jameſon, a portrait painter, called the Vandyke of Scotland, 1586.

NICHOLAS STONE, born 1586, died 1647, Statuary and Architect, made a great number of family monuments.

BERNARD JANSEN, Statuary and Architect, about the ſame date.

GERARD CHRISTMAS, Architect.

JOHN SMITHSON, Architect, 1648; his ſon, a man of ſome ſkill, ſucceeded him.

BUTLER, Architect.

STEPHEN HARRISON, Architect and Joiner.

INIGO JONES, Architect to King Charles the firſt, whoſe well-known works will ever perpetuate his memory.

Sir BALTHAZAR GERBIER D'OUVILLY, of Antwerp, Architect and Painter, publiſhed a book in 1662, at London, a ſmall diſcourſe on magnificent buildings, dedicated to the King; and another, intituled, Council and Advice to all Builders, &c. London, 1663.

JOHN WEBB, a ſcholar of Inigo Jones, built in Great Queen Street.

FRANCIS CARTER, an Architect, chief clerk of works under Inigo Jones.

FRANCIS FANELLI, a Sculptor, a Florentine, publiſhed two books Architectural, of Fountains, Vaſes, &c. about 1661.

Captain WILLIAM WIND, a diſciple of Gerbier, 1663 to 1695.

MARSH, Architect, built Nottingham Caſtle, &c.

Doctor MORECROFT, an Architect, (according to Salmon) died in 1667, was Architect at the manor houſe of Fitzwalters.

WILLIAM TALMAN, Architect, built Thoreſby, Chatſworth, &c. 1671.

Monſieur POUGET, a French Architect, built Montagu-houſe, 1678.

Sir WILLIAM WILSON rebuilt the ſteeple of Warwick Church.

Sir CHRISTOPHER WREN built the nobleſt temple, the largeſt palace, and moſt ſumptuous hoſpital, in Great Britain; he reſtored London, and recorded its fall; viz. St. Paul's Church, Greenwich Hoſpital, alſo many pariſh churches, the Monument, &c. and rebuilt Hampton Court; born at London, 1632, died 1723.

Sir JOHN VANBURGH built Blenheim, Caſtle-Howard, King's Weſton, Eaſton-Neſton, the Opera Houſe, &c. &c. died 1726. Dr. Evans wrote the following epitaph on Sir John:

" Lie heavy on him, Earth, for he
" Laid many a heavy load on thee."

ROBERTI, an Artichect.

EDWARD PIERCE, Statuary and Architect, died 1698, was an aſſiſtant to Sir Chriſtoper Wren.

ARCHER and WAKEFIELD, two Architects, followers and admirers of Sir John Vanbrugh's ſtyle.

NICHOLAS HAWKSMOOR, a diſciple of Sir Chriſtopher Wren, built St. Mary Woolnorth's Church, Chriſt Church, Spitalfields, St. George's, Middleſex, St. Ann's, Limehouſe, and St. George's, Bloomſbury, &c. died 1736.

EDWARD SHEPHERD built the north ſide of Groſvenor Square, and major part of North and South Audley Streets, &c. about 1729.

COLIN CAMPBELL built Wanſted Houſe, the Rolls, Mereworth in Kent, and publiſhed the three firſt volumes of Vitruvius Britannicus, died 1734.

WILLIAM THORNTON invented a framing of timber, and ſet upright Beverly Minſter, which over-hung four feet. Two prints thereof publiſhed in 1739.

JAMES GIBBS, Architect, ſtudied in Italy, built St. Martin's Church, St. Mary-le-Strand, New Church at Derby, the New Building at King's College, Cambridge, the Ratcliffe Library, St. Bartholomew's Hoſpital, &c. died 1754.

JOHN JAMES, of Greenwich, built Sir Gregory Page's, Blackheath, St. George's Church, Hanover Square, St. Luke's, Middleſex, &c.

GIACOMO LEONI, a Venetian, built the Duke of Queenſborough's houſe, Burlington Gardens; deſigned a large houſe for Mr. Scawen, at Carſhalton, in Surrey; publiſhed an edition of Palladio in 1742; died 1746.

JOHN NICHOLAS SERVANDONI gave the deſign for the Fireworks for the Peace, 1748.

THOMAS RIPLEY built the Admiralty, Woolterton, and Houghton, from Campbell's deſign.

BATTY LANGLEY pirated and publiſhed various books on Architecture, and is ſaid to be the inventor of artificial ſtone.

HERBERT, Earl of Pembroke, of Wilton, excelled in Architecture, and was a great patron of the art.

BOYLE, Earl of Burlington, was a great artiſt himſelf, and Architecture ſhone with luſtre under his auſpices; he was a great admirer of Palladio and Inigo Jones's works; he deſigned Chiſwick Houſe; the New Front and Colonnade at Burlington Houſe; the Dormitory, at Weſtminſter School; the Aſſembly Room, at York; Lord Harrington's, at Peterſham; Duke of Richmond's, at Whitehall; and General Wade's, in Cork Street; aſſiſted Mr. Kent in the publication of the deſigns for Whitehall, by Inigo Jones, and was a great friend and patron of that artiſt.

WILLIAM KENT ſtudied at Rome, where the Earl of Burlington met with him, and took him under his protection; it appears he was more employed as a painter than an Architect; he deſigned the King's Bench, in Weſtminſter Hall; Mr. Pelham's, at Eſher, in the Gothic ſtyle; he deſigned Holkham, in Norfolk, which alone is enough to eſtabliſh his abilities as an Architect, without further proofs. He died in 1748.

BRETTINGHAM built Holkham from Kent's deſign.

ISAAC WARE, Architect, built the Horſe Guards, &c. and publiſhed a complete Syſtem of Architecture, 2 vols. folio.

CHARLES LABELYE, a Swiſs, built Weſtminſter Bridge, died 1762.

HENRY FLITCROFT built St. Giles's Church, St. Olave's, Southwark, &c.

GEORGE DANCE built St. Leonard's, Shoreditch; the Manſion Houſe, London, &c,

ROGER MORRIS, Architect.

ROBERT MORRIS, his nephew, publiſhed ſeveral books of Deſigns on Architecture, and read ingenious lectures, founded upon harmonic and arithmetical proportions, 1730 to 1734.

SANDERSON MILLER, Eſq; of Radway, an Architect in the Gothic ſtyle.

WILLIAM JONES, (called Symmetry Jones) built the India Houſe, &c.

Vardy, Architect, built Lord Spencer's Houſe facing the Green Park, &c.

Stephen Wright, Surveyor of the Board of Works.

Edward Stephens, a diſciple of Sir William Chambers, died in purſuit of his ſtudies at Rome.

Wood, of Bath, built the Creſcent, &c.

Cooley, in Ireland, built the Exchange at Dublin; the ſucceſsful Candidate from England, 1769.

John Gwyn built ſeveral Bridges, &c. and publiſhed London and Weſtminſter improved.

James Payne built many capital Houſes in different parts of England; Richmond Bridge; Chertſey Bridge; altered Walton Bridge; built the New Stone Bridge at Kew, &c. and publiſhed his Works, 2 vols. folio.

Sir Robert Taylor built Maidenhead Bridge; the Six Clerks Office, Chancery Lane; the Stone Buildings, Lincoln's Inn; the additions to the Bank of England, &c. died 1788.

We do not preſume to recite a faithful record of all the deceaſed Artiſts who have deſerved a place with thoſe already mentioned; but have given them from the beſt authorities we could collect; we therefore preſume the public will excuſe auy little omiſſion they may diſcover, as we have aimed to be as faithful as poſſible in this brief account of them.

ARCHITECTURE is of three different claſſes; viz. Civil, Military, and Naval.

Civil Architecture, is the art of contriving, or deſigning and executing, commodious buildings for the uſes of civil life; as Houſes, Churches, Halls, Bridges, Palaces, Colleges, Temples, Porticos, &c.

Military Architecture, to deſign and erect Fortifications, Ramparts, &c. for places of defence, as offence againſt an enemy; the Military Architect is called an Engineer. See Engineer.

Naval Architecture, is the art of laying down, and building all kinds of veſſels to float on the water, and docks for the purpoſes thereof, and other aquatic works belonging thereto; and is called a Ship Builder. See Ship Builder.

Therefore Civil Architecture, by way of pre-eminence, is called Architecture.

The origin of Architecture cannot, with any degree of certainty, be traced; and it is unfortunate our earlieſt anceſtors were not aware of the curioſity which would inſpire their deſcendants, of knowing minutely the period of their invention; when they affixed branches of trees in the earth, uniting them at the top, and covering them with ſmaller boughs, turf, clay, graſs, &c. and making holes or caves in the earth and rocks, to keep them from the inclemency of the weather; the good people were not apprized they were then diſcovering Architecture, and that it might be learnedly agitated ſome thouſand years afterwards, who was the inventor of that moſt noble ſcience.

Neceſſity is certainly the parent of moſt of the common arts; therefore, upon the common ground Sir William Chambers, in his excellent Treatiſe on Civil Architecture, takes up the idea of primitive Huts, we may venture to proceed, and which is, indeed, corroborated by various diſcoveries made by our modern voyagers to the South Seas, and countries in their original ſtate of barbariſm.

The Huts of Terra del Fuego, Oonalaſhka, Kamſchatka, Atooi, the Pelew Iſlands, &c. (ſome of which are in Plate VII. of this Syſtem) are evident proofs of the conjecture; with this difference, they don't ſeem yet to have arrived at Sir William's refinement of the ſecond and third claſſes, from which, it is ſuppoſed gave birth to the orders; though, indeed, the inſide of the Kamſchatka habitation, and the places of public diverſion of Ulietea, Otaheite, and Poulaho, ſeem to indicate columns. See Plate VII. of this Syſtem.

It is hardly to be doubted but ſome degree of regularity, convenience, and even proportion, in the diſpoſition of the ſeveral parts of original building, were known, and practiſed before the orders were inſtituted; and it is to be lamented, that either through ignorance or obſtinacy, the inhabitants of the northern parts of this enlightened iſland are yet ſtrangers to even that comfort; and, as a proof thereof, truſt that the following detail will not be deemed a digreſſion.

The Bothag or Botheys, ſo called, being the habitations of the farmers in the highlands of Scotland, are inform of a parallelogram, and built with turf; poſts are worked therein, in a very rough manner, inclining to a point, to form a roof; boughs are laid thereon, and covered with turf lapping over each other, ſomething in the manner of tiles or ſlates; the turf vegetates in wet weather, and the whole building looks like a green hill; the fire-place is ſurrounded with ſtones of a ſufficient height to ſecure the fire from doing damage, and the ſmoak circulates about the room till it eſcapes out at the door, through the roof, or out of a very ſmall hole cut through the turf for a window (which is without glaſs); the floor is of the earth, or clay well trod; and the partitions which divide the bed places, are made of rough ſlabs, nailed up with their uneven edges, without regard to privacy, or common decency; a boarded platform is raiſed above the ground for a bed-place; thereon is ſome ſtraw, in a kind of ſack, on which they repoſe, with very little covering but their plaid; the gentleman by whom I am favoured with this account, was under the neceſſity of reſiding in this Bothag about five months laſt ſummer; who alſo favours me with the drawing thereof, and with the neighbouring Bothags, making together a village, as repreſented in Plate VII. Syſtem of Architecture; he alſo obſerved, their principal food was potatoes and oat cake, and that they never had meat, unleſs ſome accident happened to their caſtle; and alſo declared, no part of the family ever waſhed or cleaned themſelves while he had his reſidence with them; the inſide of the building, and every thing therein, appeared of a black bronze colour; in theſe Bothags the Highland farmers ſeem to live happy enough among themſelves; but are not at all fond of, or accommodating to, ſtrangers. This family was of ſome repute and property in that part of the country. Its remoteneſs muſt ſurely have never allowed its inhabitants the taſte of the common comforts of life; for it is evident no city in Europe is ſuperior, for taſte and elegance, to its capital, allowing for the magnitude.

Having conſidered the firſt, or primitive idea of dwellings, I now to proceed to thoſe of Divine Worſhip.

The ſuperſtition of conſecrating groves and woods to particular deities, was a practice very uſual with the ancients; for, not to ſpeak of thoſe mentioned in Holy Scripture, Pliny tells us, that trees, in old time, ſerved for the Temples of Gods; Tacitus reports this cuſtom of the old Germans; Q. Curtius of the Indians; and almoſt all writers of the Druids. The Romans, too, were great admirers of this worſhip, and therefore had their Luci, or conſecrated groves, in moſt parts of the city.

The moſt probable reaſon given for this practice is, that thoſe dark and lonely ſituations created that fear and awe which ſtruck them with a more proper degree of divine reverence; therefore, thoſe places, being appointed for their worſhip, gives us the preſumption of Primitive Churches; which idea, with an eye to its origin, the Gothic Architecture ſprung.

The bodies of trees in rows, forming an avenue, reſemble the pillars; the ſhoots and ſuckers adhering thereto, the ſmaller pillars; the joints, from whence the buds ſhoot, the aſtragals or mouldings; the boughs and ramifications, the groins and vaulted arches; and their interſecting at the top, and ſome returning downward, the apex thereof, and the pendant ornaments; as in the Chapel of Henry the Seventh, at Weſtminſter Abbey, ſo far we may venture on ideal reaſoning on the conſtruction of Gothic Architecture. Its firſt practice is not eaſy to be traced; indeed we read of its being introducted in Rome when that empire was overrun by the Goths, after the reign of Alexander Severus, but know not from whence to date its origin.

Building, in its minority, was undoubtedly not only plain, but irregular; and nothing more conſidered than bare neceſſity urged; when, by degrees, mankind inſenſibly improved in the art, and invented methods to make their habitations comfortable and laſting; and therefore, when ſociety began to encreaſe in numbers and wealth, by traffic and commerce, their ideas made gradual advances toward rule, order, and elegance; and at length diſcovered a ſtyle of building which ſucceeding ages have greatly admired and venerated.

When arts and learning became famous in Egypt, Perſia, Aſſyria, &c. with them Architecture flouriſhed; for we find works amazingly elaborate, mentioned among the great deſigners cotemporary with Noah; in the year of the world 2038, the Walls of Babylon are reported to have been built by Semiramis, very magnificent, and eſteemed one of the Seven Wonders of the World: the Pyramids or Sepulchres of Egypt, in the deſart of Libya, was another of them; the ground whereon the largeſt ſtands containing eleven acres and a quarter, and near five hundred feet high; the baſe of which may be readily compared by the incloſure of Lincoln's-Inn-Fields, which Inigo Jones ſet out, by the reported dimenſions of the largeſt of the Egyptian Pyramids; the Great Wall of China, fifteen hundred miles long, and thirty feet high, and broad enough for eight perſons to ride abreaſt upon.

The Sepulchre of Porſena, king of Hetruria, deſcribed by Pliny, out of Varro, is of an extraordinary nature; this king was buried without the city Cluſium, in which place was erected a monument of ſquare ſtone; each ſide of it three hundred feet broad, and fifty feet high; within the ſquare baſis there is an inextricable labyrinth, whither, whoſo ventures without a clue, can find no paſſage out; upon this ſquare ſtands five Pyramids, four in the angles, and one in the middle; in the bottom they are ſeventy-five feet broad and one hundred and fifty feet high; they are pointed in ſuch a manner, that, at the top, there is one braſs circle and covering for them all; from which there hang bells, faſtened by chains; thoſe being moved by the wind, give a ſound afar off. Upon this circle there are four other Pyramids, each of them an hundred feet high; above which, upon one plane, there are five Pyramids, the altitude of which Varro was aſhamed to add. The Etruſcan fables report, that it was as much as that of the whole work; the end of which, the Artificer's fame ſeems more recorded than king Porſena's.

The Tower of Babel is another remarkable inſtance of the early knowledge of building. The two famous pillars, one of brick, the other of ſtone, erected ſoon after the flood by the ſons of Noah, on which were recorded the remarkable paſſages, from the Creation down to the Flood. The Palace near Andera, in Upper Egypt; the ruins of Perſepolis; the amazing Labyrinths; extenſive Lakes; gigantic Obeliſks; and wonderful Staircaſes, &c. are evident teſtimonies of their ſkill, perſeverance, and progreſs in Mathematical and Architectural Arts.

Moſt of our writers, on theſe ſubjects, ſeem to agree, that Arches were not known or practiſed in any of theſe ſtructures, as the cielings and roofs were flat, and ſupported by clumſy pillars; and that it is evident their buildings were more remarkable for their magnitude and vaſtneſs, than for their elegance and convenience, notwithſtanding Architecture arrived at great perfection among the Egyptians. To Egypt the firſt Grecian Architects were uſed to travel, as our modern artiſts do to Rome, for Improvement.

The arts were firſt conveyed into Greece by Cadmus (Grandſon to Agenor, King of Tyre, 562 years after the Walls of Babylon were built) from the Phœnicians, and built Thebes, called ſo from the famous Thebes in Egypt: and we find, that about 300 years after the foundation of Rome was laid, that Phidias, an Athenian, built a Temple of the Doric Order, whoſe height was ſixty-eight feet to the roof; and, it is ſaid, the Grecians never made uſe of but one order in the height of their buildings.

Greece was furniſhed with many noble monuments of building, which were brought to Rome by Marcellus; viz. The Temple of Jupiter Olympus, the Temple of Cizenis, which Pliny reports was ſo rich and curiouſly wrought, that in all the joints of the ſtone, threads of gold were inlaid to ſeparate them; the Temple of Trallius; of Diana; of Pallas; of Minerva at Athens; of Apollo, &c. all ſo teſtify the nobleneſs, uſe, and beauty of Architecture, before it was brought to Rome, that the forementioned author relates, that Cecrops, the firſt king of Athens, 200 years before the deſtruction of Troy, founded a ſchool for the inſtruction and encouragement of Architects; and to them the invention of three of the regular Orders of Architecture are attributed; viz. The Doric, Ionic, and Corinthian; if they collected any ideas of beauty or proportion from the Egyptians, they cultivated, improved and brought them to perfection; as the orders alluded to, are yet unexampled ſtandards of taſte and beautiful proportion, as appears by the remaining antiquities of that country in various publications.

Greece happily perfected the art; but ambitious Rome ſtole Architecture from her, and laid deſolate its glory; the Emperors pulled down her ſtately Edifices and Temples, and tranſported them to Rome; there confined the art and materials to raiſe and immortalize themſelves and poſterity.

Rome, poſſeſſed of the ineſtimable prize, and at the ſame time ſo extenſive and opulent, ſelected together the greateſt artiſts of thoſe times; and, by their aſſiduity and unwearied purſuits, traced the paths and footſteps of the Grecians, both in learning, arts, and government.

Athens furniſhed them with exemplary rules; and, being naturally aſpiring, they ſhone forth in the luſtre and perfection of Architecture, in the various noble Structures and Temples which they erected to the honour of their emperors, and the victorious conqueſts they made, particularly in their Triumphal Arches, Baſilicæs, Aquæducts, and Baths, which were amazingly rich and elegant; Circi or Circuſes; that of Maximus is ſaid to have been large enough to contain two hundred and ſixty thouſand ſpectators in their proper places; Caracalla cauſed divers parts of it to be ornamented with paint and gilding; and Heliogabalus ordered its floor, on ſome occaſions, to be ſtrewed with gold and ſilver duſt. Columns and Obiliſks; their Domi or capital Houſes; Forums; Gates; Palaces; Porticos; Temples in great numbers; Theatres and Amphitheatres; of which the Coliſeum and Theatre of Marcellus, built by Auguſtus, are beautiful remains of Roman antiquity; alſo Mauſoleums, Tombs and Sepulchres; Luci or Groves, &c. &c.

Rome, in its flouriſhing ſtate, under the Conſuls and Emperors, who were ſo much given to building, at one time is ſaid to have in employ upwards of four hundred Architects.

Pompey the Great is reported by Tacitus to have built the firſt Amphitheatre at Rome; and Marcellus, happy in victory, together with a fine genius, brought from Greece that moſt beautiful and regular piece of Architecture, called after his name. The magnificence of the Romans in their public buildings, many of which are yet to be ſeen, and others traced by their veſtiges, and which are frequently viſited by admirers of the art, and our modern Architects, who are purſuing the ſtudy, are evident proofs the Art of Architecture was in their full poſſeſſion for about two centuries, when it declined rapidly as the empire was overturned, after the battle of Actium, when the Goths prevailed, who naturally introduced their own ſtyle of building, which, being grafted to the Roman, produce a miſerable effect. We ſee many inſtances of that clumſy barbarity in various publications, particularly in the Views of Venice.

Apprehending that authors diſagreeing in their accounts of the Meaſures of Antiquity, ariſes either from the inſtrument they are taken with, or that they truſted to information or tranſlations; not conſidering properly the meaſures of cuſtomary feet in different countries, or I ſhould have more particularly explained ſome of the beforementioned amazing buildings. But finding their dimenſions variouſly expreſſed by different authors, I could not aſcertain with that degree of certainty I wiſh; as the following Table will explain.

MEASURES.

The Engliſh Foot divided into	1000	parts
The Roman contains ———	967	
Paris ——— ———	1068	
Spaniſh ————	920	
Venetian ——— ———	1032	
Rhinland ———	1033	
The Brachio at Florence —	1913	
Ditto at Naples ———	2190	
The Derah at Cairo —	1824	
The great Turkiſh Pike at Conſtantinople ———	2200	

“ The firſt mention of a Chriſtian Church in this iſland, is ſaid to have been built by Joſeph, of Arimethea, and his company in the iſle of Avalon, ſometimes called Iris Witrin, and ſince Glaſtenbury. This Joſeph, as is ſaid by a wonderful Providence, being arrived in Britain with ten or twelve aſſociates, obtained leave from Arvirageas, their king, to ſettle with ſome accommodations at Glaſtenbury, in Somerſetſhire, where he and his companions erected a ſmall Church, and, as it is alſo ſaid, by direction of the arch-angel Gabriel; this he incloſed with a Church-yard, and dedicated to the Virgin Mary; and for the materials and dimenſions of this Church they are thus deſcribed, viz. It had in length ſixty feet, in breadth twenty-ſix feet, and made of wooden rods, interwoven or watled; the Icon, whereof we have here thought fit, ſuitable to its traditional dimenſions, to exhibit unto view, ſee Plate VI. Syſtem of Architecture. This Church when finiſhed, was their Church or Oratory, wherein to pray, watch, faſt, and preach; and in or near to which Joſeph himſelf was afterwards buried; and ſome have ſince pretended to have recovered his Epitaph, thus, *Ad Britones veni poſt quam Chriſtum ſepe livi; docui, requieve.* Other particulars of tradition: there are alſo ſeveral paſſages at the founding of this Church; of relicks there repoſited, endowment, and other matters; of all which, in all the circumſtances, if any one ſhall ſuſpend a full belief, I ſhall not preſently therefore eſteem him an infidel; ſeeing much of this nature hath ſufficiently been detected to be but the product of Monkiſh ignorance, or vanity accommodated to the humour and perſuaſion of thoſe times the writers lived in: as there is ſcarce any Saint in all the Kalendar, whoſe hiſtory would not be much ſuſpected or prejudiced, if the additions of the middle or darker times ſhould be urged to the undermining and diſparagement of the whole narration. Yet, for the main, that ſome Cell, Chapel, Church, Oratory, or convenient receptacle was there erected, dedicated, and uſed for divine ſervice, there are many reaſons and circumſtances which may induce an innocent perſuaſion. And that firſt, in regard of the general conſent of writers, ſince that time; then by the obſervation of the frame and tenor of the Norman characters of Glaſtenbury, referring to a ſucceſſion of many ancient characters beſtowed on that Church by ſeveral Saxon kings, whoſe characters alſo relate to the Britiſh grants before, and all pointing at the being and actions of Joſeph there. And upon this conſideration it was, that this place was much honoured by our devout anceſtors by the appellations of, *The firſt land of God. The firſt land of Saints in England. The beginning and fountain of all Religion in England. The Tomb of Saints. The Mother of Saints. The Church founded and built by the Lord's Diſciples, &c.*

What further was the ſtate and ſucceſſion of this Primitive Church, is recorded thus: That where the little old Cell, or Chapel, built by the forenamed Joſeph, was decayed by time; Demi, a Welch or Britiſh biſhop, built a new one in the ſame place; and this alſo in time falling to decay, twelve men came out of North Britain and put it in good repair; and laſtly, king Ina, donor of the Peter-pence, pulled down the old one, and erected a fair and ſtately Church to the honour of Chriſt and St. Peter, and St. Paul, filleted under the higheſt coping, with heroic verſes in Latin, celebrating the memory of the Founder, and the Saints to whom it was dedicated; which verſes have been borrowed and applied, with ſome variation, by Venatius Fortunatus, in praiſe of ſome ſtately Churches in France; but afterwards, this was by the famous Dunſtan, converted to a Monaſtery of Benedictine Monks, himſelf being ſometimes Abbot there; in which quality it continued till the time of Henry the Eighth, when it participated of the great downfall of Abbies, whilſt, by its late ruins, it was not hard to trace its former dimenſions and magnificence.

In Britain, before the Roman invaſion, the natives appear to have had no better lodgings than thickets, dens, and caves. Some of theſe caves, which were their winter-habitations, and places of retreat in time of war, were formed and rendered ſecure and warm by art, like thoſe of the ancient Germans, which are thus deſcribed by Tacitus: “ They are uſed to dig deep caves in the ground and cover them with earth, where they lay up their proviſions,

ſions, and dwell in winter for the ſake of warmth. Into thoſe they retire alſo from their enemies, who plunder the open country, but cannot diſcover theſe ſubterranean receſſes." Some of the ſubterraneous, or earth-houſes, as they are called, are ſtill remaining in the weſtern iſles of Scotland and in Cornwall. The ſummer habitations of the moſt ancient Britons were very ſlight; and, like thoſe of the Finnians, conſiſted only of a few ſtakes driven into the ground, interwoven with wattles, and covered over with the boughs of trees.

When Julius Cæſar invaded Britain, the inhabitants of Cantium, Kent, and of ſome other parts in the ſouth, had learned to build houſes a little more ſubſtantial and convenient. "The country, ſays Cæſar, abounds in houſes, which very much reſemble thoſe of Gaul." The firſt ſtep towards this improvement ſeems to have been that of daubing the wattled walls of their houſes with clay, to fill up the chinks and make them warmer. "The Germans uſed for this purpoſe a kind of pure reſplendent earth of different colours, which had an appearance of painting at a diſtance;" but the Gauls and Britains choſe rather to whitewaſh the clay after it was dry with chalk. Inſtead of the boughs of trees, they thatched theſe houſes with ſtraw, as a much better ſecurity againſt the weather. They next proceeded to form the walls of large beams of wood, inſtead of ſtakes and wattles. This ſeems to have been the mode of building in Britain, when it was firſt invaded by the Romans. "The Britons, ſays Diodorus Siculus, who was cotemporary with Cæſar, dwell in wretched cottages, which are conſtructed of wood, covered with ſtraw." Theſe wooden houſes of the ancient Gauls and Britons were not ſquare but circular, with high tapering roofs, at the top or center of which was an aperture for the admiſſion of light and emiſſion of ſmoke. Thoſe of Gaul are thus deſcribed by Strabo: "They build their houſes of wood, in the form of a circle, with lofty tapering roofs." The foundations of ſome of the moſt magnificent of theſe circular houſes were of ſtone, of which there are ſome veſtiges ſtill remaining in Angleſey and other places. It was probably in imitation of theſe wooden houſes, that the moſt ancient ſtone edifices, of which there are ſtill ſome remains in the weſtern iſlands of Scotland, were built circular, and have a large aperture at the top.

When the Britons were invaded by the Romans, they had nothing among them anſwering to our ideas of a city or town, conſiſting of a great number of contiguous houſes, diſpoſed into regular ſtreets, lanes, and courts. Their dwellings, like thoſe of the ancient Germans, were ſcattered about the country, and generally ſituated on the brink of ſome rivulet for the ſake of water, and on the ſkirt of ſome wood or foreſt for the conveniency of hunting and paſture for their cattle. As theſe inviting circumſtances were more conſpicuous in ſome parts of the country than others, the princes and chiefs made choice of theſe places for their reſidence; and a number of their friends and followers, for various reaſons, built their houſes as near to them as they could with conveniency. This naturally produced an ancient Britiſh town, which is deſcribed by Cæſar and Strabo in the following manner: "From the Caſſi he learnt that the town of Caſſivelaun was at no great diſtance; a place defended by woods and marſhes, in which very great numbers of men and cattle were collected. For what the Britons call a town, is a tract of woody country, ſurrounded by a mound and ditch, for the ſecurity of themſelves and their cattle againſt the incurſions of their enemies." "The foreſts of the Britons are their cities: for when they have incloſed a very large circuit with felled trees, they build within it houſes for themſelves and hovels for their cattle. Theſe buildings are very ſlight, and not deſigned for long duration." The palaces of the Britiſh princes were probably built of the ſame materials, and on the ſame plan, with the houſes of their ſubjects, and differed from them only in ſolidity and magnitude.

Though the communication between this iſland and the continent was more free and open after the firſt Roman invaſion than it had been before, and ſome of the Britiſh princes and chieftains even viſited Rome, then in its greateſt glory; it doth not appear that the people of Britain made any conſiderable improvements in their manner of building for at leaſt a hundred years after that invaſion. For when the renowned Caractacus was carried priſoner to Rome, A. D. 52, and obſerved the beauty and magnificence of the buildings in that proud metropolis of the world, he is ſaid to have expreſſed great ſurpriſe, "That the Romans, who had ſuch magnificent palaces of their own, ſhould envy the wretched cabbins of the Britons."

It muſt appear very ſurpriſing that the ancient Britons, when they were ſo ignorant of architecture, were capable of erecting, if indeed it was erected by them, ſo ſtupendous a fabric as that of Stonehenge on Saliſbury plain: a fabric which hath been the admiration of all ſucceeding ages, and hath outlaſted all the ſolid and noble ſtructures which were erected by the Romans in this iſland.

Of another very extraordinary ſpecies of building ſeveral remains are found in the Highlands of Scotland. They conſiſt of ruins; the walls of which, inſtead of being cemented with lime or ſome other ſimilar ſubſtance, or of being raiſed with dry ſtones, as was the method before cement came into uſe, are deſcribed as having been vitrefied, or the ſtones run and compacted together by the force of fire. Concerning the origin, uſe, &c. of theſe buildings, different opinions have been formed; and even the reality of them as works of contrivance has been called in queſtion.

But for whatever purpoſes, or by whatever means, the above and other ſimilar ſtructures of a peculiar nature were erected, we have ſufficient evidence that the people of Britain, before they were ſubdued and inſtructed by the Romans, had but a rude knowledge of architecture, and were very meanly lodged. As ſoon, however, as the Romans began to form ſettlements and plant colonies in this iſland, a ſudden and ſurpriſing change enſued in the ſtate of architecture. For that wonderful people were as induſtrious as they were brave, and made haſte to adorn every country that they conquered. The firſt Roman colony was planted at Camelodunum, A. D. 50; and when it was deſtroyed by the Britons in their great revolt under Boadicia, only eleven years after, it appears to have been a large and well built town, adorned with ſtatues, temples, theatres, and other public edifices.

The Romans not only built a prodigious number of ſolid, convenient, and magnificent ſtructures for their own accommodation, but they exhorted, encouraged, and inſtructed the Britons to imitate their example. This was one of the arts which Agricola, the moſt excellent of the Roman governors, employed to civilize the Britons, and reconcile them to the Roman government. "The following winter, ſays Tacitus, was ſpent by Agricola in very ſalutary meaſures. That the Britons, who led a roaming and unſettled life, and were eaſily inſtigated to war, might contract a love to peace and tranquillity, by being accuſtomed to a more pleaſant way of living, he exhorted and aſſiſted them to build houſes, temples, courts, and market-places. By praiſing the diligent and reproaching the indolent, he excited ſo great an emulation among the Britons, that after they had erected all thoſe neceſſary edifices in their towns, they proceeded to build others merely for ornament and pleaſure, as porticoes, galleries, baths, banqueting-houſes, &c." From this time, which was A. D. 80, to the middle of the fourth century, architecture, and all the arts immediately connected with it greatly flouriſhed in this iſland; and the ſame taſte for erecting ſolid, convenient, and beautiful buildings, which had long prevailed in Italy, was introduced into Britain. Every Roman colony and free city, of which there was a great number in this country, was a little Rome, encompaſſed with ſtrong walls, adorned with temples, palaces, courts, balls, baſilicas, baths, markets, aqueducts, and many other fine buildings, both for uſe and ornament. The country every where abounded with well-built villages, towns, forts, and ſtations; and the whole was defended by that high and ſtrong wall, with its many towers and caſtles, which reached from the mouth of the river Tine on the eaſt to the Solway Firth on the weſt. This ſpirit of building, which was introduced and encouraged by the Romans, ſo much improved the taſte and increaſed the number of the Britiſh builders, that in the third century this iſland was famous for the great number and excellence of its architects and artificers. When the emperor Conſtantius, father of Conſtantine the Great, rebuilt the city of Autun in Gaul, A. D. 296, he was chiefly furniſhed with workmen from Britain, "which, ſays Eumenius, very much abounded with the beſt artificers."

Not very long after this period, architecture and all the arts connected with it began to decline very ſenſibly in Britain, and in all the provinces of the weſtern empire. This was partly owing to the building of Conſtantinople, which drew many of the moſt famous architects and other artificers into the eaſt, and partly to the irruptions and depredations of the barbarous nations.

The final departure of the Romans was followed by the almoſt total deſtruction of architecture in this iſland. For the unhappy and unwarlike people whom they left behind, having neither ſkill nor courage to defend the numerous towns, forts, and cities which they poſſeſſed, they were ſeized by their ferocious invaders, who firſt plundered and then deſtroyed them. By this means, the many noble ſtructures with which Provincial Britain had been adorned by the art and induſtry of the Romans, were ruined or defaced in a very little time; and the unfortunate Britons were quite incapable of repairing them, or of building others in their room. That long ſucceſſion of miſeries in which they were involved by the Scots, Picts, and Saxons, deprived them of the many uſeful arts which they had learned from their former maſters, and lodged them once more in foreſts, dens, and caves, like their ſavage anceſtors.

The moſt wanton and extenſive devaſtations were thoſe committed by the Anglo-Saxons; among whom it ſeems to have been a maxim to deſtroy all the towns and caſtles which they took from their enemies, inſtead of preſerving them for their own uſe.

About the time of the Saxons firſt appearing on this iſland, in the year of Chriſt 420, Germanus, and Lupus, two orthodox French biſhops, came over to ſuppreſs the errors that Pelagius had broached in Britain: by the conduct and prudence of that pious man, a great victory was obtained by the Britons againſt the Saxons and Picts, whereupon ſeveral Churches were built to the memory of Germanus, one at St. Germains, in Cornwall; ſometime a biſhop's ſee, but after tranſlated to Exeter; and near to old Verulam, a Chapel was erected to the memory of St. Germain; William the Conqueror alſo built an Abby at Selby in Yorkſhire, in memory of this St. Germain, who had confuted the Pelagian hereſy. The like honour having been alſo done to the memory of St. Helena, mother of Conſtantine, by inſcribing Churches with her name, teſtified by Hellenſtow, in Berkſhire; St. Helen's, Bedford; St. Helen's, London, &c.

It cannot be ſuppoſed, that a people who wantonly demoliſhed ſo many beautiful and uſeful ſtructures had any taſte for the arts by which they had been erected. The truth is, that the Anglo-Saxons at their arrival in this iſland were almoſt totally ignorant of theſe arts; and, like all the other nations of Germany, had been accuſtomed to live in wretched hovels, built of wood or earth, and covered with ſtraw or the branches of trees: nor did they much improve in the knowledge of architecture for 200 years after their arrival. During that period, maſonry was quite unknown and unpractiſed in this iſland; and the walls even of cathedral churches were built of wood. "There was a time, ſays Venerable Bede, when there was not a ſtone church in all the land; but the cuſtom was to build them all of wood. Finan, the ſecond biſhop of Lindiſfarne, or Holy iſland, built a church in that iſland A. D. 652, for a cathedral, which yet was not of ſtone, but of wood, and covered with reeds; and ſo it continued till Eadbert, the ſucceſſor of St. Cuthbert, and ſeventh biſhop of Lindiſfarne, took away the reeds, and covered it all over, both roof and walls, with ſheets of lead." The firſt cathedral of York was built of the ſame materials; and a church of ſtone was eſteemed a kind of prodigy in thoſe times that merited a place in hiſtory. "Paulinus, the firſt biſhop of York, built a church of ſtone in the city of Lincoln, whoſe walls, ſays Bede, are ſtill ſtanding, though the roof is fallen down; and ſome healing miracles are wrought in it every year, for the benefit of thoſe who have the faith to ſeek them."

"About the year of Chriſt 659, Wulphere, king of Mercia, being a Pagan, underſtanding that two of his ſons, under pretence of hunting, often reſorted to St. Chad, the famous biſhop of Lichfield, to be by him inſtructed in Chriſtianity, to which they were inclined; he, once miſſing his ſons, haſted, in great rage, to St. Chad, with whom in a private oratory he found his ſons, and there with his own hand he ſlew them both; in memory whereof their mother Erminhild afterwards cauſed a Church in that place to be erected; the foundation and ſtructure whereof being of ſuch a quantity and quality of ſtone as was unuſual at thoſe times; for the rariety thereof it acquired the name of Stone, which is continued to the market-town thereof to this day." Camb. Brit. fol. 583.

There does not ſeem to have been ſo much as one church of ſtone, nor any artiſts who could build one, in all Scotland, at the beginning of the eighth century. For Naitan, king of the Picts, in his famous letter to Ceolfred, abbot of Weremouth, A. D. 710, earneſtly intreats him to ſend him ſome maſons to build a church of ſtone in his kingdom, in imitation of the Romans; which he promiſes to dedicate to the honour of the apoſtle Peter, to whom the abbey of Weremouth was dedicated: and we are told by Bede, who was then living in that abbey, that the reverend abbot Ceolfred granted this pious requeſt, and ſent maſons according to his deſire.

Maſonry was reſtored, and ſome other arts with it introduced into England, towards the end of the ſeventh century, by two clergymen, who were great travellers, and had often viſited Rome, where they had acquired ſome taſte for theſe arts. Theſe were, the famous Wilfrid, biſhop of York, and afterwards of Hexham, and Benedict Biſcop, founder of the abbey of Weremouth.

Wilfrid, who was one of the moſt ingenious, active, and magnificent prelates of the ſeventh century, was a great builder, and erected ſeveral ſtructures at York, Rippon, and Hexham, which were the admiration of the age in which he flouriſhed.

The cathedral of Hexham, which was one of theſe ſtructures, is thus deſcribed by his biographer: "Having obtained a piece of ground at Hexham from Queen Etheldreda, he there founded a moſt magnificent church, which he dedicated to the bleſſed apoſtle St. Andrew.

As the plan of this ſacred ſtructure ſeems to have been inſpired by the Spirit of God, it would require a genius much ſuperior to mine to deſcribe it properly. How large and ſtrong were the ſubterraneous buildings, conſtructed of the fineſt poliſhed ſtones! How magnificent the ſuperſtructure, with its lofty roof, ſupported by many pillars; its long and high walls; its ſublime towers, and winding ſtairs! In one word, there is no church on this ſide of the Alps, ſo great and beautiful."

This admired edifice, of which ſome veſtiges are ſtill remaining, was built by maſons, and other artificers brought from Rome, by the munificence of its generous founder. Benedict Biſcop was the cotemporary and companion of Wilfrid in ſome of his journies, and had the ſame taſte for the arts. He made no fewer than ſix journies to Rome, chiefly with a view of collecting books, pictures, ſtatues, and other curioſities; and of perſuading artificers, of various kinds, to come from Italy and France, and ſettle in England. Having obtained a grant of a conſiderable eſtate from Egfrid, king of Northumberland, near the mouth of the river Were, he there founded a monaſtery, A. D. 674.

"About a year after the foundation of this monaſtery were laid, Benedict croſſed the ſea into France, where he collected a number of maſons, and brought them over with him, in order to build the church of his monaſtery of ſtone, after the Roman manner, of which he was a great admirer. His love to the apoſtle Peter, to whom he deſigned to dedicate his church, made him urge theſe workmen to labour ſo hard, that maſs was celebrated in it about a year after it was founded. When the work was far advanced, he ſent agents into France, to procure, if poſſible, ſome glaſs-makers, a kind of artificers quite unknown in England, and to bring them over to glaze the windows of his church and monaſtery. Theſe agents were ſucceſsful, and brought ſeveral glaſs-makers with them: who not only performed the work required by Benedict, but inſtructed the Engliſh in the art of making glaſs for windows, lamps, drinking veſſels, and other uſes."

But though theſe arts of building edifices of ſtone, with windows of glaſs, and other ornaments, were thus introduced by theſe two prelates in the latter part of the ſeventh century, they do not ſeem to have flouriſhed much for ſeveral centuries. It appears, from many incidental hints in our ancient hiſtorians, that ſtone buildings were ſtill very rare in the eighth and ninth ages; and, that when any ſuch buildings were erected, they were the objects of much admiration. When Alfred the Great, towards the end of the ninth century, formed the deſign of rebuilding his ruined cities, churches, and monaſteries, and of adorning his dominions with more magnificent ſtructures, he was obliged to bring many of his artificers from foreign countries. "Of theſe (as we are told by his friend and companion Aſſerius) he had an almoſt innumerable multitude, collected from different nations; many of them the moſt excellent in their ſeveral arts."

In the other parts of this iſland, Architecture was, as might naturally be imagined, in a ſtill leſs flouriſhing ſtate. It appears, indeed, to have been almoſt entirely loſt among the poſterity of the ancient Britons, after they retired to the mountains of Wales.

The chief palace of the kings of Wales, where the nobility and wiſe men aſſembled for making laws, was called White Palace, becauſe the walls of it were woven with white wands, which had the bark peeled off. By the laws of Wales, whoever burnt or deſtroyed the king's hall or palace, was obliged to pay one pound and eighty pence, beſides one hundred and twenty pence for each of the adjacent buildings, which were eight in number; viz. the dormitory, the kitchen, the chapel, the granary, the bake-houſe, the ſtore-houſe, the ſtable, and the dog-houſe. From hence it appears, that a royal reſidence in Wales, with all its offices, when theſe laws were made, was valued at five pounds and eighty pence of the money of that age, equal, in quantity of ſilver, to ſixteen pounds of our money, and, in efficacy, to one hundred and ſixty. This is certainly a ſufficient proof of the meanneſs of thoſe buildings, which were only of wood. Even the caſtles in Wales, at this period, that were built for the ſecurity of the country, appear to have been conſtructed of the ſame materials; for the laws required the kings vaſſals to come to the building of theſe caſtles, with no other tools but an axe.

The arts of building do not ſeem to have been much better underſtood by the Scots and Picts than by the ancient Britons, in the former part of this period. When Finant, the ſecond biſhop of Lindisfarne, built a church of wood in that iſland, A. D. 652, he is ſaid to have done it *more Scotorum*, after the manner of his countrymen the Scots; and it hath been already obſerved, that Naitan, king of the Picts, was obliged to bring maſons from Northumberland, when he reſolved to build a church of ſtone in his dominions, A. D. 710. After this laſt period, it is probable that the Picts, and perhaps the Scots, began to learn and practiſe the art of maſonry; becauſe there are ſtill ſome ſtone buildings of a very ſingular conſtruction, and great antiquity, to be ſeen in Scotland. Theſe buildings are all circular; though of two kinds, ſo different from each other, that they ſeem to be the works of different ages, and of different nations.

The largeſt of theſe ſtructures are in a very extraordinary taſte of Architecture; and are thus deſcribed by a modern antiquary, who viewed them with no little attention. "Having arrived at the barrack of Glenelg, I was conducted to the remains of thoſe ſtupendous fabrics, ſeated about two miles from thence, in a valley called Glenbeg, in which four of them anciently ſtood. Two of theſe are now almoſt quite demoliſhed; the third is half fallen down; the fourth is almoſt entire.

The firſt I met with lies towards the north ſide of the valley, and is called Caſtle Chalamine, or Malcom's Caſtle. It ſtands upon a conſiderable eminence, and affords us a fine proſpect of the Iſland of Sky, and a good part of the ſea-coaſt. The foundation of this only appears; as alſo of that other, on the eaſt end of the valley, called Caſtle Chonel. About a quarter of a mile further, upon the bank of a rivulet, which paſſes through the middle of the glen, ſtands the third fabric, called Caſtle Tellve. I found it compoſed of ſtones without cement; not laid in regular courſes, after the manner of elegant buildings, but rudely and without order. Thoſe toward the baſe were pretty large; but aſcending higher, they were thin and flat, ſome of them ſcarce exceeding the thickneſs of an ordinary brick. I was ſurpriſed to find no windows on the outſide, nor any manner of entrance into the fabric, except a hole towards the weſt, at the baſe ſo very low and narrow, that I was forced to creep in upon hands and knees, and found that it carried me down four or five ſteps below the ſurface of the ground. When I was got within, I was environed betwixt two walls, having a cavity or void ſpace which led me round the whole building. Oppoſite to the little entry, on the outſide, was a pretty large door, in the ſecond or inner wall, which let me into the area or inner court. When I was there, I perceived that one half of the building was fallen down, and thereby had an opportunity of ſeeing a complete ſection thereof. The two walls join together at the top, round about, and have formed a large void ſpace or area in the middle.

" But, to give a more compleat idea of theſe buildings, I ſhall deſcribe the fourth, called Caſtle Troddan, which is by far the moſt entire of any in that country, and from whence I had a very clear notion how theſe fabrics were originally contrived. On the outſide were no windows, nor were the materials of this caſtle any wiſe different from thoſe of the other already deſcribed, only the entry on the outſide was ſomewhat larger; but this might be occaſioned by the falling of the ſtones from above. The area of this makes a complete circle; and there are four doors in the inner wall, which face the four cardinal points of the compaſs. Theſe doors are each eight feet and an half high, and five feet wide, and lead from the area into the cavity between the two walls, which runs round the whole building. The perpendicular height of this fabric is exactly thirty-three feet; the thickneſs of both walls, including the cavity between, no more than twelve feet; and the cavity itſelf is hardly wide enough for two men to walk abreaſt; the external circumference is one hundred and ſeventy-eight feet. The whole height of the fabric is divided into four parts or ſtories, ſeparated from each other by thin floorings of flat ſtones, which knit the two walls together, and run quite round the building; and there have been winding ſtairs, of the ſame flat ſtones, aſcending betwixt wall and wall up to the top. The undermoſt partition is ſomewhat below the ſurface of the ground, and is the wideſt; the others grow narrower by degrees, till the walls cloſe at top. Over each door are nine ſquare windows, in a direct line above each other, for the admiſſion of light; and between every row of windows are three others in the uppermoſt ſtory, riſing above a cornice which projects out from the inner wall, and runs round the fabric."

From this deſcription of theſe ſingular edifices, it plainly appears, that they were deſigned both for lodging and defence; and, conſidering the ſtate of the times in which they were built, they were certainly very well contrived for anſwering both theſe purpoſes.

The ſtone edifices of the other kind, which were probably erected in this period, and of which ſome few are ſtill to be ſeen in Scotland, are not ſo large as the former, but more artificial. They are ſlender, lofty, circular towers, of cut ſtone, laid in regular rows, between forty and fifty feet in external circumference, and from ſeventy to one hundred feet high, with one door, ſome feet from the ground. They are exactly ſimilar to the round tower of Ardmore, and ſeveral others, in Ireland; and, therefore, were probably built about the ſame time, which was in the tenth century, and for the ſame purpoſes; which are believed by ſome to have been for the confinement of penitents, while they were performing penance.

On this account theſe towers are always found in the neighbourhood of churches, both in Scotland and Ireland; and are ſaid to have been uſed in this manner: " The penitents were placed in the uppermoſt ſtory of the tower (which commonly conſiſted of five or ſix ſtories); where, having made probation, or done penance, ſuch a limited time, according to the heinouſneſs of their crimes, they then were permitted to deſcend to the next floor, and ſo on by degrees, until they came to the door, which always faced the entrance of the church, where they ſtood to receive abſolution from the clergy, and the bleſſings of the people." A tedious proceſs, to which few penitents in the preſent age would willingly ſubmit.

Other writers are of opinion, that the deſign of theſe circular towers (one of which is ſtill remaining at Abernethy, and another at Brechin) was to be places from whence the people were called to public worſhip, by the ſound of a horn or trumpet, before the introduction of bells.

" Matt. Paris relates, that Offa, the great Saxon king, and firſt founder of the Abbey of St. Albans, built alſo the Church of St. Alban's, Wood-ſtreet, London, as a Chapel to his Palace, thereabouts ſituated; this was about the year 790."

It is ſaid of king Edgar, who reigned in the year 959, that he built above forty Monaſteries and Churches, and in particular the Church of St. Ives upon Uſk, the river of Huntingdon; and St. Giles's upon Grant, the river of Cambridge.

We read of Kenulphus, a king of Mercia, in the Saxon Heptarchy, who took Egbert, king of Kent, priſoner; but afterwards Kenulphus having built a Church at Winchcomb, upon the day of its dedication, in the preſence of ten noblemen, thirteen biſhops, and many other great perſonages, he brought the Royal priſoner Egbert into the New Built Church, and reſtored him to his liberty and kingdom again.

John Brompton relates, that at the building of St. Peter's Church in Hereford, WALTER DE LACY, the founder, going up a ladder, to view ſome part thereof, fell from it, and was killed, 1070.

When CANUTUS, the Daniſh king, was in conteſt with the noble Edward Ironſide, for the kingdom of England, the fortunate Dane obtained a complete victory at Aſſendon or Aſhdown, in Eſſex; in memory of which, after he had acquired the entire kingdom, he built a church in that place, which was afterwards conſecrated by Ulſtan, archbiſhop of York, *Cam. Brit. in Eſſex*, fol. 442.

William the ſon of Haman, the ſon of Vitalis, one who came with the Conqueror, built the Church of St. Mary Breden, in Canterbury, as his father Haman had built that of St. Edmund Ridingate, in the ſame city; that built by the ſon is yet ſtanding, though that of Haman's is ſo utterly periſhed, that the place where it ſtood cannot at this day be diſcovered *Somner's Antiq. Cant.* fol. 343.

Soon after the Normans coming, a mercileſs fire happened in Cambridge, and burned the greateſt part of the town, and moſt of the churches, which were built of wood; the Normans brought in with them new faſhions, and among the reſt, that of building; for notwithſtanding ſome few ſingular fabricks of ſtone, as have been mentioned, the monaſteries and church buildings were of wood, ſo as theſe timber buildings fell to decay, or grew out of uſe, ſtone buildings raiſed upon arches, were introduced; and therefore Stow and others relate how Mauritius, biſhop of London, began the foundation of the new church of St. Paul upon arches of ſtone, to prevent the danger of fire, (for not long before, with a great part of the city, it had been burnt) a manner of work, till then unknown to the Engliſh, and brought in by the French; the ſtone being fetched from Caen, in Normandy.

The church of St. Mary-le-Bow, in London, was alſo built much about the ſame time and manner, that is, upon bows or arches of ſtone, and was therefore called St. Mary-le-Bow: Hence the Official of the Arches has been ſo ſtiled for many ages, becauſe in former times he kept his court in Bow church.

Stratford Bridge, being the firſt bridge in England built with arches of ſtone, was therefore called Stratford-le-Bow. *Vide Stowe*'s *Survey*; and hence it was, that William of Malmeſbury, upon the coming in of the Conqueror, enlarging on the characters of the Engliſh and Normans of that time, gives this note of the Normans induſtry and ingenuity; *videas ubiq; in villis eccleſia*, &c. You may every where ſee churches in towns, and monaſteries in cities, riſe up in the new mode of building. As in the year 1077, being preſently after the Normans entry, Paulus, the fourteenth abbot of St. Alban's, couſin (and ſome thought ſon) of archbiſhop Lanfranc, according to the Norman way, built the abbey church of St. Alban's of ſuch ſtone as was left of the old city Verulam; his patron, Lanfranc, aſſiſting him with the ſum of One Thouſand Marks to carry on the work; but dedicated in the time of the next abbot, Richard. *Matt. Paris, Abb. St. Alban's*. Though, according to the model of the foregoing times, there had been before a famous church, built in honour and memory of the Proto-martyr, St. Alban, but not to be thought comparable to that afterwards built of ſtone by the Abbat Paulus. *Bede Eccl. Hiſ. Lib.* 1. *cap.* 7. which, at the demoliſhing of the monaſtery was redeemed by the townſmen for Four hundred pounds; and thenceforth converted into a pariſh church. See *Leland's Itinerary*.

When Joffred, abbot of Croyland, reſolved to rebuild the church of his monaſtery, 1106, he obtained, from the archbiſhops of Canterbury and York, a bull, diſpenſing with the third part of all penances for ſin, to thoſe who contributed any thing towards building of that church. This bull was directed not only to the king and people of England, but to thoſe of France and Scotland, and all other kings, earls, barons, archbiſhops, biſhops, abbots, priors, rectors, preſbyters and clerks, and to all true believers of Chriſt, rich and poor, in all Chriſtian kingdoms. He alſo ſent two monks to proclaim it to France and Flanders; two into Scotland; two into Wales, Cornwall and Ireland; and others into different parts of England.

" By this means (ſays the hiſtorian) the wonderful benefits granted to all the contributors to the building of this church, was publiſhed to the very ends of the earth, and great heaps of treaſure, and maſſes of yellow metal, flowed in from all countries, upon the venerable Abbot Joffred, and encouraged him to lay the foundation of his church."

Having ſpent about four years in collecting the materials, he fixed a day for the great ceremony of laying the foundation, which he contrived to make a very effectual means of raiſing the ſuperſtructure; for, on the long expected day, the feaſt of the Holy Virgin's *Felicitas and Perpetua*, an immenſe multitude of earls, barons, and knights, with their ladies and families of abbots, priors, monks, nuns, clerks, and perſons of all ranks, arrived at Croyland to aſſiſt at this ceremony. The pious abbot Joffred began by ſaying certain prayers, and ſhedding a flood of tears on the foundation. Then each of the nobility and viſitants laid a ſtone, or at leaſt depoſited a ſum of money, grants of land, tythes or patronages, or a promiſe of ſtone, lime, wood, or carriage, for the building of the ſaid church. After this the abbot entertained the whole company, amounting to about five thouſand perſons, with a dinner. To this entertainment they were all entitled; the benefits he received by his manœuvre were alone ſufficient to have raiſed a very noble fabric.

William Rufus, the Conqueror's ſon, continued to build palaces and caſtles; as alſo Henry the firſt; but more ſo in the reign of Stephen; whence it is ſaid, that no leſs than 1115 caſtles were built in nineteen years, from 1135 to 1154, covered with lead, glazed, plaiſtered, and white-waſhed, and the timber work of oak or cheſnut, well framed, and frequently carved.

The architects and artificers, by whom that work was planned and executed, muſt have attained conſiderable dexterity in their reſpective arts; ſeveral of theſe architects have obtained a place in hiſtory, and are highly celebrated for their ſuperior ſkill.

William of Sens, architect to Archbiſhop Lanfranc in building his cathedral, is ſaid, by Gervaſe of Canterbury, to have been a moſt exquiſite artiſt both in ſtone and wood. He made not only a model of the whole cathedral, but of every particular piece of ſculpture and carving, for the direction of the workmen; and invented many curious machines for loading and unloading ſhips, and conveying heavy weights by land, becauſe all the ſtones were brought from Normandy.

Matthew Paris ſpeaks even in a higher ſtrain of Walter of Coventry, who flouriſhed towards the end of this period, when he ſays, that "ſo excellent an architect had never yet appeared, and probably never would appear, in the world." This encomium was undoubtedly too high; but it is impoſſible to view the remains of many magnificent fabrics, both ſacred and civil, that were erected in this period, without admiring the genius of the architects by whom they were planned, and the dexterity of the workmen by whom they were executed.

In the year 1164, in the reign of Henry the ſecond, the church of Reading was conſecrated by Thomas Becket, archbiſhop of Canterbury, in the preſence of the king, ten biſhops, and a multitude of aſſiſtants and Spectators. *Matt. Paris*, fo. 122.

King Henry the third, who founded the Domus Converſorum, near London, for the convert Jews, gave ſeven hundred marks for the building of a church, with other convenient ſtructures, for the converted. But upon the baniſhment of that people, the houſe was annexed to the Maſter of the Rolls, by patent; and the church, now known by the name of the Chapel of the Rolls, in Chancery-lane. *Cart.* 16, *H.* 3. *M.* 10.

The Temple Church, of London, is of ancient foundation; ſome have delivered that Dunwallo Molmutius, a king here in Britain, about the year of the world 5748, anno domini 34, built here a temple, to which, as to ſome other places, he aſſigned ſanctuary privileges; and that he was there buried, with ſeveral others of the Britiſh kings.

But for that excellent ſtructure now ſtanding, it is of a far later extraction; being built by the Knights Templars in the reign of Henry the ſecond, anno 1185, and dedicated to Heraclius, patriarch, teſtified by an inſcription over one of the doors for that purpoſe. The entrance is through a circular tower, of Saxon Architecture, and the nave, or body of the church, is of the Saracenic, or improved Gothic.

In 1176 it was reſolved to build London Bridge of ſtone, a little weſt of the old one of wood; it was undertaken by Peter of Colechurch, and finiſhed by Elyas, of Weſtminſter, in 1209; it was therefore thirty-three years in building. The ſtone piers are built upon piles, about nine feet above the bed of the river (which confutes the abſurd idea of the river having been turned for that purpoſe) and three feet below the ſterlings, or frame-work, which was made round the piers to protect them; the courſes of ſtone in the piers, under water, are bedded together with pitch inſtead of mortar. The maſter maſon erected, at his own expence, a chapel on the eaſt ſide of the ninth pier, and endowed it: which was a beautiful arched Gothic ſtructure; the deſcription of it ſeems to indicate it rather the Saracenic; as follows: Cluſters of ſmall pillars ariſe at equal diſtances, on the ſides, bending over the ceiling, a roof meets in the centre of the arch, where they appeared bound together by a flower cut in the ſame ſtone.

It has been ſuppoſed the Saxons were ſtrangers to the forming or application of arches, particularly from the foregoing remarks on Bow Church, Bow Bridge, and the foundation of St. Paul, &c. it is not much to be wondered at, as we find all their public buildings were of wood for a long period of time; and when they had occaſion to build with ſtone as the Cathedral of Ely, ſome arches at Canterbury, &c. they had aſſiſtance from the continent, till again introduced by the Normans: as Henry the third ſent to Rome for Peter Cavalini, to erect the ſhrine of Edward the confeſſor, in Weſtminſter Abbey, in the year 1256, in the Roman ſtyle, which was again a revival of that Architecture in England. See Plate VIII. of this Syſtem.

A further diſtinction of the Saxon and Norman Architecture is, that the Saxon Churches were made with deſcents into them, the windows and doors ſmall and confined, low and gloomy, dark and damp, and very thick walls when built with ſtone; the entrances generally at the Weſt end by deſcents inward, and drawn over at the top gradually correſponding with the ſteps, and finiſhed at the top with ſome ſemicircular pieces of Gothic work, all which together made a kind of artificial perſpective.

The Norman Churches were generally built with aſcents, the windows and doors larger and loftier, the walls high, lightſome, and chearful, and their arches circular.

The Saxon, Gothic, Norman, and Roman, frequently became one general jumble, and often produced very incoherent, heavy, aukward buildings, and it was frequently a maxim with them not to attend to any degree of ſymmetry, as they ſeemed determined not to have any two things alike in one building, the ancient parts of many of our Cathedrals are of the ancient Norman, and of that mixture worked with ſtone from Caen in Normandy.

Biſhop Warburton, in his notes on Pope's Epiſtles, in the octavo edition, has the following ingenious obſervations on this ſubject: "Our Gothic anceſtors had juſter and manlier notions of magnificence, on Greek and Roman ideas, than theſe mimics of taſte, who profeſs to ſtudy only claſſic elegance; and becauſe the thing does honour to the genius of thoſe barbarians, I ſhall endeavour to explain it. All our ancient churches are called without diſtinction Gothic, but erroneouſly. They are of two ſorts; the one built in the Saxon times, the other in the Norman. Several cathedral and collegiate churches of the firſt ſort are yet remaining, either in whole or in part; of which this was the original: when the Saxon kings became Chriſtians, their piety, which was the piety of the times, conſiſted chiefly in building churches at home, and performing pilgrimages abroad, eſpecially to the Holy Land; and theſe ſpiritual exerciſes aſſiſted and ſupported one another; for the moſt venerable as well as moſt elegant models of religious edifices were then in Paleſtine. From theſe the Saxon builders took the whole of their ideas, as may be ſeen by comparing the drawings which travellers have given us of the churches yet ſtanding in that country, with the Saxon remains of what we find at home; and particularly in that ſameneſs of ſtyle in the latter religious edifices of the knights temporals, profeſſedly built upon the model of the church of the Holy Sepulchre at Jeruſalem, with the earlier remains of our Saxon edifices. Now the architecture of the Holy Land was Grecian, but greatly fallen from its ancient elegance. Our Saxon performance was indeed a bad copy of it, and as much inferior to the works of St. Helene and Juſtinian, as theirs were to the Grecian models they had followed: yet ſtill the footſteps of ancient art appeared in the circular arches, the entire columns, the diviſion of the entablature into a ſort of architrave, frize, and corniche, and a ſolidity equally diffuſed over the whole maſs. This, by way of diſtinction, I would call the Saxon architecture. But our Norman works had a very different original. When the Goths had conquered Spain, and the general warmth of the climate and the religion of the old inhabitants had ripened their wits and inflamed their miſtaken piety, both kept in exerciſe by the neighbourhood of the Saracens, through emulation of their ſervice, and averſion to their ſuperſtition, they ſtruck out a new ſpecies of architecture, unknown to Greece and Rome, upon original principles, and ideas much nobler than what had given birth even to claſſical magnificence. For this northern people having been accuſtomed, during the gloom of paganiſm, to worſhip the deity in groves, a practice common to all nations; when their new religion required covered edifices, they ingeniouſly projected to make them reſemble groves, as nearly as the diſtance of Architecture would permit; at once indulging their old prejudices, and providing for their preſent conveniences, by a cool receptacle in a ſultry climate; and with what ſkill and ſucceſs they executed the project by the aſſiſtance of Saracen architects, whoſe exotic ſtyle of building very luckily ſuited their purpoſe, appears from hence, that no attentive obſerver ever viewed a regular avenue of well grown trees intermixing their branches overheard, but it preſently put him in mind of the long viſto through the Gothic cathedral; or even entered one of the larger and more elegant edifices of this kind, but it preſented to his imagination an avenue of trees; and this alone is what can be truly called the Gothic ſtyle of building. Under this idea of ſo extraordinary a ſpecies of architecture, all the irregular tranſgreſſions againſt art, all the monſtrous offences againſt nature, diſappear; every thing has its reaſon, every thing is in order, and an harmonious whole ariſes from the ſtudious application of means proper and proportionate to the end. For could the archers be otherwiſe than pointed, when the workmen were to imitate that curve which branches of two oppoſite trees make by their inſertion with one another? or could the columns be otherwiſe than ſplit into diſtinct ſhafts, when they were to repreſent the ſtems of a clump of trees growing cloſe together? On the ſame principles they formed the ſpreading ramification of the ſtone-work in the windows, and the ſtained glaſs in the interſtices; the one to repreſent the branches, and the other the leaves of an opening grove, and both concurred to preſerve that gloomy light which inſpires religious reverence and dread. Laſtly, we ſee the reaſon of their ſtudied averſion to apparent ſolidity in theſe ſtupendous maſſes, deemed ſo abſurd by men accuſtomed to the apparent as well as real ſtrength of Grecian architecture. Had it been only a wanton exerciſe of the artiſt's ſkill, to ſhow he could give real ſtrength without the appearance of any, we might indeed admire his ſuperior ſcience, but we muſt needs condemn his ill judgment. But when one conſiders, that this ſurpriſing lightneſs was neceſſary to complete the execution of his idea of a Sylvan place of worſhip, one cannot ſufficiently admire the ingenuity of the contrivance. This too will account for the contrary qualities in what I call the Saxon architecture. Theſe artiſts copied, as has been ſaid, from the churches in the Holy Land, which were built on the models of the Grecian architecture, but corrupted by prevailing barbariſm; and ſtill farther depraved by a religious idea. The firſt places of Chriſtian worſhip, were ſepulchres and ſubterraneous caverns, low and heavy from neceſſity. When Chriſtianity became the religion of the ſtate, and ſumptuous temples began to be erected, they yet, in regard to the firſt pious ages, preſerved the maſſive ſtyle, made ſtill more venerable by the church of the Holy Sepulchre; where this ſtyle was, on a double account, followed and aggravated."

The marks which conſtitute the character of the Saracenic, or modern Gothic Architecture, are its pointed arches, prominent buttreſſes, taper ſpires, delicate pinnacles, large ramified windows, niches or canopies, ſculptured ſaints, neat lace-work, perforated battlements, and fretted roofs, with pendant drops, and exquiſite profuſion of ornaments. But its peculiar diſtinguiſhing characteriſtics are the ſmall cluſtered pillars and pointed arches (agreeing with a former idea given of its origin.)

This ſtyle of Architecture was introduced in England between the eleventh and twelfth century; and Saliſbury cathedral, finiſhed in 1258, was ſaid, by Sir Chriſtopher Wren, to be the moſt compleat building in that ſtyle.

Torregiano, a Florentine, who built Henry the ſeventh's chapel, and Cloos, the builder of King's College, Cambridge, excelled in the art; with many others about that time; ſo much ſo, that moſt of our very eminent men, who have attempted that ſtyle, have fallen very ſhort of their examples.

From this time till the reign of Henry VIII. the faſhionable pillars in churches were of Purbec marble, very ſlender and round, encompaſſed with marble ſhafts a little detached, having each a capital adorned with foliage, which joining, formed one elegant capital for the whole pillar. The windows were long and narrow, with pointed arches and painted glaſs, which was introduced about that time, or at leaſt became more common. In this century alſo they began to delight in lofty ſteeples, with ſpires and pinnacles. In the fourteenth century, the pillars conſiſted of an aſſemblage of ſhafts not detached, but united, forming one ſolid and elegant column; the windows, eſpecially thoſe in the eaſt and weſt ends, were greatly enlarged, divided into ſeveral lights by ſtone mullions running into ramifications above, and forming numerous compartments in various fanciful ſhapes. Thoſe windows, filled with ſtained glaſs of the moſt lively colours, repreſenting kings, ſaints, and martyrs, and their hiſtories, made a moſt ſolemn and glorious appearance. There were ſeveral other variations, eſpecially in the taſte of the carvings and other ornaments, which are too minute for general hiſtory.

The Abbeys, Cathedrals, and College Buildings, erected in the improved ſtyle, were many, and ſome of them extremely grand; and if the architects of that day had not the happineſs of lighting on the ſimplicity and proportion of the Greek orders, they were however ſo lucky as to ſtrike out a thouſand graces, and effects, which rendered their buildings magnificent, yet genteel; vaſt, yet light; venerable and pictureſque: for inſtance, the Cathedral at Rheims, and ſeveral of the Cathedrals in England. It is difficult for the nobleſt Grecian Temple to convey half ſo many impreſſions on the mind as a Cathedral does, of the beſt Gothic or Saracenic Architecture; a proof of ſkill in the Architects, and of addreſs in the prieſts who erected them, the latter exhauſted their knowledge of the paſſions in compoſing edifices, whoſe pomp, mechaniſm, vaults, tombs, painted windows, gloom and perſpectives, infuſed ſuch ſenſations of romantic devotion, that they were happy in finding artiſts, capable of executing ſuch machinery; we muſt have taſte to be ſenſible of the beauties of Grecian Architecture; we only want paſſions to feel Gothic: In St. Peter's, or St. Paul's, we are convinced they were built by great Princes. In Weſtminſter Abbey, and Gothic Cathedral, we think not of the builder, the religion of the place makes the firſt impreſſion; and though ſtripped of its altars, and ſhrines, it is nearer converting us to popery, than all the regular pageantry of Roman domes. Gothic Churches infuſe ſuperſtition; Grecian admiration; the papal ſee amaſſed its wealth by Gothic Cathedrals, and diſplays it in Grecian Temples; certainly there is no compariſon between the rational beauties of regular Architecture, and the unreſtrained licentiouſneſs of that which is called Gothic; yet, it is certain, the perſons who executed the latter, had much more knowledge of their art, more taſte, more genius, and more propriety than we chuſe to imagine. There is a magic hardneſs in the execution of ſome of their works, which would not have ſuſtained themſelves if dictated by mere caprice.

There is a tradition that Sir Chriſtopher Wren went once a year to ſurvey the roof of the chapel of King's College, Cambridge, and ſaid, that if any man would ſhow him where to place the firſt ſtone, he would engage to build ſuch another. That there is great grace in ſeveral places, even in their cluſters of ſlender pillars, and in the application of their ornaments; though the principles of the latter are ſo confined, that they may almoſt all be reduced to the trefoil, extended and varied; it is not neceſſary to appeal to the edifices themſelves. It is ſufficient to obſerve, that Inigo Jones, Sir Chriſtopher Wren, and Mr. Kent, &c. who certainly underſtood beauty, blundered into the heavieſt and clumſieſt compoſitions, whenever they aimed at imitations of the Gothic, particularly in Lincoln's Inn Chapel, the ſteeple of the Church at Warwick, the King's Bench in Weſtminſter Hall, the ſcreen at Glouceſter, Eſher in Surry, &c. &c. is an art deſpicable in which a great maſter cannot ſhine?

Conſidering how ſcrupulouſly our Architects confine themſelves to antique precedent, perhaps ſome deviations into Gothic may a little relieve them from that ſervile imitation; that is, that they ſhould ſtudy both taſtes, not blend them, as we ſee in many inſtances, where Architects make additions or alterations, differing from the ſtye of the original building; as if they meant to record every alteration with the ſervile faſhion of the day, however ridiculous; at leaſt, externally, the ſtyle ſhould be preſerved. Architecture is an extenſive field, and it is a pity that the art ſhould be reſtrained too much, as, it is evident, it contains ſufficient variety to furniſh infinite ſcenes of ſingular beauty. The application of loggias, arcades, terraces, and flights of ſteps, at different ſtages of a building, would contribute much to magnificence. It is true, our climate, and the expence of building in England, are great reſtrictions on imagination; but when we talk of the extent of which Architecture is capable, we may ſuppoſe that pomp and beauty are the principal objects; we ſpeak of palaces, public buildings, and houſes of nobility; not of ſmall houſes, &c.

It is certain that the Gothic or Saracenic taſte remained in vogue till toward the end of the reign of Henry the Eighth, but ſoon after the Grecian ſtyle was introduced; and no wonder when ſo many Italians were entertained in the king's ſervice. They had ſeen that Architecture revived in their own country in all its purity; but whether they were not perfect maſters of it, or that it was neceſſary to introduce the innovation by degrees, it certainly did not at firſt obtain full poſſeſſion; it was plaiſtered upon Gothic, and made a barbarous mixture (ſimilar to the introduction of the Saracenic with the Saxon and Normans). Regular columns, with ornaments neither Grecian nor Gothic, and half embroidered with foliage, were crammed over frontiſpieces, façades, chimnies, &c. and loſt all grace, by wanting ſimplicity. This mungrel ſpecies laſted till late in the reign of James the Firſt.

The beginning of reformation in building ſeems owing to Hans Holbein; his porch at Wilton, though purer than the work of his ſucceſſors, is of the baſtard ſort; but the ornaments and proportions of his works are graceful and well choſen. Henry had actually an Italian, whom, it is ſuppoſed, introduced regular Architecture; but it is doubted whether he or Holbein firſt arrived in England. He was called John of Padua; and his very office ſeems to intimate ſomething novel in his practice. He was termed *Devizor of his Majeſty's Buildings*.

As to the ſtate of Civil Architecture during the ſame period; the houſes of the common people in the country, and of the lower burgeſſes in towns and cities, were very little improved in their ſtructure; that moſt numerous and uſeful order of men being much depreſſed in the times we are now delineating. Even in the capital city of London, all the houſes of mechanics and common burgeſſes were built of wood, and covered with ſtraw or reeds, towards the end of the twelfth century; ſo that Architecture was not brought to any great degree of perfection till the reign of Charles the Firſt, when Inigo Jones recovered the full powers of Grecian Architecture; he was ſucceeded by Sir Chriſtopher Wren, who died in 1723, and left St. Paul's, with many other capital buildings, as his monuments and ſtandards for ſucceeding ages: very little violation of that true taſte has been committed, except by Sir John Vanburgh and his diſciples, who built priſons for dwelling-houſes: and we may boaſt to this day, that the purity of Grecian and Roman Architecture, together with elegant, uſeful, and convenient habitations, are as well known and practiſed in this country, as in either Greece or Rome, in its flouriſhing ſtate; which our modern churches, public buildings, ſquares, ſtreets, bridges, pantheons, ſcreens, colonades, noblemens ſeats, and private houſes, teſtify.

Having treated on the Origin, Riſe and Progreſs of Architecture, *and traced its various fluctuations, I proceed on the principles of the Art, as it is now practiced; and ſhall attempt to define the Intrinſic aud Relative Beauty, together with the convenience and propriety, &c. of the Art.*

In the beauty of viſible objects, we diſcover two kinds. The firſt may be termed *intrinſic* beauty, becauſe it is diſcovered in a ſingle object, without relation to any other. The ſecond may be termed *relative* beauty, being founded on a combination of relative objects. Architecture admits of both kinds. We ſhall firſt give a few examples of *relative* beauty.

The proportions of a door are determined by the uſe to which it is deſtined. The door of a dwelling-houſe, which ought to correſpond to the human ſize, is confined to ſeven or eight feet in height and three or four in breadth. The proportions proper for a ſtable or coach-houſe are different. The door of a church ought to be wide, in order to afford an eaſy paſſage for a multitude; and its height muſt be regulated by its wideneſs, that the proportion may pleaſe the eye. The ſize of the windows ought always to be proportioned to that of the room they are deſtined to illuminate; for, if the apertures be not large enough to convey light to every corner, the room muſt be unequally lighted, which is a great deformity. Steps of ſtairs ſhould likewiſe be accommodated to the human figure, without regarding any other proportion; they are accordingly the ſame in large and in ſmall buildings, becauſe both are inhabited by men of the ſame ſize.

We ſhall next conſider *intrinſic* beauty, blended with that which is *relative*. A cube itſelf is more agreeable than a parallelopipedon; this conſtantly holds in ſmall figures; but a large building in the form of a cube is lumpiſh and heavy; while a parallelopipedon, ſet on its ſmaller baſe, is more agreeable on account of its elevation: hence the beauty of Gothic towers. But if this figure were to be uſed in a dwelling-houſe, to make way for relative beauty, we would immediately perceive that utility ought chiefly to be regarded; and this figure, inconvenient by its height, ought to be ſet on its larger baſe: the loftineſs in this caſe would be loſt; but that loſs will be more than ſufficiently compenſated by the additional convenience. Hence the form of buildings ſpread more upon the grouud than raiſed in height, is always preferred for a dwelling-houſe.

With regard to the internal diviſions, utility requires that the rooms be rectangular, to avoid uſeleſs ſpaces. An hexagonal figure leaves no void ſpaces; but it determines the rooms to be all of one ſize, which is both inconvenient and diſagreeable for want of variety. Though a cube be the moſt agreeable figure, and may anſwer for a room of modern ſize; yet in a very large room, utility requires a different figure. Unconfined motion is the chief convenience of a great room; to obtain this the greateſt length that can be had is neceſſary. But a ſquare room of large ſize is inconvenient. It removes chairs, tables, &c. at too great a diſtance from the hand, which, when unemployed, muſt be ranged along the ſides of the room. Utility, therefore, requires a large room to be a parallelogram. This figure is likewiſe beſt calculated for the admiſſion of light; becauſe, to avoid croſs-lights, all the windows ought to be in one wall; and if the oppoſite wall be at ſuch a diſtance as not to be fully lighted, the room muſt be obſcure. The height of a room exceeding nine or ten feet has little relation to utility; therefore proportion is the only rule for determining the height when above that number of feet.

Artiſts who deal in the beautiful, love to entertain the eye; palaces and ſumptuous buildings, in which intrinſic beauty may be fully diſplayed, give them an opportunity of exerting their taſte. But ſuch a propenſity is peculiarly unhappy with regard to private dwelling houſes; becauſe, in theſe, relative beauty cannot be diſplayed to perfection without hurting intrinſic beauty. There is no opportunity for great variety of form in a ſmall houſe; and in edifices of this kind, internal convenience has not hitherto been happily adjuſted to external regularity. Perhaps an accurate coincidence in this reſpect is beyond the reach of art. Architects, however, conſtantly ſplit upon this rock; for they never can be perſuaded to give over attempting to reconcile theſe two incompatibles: how otherwiſe ſhould it happen, that of the endleſs variety of private dwelling-houſes, there ſhould not be one found that is generally agreed upon as a good pattern? the unwearied propenſity to make a houſe regular as well as convenient, obliges the architect, in ſome articles, to ſacrifice convenience to regularity; and, in others, regularity to convenience; and accordingly the houſe which turns out neither regular nor convenient, never fails to diſpleaſe.

Nothing can be more evident, than that the form of a dwelling-houſe ought to be ſuited to the climate; yet no error is more common than to copy in Britain the form of Italian houſes, not forgetting even thoſe parts that are purpoſely contrived for collecting air, and for excluding the ſun: witneſs our colonnades and logios, deſigned by the Italians to gather cool air, and exclude the beams of the ſun; conveniences which the climate of this country does not require, except in ſome particular ſituations.

We ſhall next view architecture as one of the fine arts; which will lead us to the examination of ſuch buildings, and parts of building, as are calculated ſolely to pleaſe the eye. Variety prevails in the works of nature, but art requires to be guided by rule and compaſs. Hence it is, that in ſuch works of art as imitate nature, the great art is, to hide every appearance of art; which is done by avoiding regularity and indulging variety. But in works of art that are original and not imitative, ſuch as architecture, ſtrict regularity and uniformity ought to be ſtudied, ſo far as conſiſtent with utility.

Proportion is not leſs agreeable than regularity and uniformity; and therefore, in buildings intended to pleaſe the eye, they are all equally eſſential. It is taken for granted by many writers, that in all the parts of a building there are certain ſtrict proportions which pleaſe the eye, in the ſame manner as in ſound there are certain ſtrict proportions which pleaſe the ear; and that, in both, the ſlighteſt deviation is equally diſagreeable. Others ſeem to reliſh more a compariſon between proportion in numbers and proportion in quantity; and maintain, that the ſame proportions are agreeable in both. The proportions, for example, of the numbers 16, 24, and 36, are agreeable; and ſo, ſay they, are the proportions of a room, whoſe height is 16 feet, the breadth 24, and the length 36. But it ought to be conſidered, that there is no reſemblance or relation between the objects of different ſenſes. What pleaſes the ear in harmony, is not the proportion of the ſtrings of the inſtrument, but of the ſound which theſe ſtrings produce. In architecture, on the contrary, it is the proportion of different quantities that pleaſes the eye, without the leaſt relation to ſound. The ſame thing may be ſaid of numbers. Quantity is a real quality of every body; number is not a real quality, but merely an idea that ariſes upon viewing a plurality of things in ſucceſſion: an arithmetical proportion is agreeable in numbers; but have we any reaſon to conclude, that it muſt alſo be agreeable in quantity? At this rate a geometrical proportion, and many others, ought alſo to be agreeable in both. A certain proportion may coincide in quantity and number; and, amongſt an endleſs variety of proportions, it would be wonderful if there never ſhould be a coincidence. One example is given of this coincidence in the numbers 16, 24, and 36; but, to be convinced that it is merely accidental, we need but reflect, that the ſame proportions are not applicable to the external figure of a houſe, and far leſs to a column.

It is ludicrous to obſerve writers acknowledging the neceſſity of accurate proportions, and yet differing widely about them. Laying aſide reaſoning and philoſophy, one fact univerſally agreed on ought to have undeceived them, that the ſame proportions which pleaſe in a model, are not agreeable in a large building: a room 48 feet in length, and 24 in breadth and height, is well proportioned; but a room 12 feet wide and high, and 24 long, approaches to a gallery.

Perrault, in his compariſon of the ancients and moderns, goes to the oppoſite extreme; maintaining, that the different proportions aſſigned to each order of columns are arbitrary, and that the beauty of theſe proportions is entirely the effect of cuſtom. But he ſhould have conſidered, that if theſe proportions had not originally been agreeable, they could never have been eſtabliſhed by cuſtom.

For illuſtrating this point, we ſhall add a few examples of the agreeableneſs of different proportions. In a ſumptuous edifice, the capital rooms ought to be large, otherwiſe they will not be proportioned to the ſize of the building; for the ſame reaſon, a very large room is improper in a ſmall houſe. But in things thus related, the mind requires not a preciſe or ſingle proportion, rejecting all others; on the contrary, many different proportions are equally agreeable. It is only when a proportion becomes looſe and diſtant, that the agreeableneſs abates, and at laſt vaniſhes. Accordingly, in buildings, rooms of different proportions are found to be equally agreeable, even where the proportion is not influenced by utility. With regard to the proportion the height of a room ſhould bear to the length and breadth, it muſt be extremely arbitrary, conſidering the uncertainty of the eye as to the height of a room when it exceeds 16 or 17 feet. In columns, again, every architect muſt confeſs that the proportion of height and thickneſs varies betwixt 8 diameters and 10, and that every proportion between theſe two extremes is agreeable. Beſides, there muſt certainly be a further variation of proportion, depending on the ſize of the column. A row of columns 10 feet high, and a row twice that height, requires different proportions: the intercolumniations muſt alſo differ in proportion according to the height of the row.

Proportion of parts is not only itſelf a beauty, but is inſeparably connected with a beauty of the higheſt reliſh, that of concord and harmony; which will be plain from what follows: a room, the parts of which are all finely adjuſted to each other, ſtrikes us not only with the beauty of proportion, but with a pleaſure far ſuperior. The length, the breadth, the height, the windows, raiſe each of them a ſeparate emotion: theſe emotions are ſimilar; and, though faint when ſeparately felt, they produce in conjunction the emotion of concord or harmony, which is very pleaſant. On the other hand, where the length of a room far exceeds the breadth, the mind, comparing together parts ſo intimately connected, immediately perceives a diſagreement or diſproportion which diſguſts. Hence a long gallery, however convenient for exerciſe, is not an agreeable figure of a room.

In buildings deſtined chiefly or ſolely to pleaſe the eye, regularity and proportion are eſſentially neceſſary, becauſe they are the means of producing intrinſic beauty. But a ſkilful artiſt will not confine his view to regularity and proportion; he will alſo ſtudy congruity, which is perceived when the form and ornaments of a ſtructure are ſuited to the purpoſe for which it is appointed. Hence every building ought to have an expreſſion ſuited to its deſtination. A palace ought to be ſumptuous and grand; a private dwelling, neat and modeſt; a play-houſe, gay and ſplendid; and a monument, gloomy and melancholy. A heathen temple has a double deſtination: it is conſidered as a houſe dedicated to ſome divinity; therefore it ought to be grand, elevated, and magnificent: it is alſo conſidered as a place of worſhip; and therefore ought to be ſomewhat dark and gloomy, becauſe dimneſs or obſcurity produces that tone of mind which is favourable to humility and devotion. Columns, beſides their chief deſtination of being ſupports, contribute to that peculiar expreſſion which the deſtination of a building requires Columns of different proportions ſerve to expreſs loftineſs, lightneſs, &c. as well as ſtrength. Situation may alſo contribute to expreſſion: conveniency regulates the ſituation of a private dwelling-houſe; and the ſituation of a palace ought to be lofty. This leads to a queſtion, Whether the ſituation, where there happens to be no choice, ought, in any meaſure, to regulate the form of the edifice? The connection between a great houſe and a neighbouring field, though not extremely intimate, demands however ſome congruity. It would, for example, diſpleaſe us to find an elegant building thrown away upon a wild uncultivated country; congruity requires a poliſhed field for ſuch a building. The old Gothic form of building was well ſuited to the rough uncultivated regions where it was invented; but was very ill adapted to the fine plains of France and Italy.

"An ingenious author on the ſubject of proportions of external and internal objects, ſays, that proportion requires our niceſt application to attain. To ſee on a conſiderable eminence the length of a front trifling, and the height diſproportioned, would appear as abſurd, as to behold a front in a vale long and extended, and elevated only one ſtory. And this choice muſt likewiſe be dependant upon rules; for as the jarring of inſtruments by blind chance cannot poſſibly pleaſe the ear, ſo the diſproportion of the parts of any object muſt naturally ſhock the eye; and in both unerring rules muſt ſo proportion the ſounds, and diſpoſe the parts, as the whole may be in a compleat harmony. Nature has taught mankind, in muſic, certain rules for proportions of ſounds, ſo Architecture has its rules dependant on thoſe proportions, or at leaſt ſuch proportions which are in Arithmetical harmony; and thoſe I take to be dependant on nature. The *ſquare*, in Geometry; the *uniſon*, or *circle*, in Muſic; and the *cube*, in Building; have all an inſeparable proportion; the parts being equal, and the ſides and angles, &c. give the eye and ear an agreeable pleaſure; from hence, may likewiſe be deduced the cube and half; the double cube; the diapaſon; and diapente; being founded on the ſame principles in muſic. From hence may be conſidered likewiſe the ſubduple proportion of 2, 3, and 4; and their duplicates 3, 4, and 5; likewiſe of 3, 4, and 6; all which follow, and their uſes applied to the external part of building."

It is to be obſerved, a building of 1000 feet long may have the ſame or ſimilar proportions applied thereto by advancing forward for the cube, retreating for the diapaſon and changing the line again to a diapente which the French artiſts call *mouvement*, and which mixture of proportioned parts make the whole agreeable; alſo heightening and lowering the ſeveral parts in a ſimilar way, obſerving that the whole accord in uniſon.

In any of the following proportions to be performed, it is to be obſerved, that the cube muſt never exceed 50 feet; the cube and half 60 feet, and the double cube more than 80 feet fronts.

If the cube be 50 feet front, conſequently the depth and height will be the ſame: the cube and half, if the front be 60 feet, the depth will be 40, and the height 40: the double cube of 60 feet front, will be 30 feet deep, and 30 feet high; this is called a double cube in building; is alſo placing of two cubes together in plano.

The Arithmetical proportions flow in the ſame progreſſive channel, and are to be made uſe of as neceſſity requires, 4, 3, and 2, with their duplicates, make an agreeable front; if the front be 60 feet, then the depth will be 45, and height 30; agreeably to the above proportions; or if it be 80 feet front, the depth will by the ſame rule be 60 feet, and the height 40.

In the Arithmetical proportion of 5, 4, and 3, if the front be 60 feet, the depth will be 48, and height 36; or if the front be 80 feet, it will produce 60 feet deep, and 48 feet high; which numbers are in the proportion of 5, 4, and 3, reſpectively.

The Arithmetical proportion of 6, 4, and 3, will, if the front be 60 feet, produce the depth 40, and height 30 feet; or if the front be 90 feet, the depth will be 60, and height 45.

It is not in every inſtance buildings are ſo detached that the two fronts are ſeen at the ſame time, and when that is the caſe, leſs attention is neceſſary to proportion the depth of building; and it frequently happens, that one or two fronts are attached to offices, and planted out with ſhrubs and evergreens, the object of proportional effect is where the elevations are expoſed.

Having conſidered external proportions, I proceed to conſider the internal proportions of rooms on the ſame principle. In muſic are only ſeven diſtinct notes; in Architecture, therefore are ſeven diſtinct proportions, which produce all the different effects neceſſary in building.

The cube; cube and half; double cube; the duplicates of 3, 2, and 1; of 4, 3, and 2; of 5, 4, and 3; and of 6, 4, and 3; produce all the harmonic proportions of rooms.

For example: Suppoſe a building whoſe principal floor is 12 feet high, how to proportion thoſe rooms which are the internal part by the preceding rules.

		Feet		Feet	
If the height by 12 feet.	The cube will be	12	long	12	broad
	The cube and half	18	——	12	
	The double cube	24	——	12	
	The duplicate of 3, 2, and 1	36	——	24	
	Ditto 4, 3, and 2	24	——	18	
	Ditto 5, 4, and 3	20	——	16	
	Ditto 6, 4, and 3	24	——	16	

Theſe are the ſeven proportions of rooms which are founded upon the ſame rules as the uniſon, the diapente, the diapaſon, the ſeſquialter, &c. are in muſic, and may be varied to all kinds of magnitudes whatever, ſuppoſing your ſtory to be the ſtandard.

This rule is again illuſtrated by one more example.

		Feet		Feet	
The height of the ſtory being 18 feet.	The cube will be	18	long	18	broad
	The cube and half	27	——	18	
	The double cube	36	——	18	
	The ſubduple of 4, 3, and 2	36	——	27	
	Ditto 5, 4, and 3	30	——	24	
	Ditto 6, 4, and 3	36	——	24	
	Ditto 3, 2, and 1	54	——	36	

The rule explained. Suppoſe the height 18 feet, and the ſubduple proportion is 6, 4, and 3, divide 18 by 3, and the quotient is 6; multiply that quotient by 4, produceth 24 the breadth; and multiplying it by 6, produceth 36, the length of the room: and ſo of all the other proportions.

External proportion is very much to be attended to, in the country particularly, and where the whole, or any part of the building becomes an object on the approach, or ſeen by paſſengers; but in town the caſe is generally different, as few houſes are detached; but where they are, or made conſpicuous, a very nice obſervation, and regard to proportion, becomes neceſſary; as in ſeveral houſes in Pall-mall; the ſquares; Mr. Wyat's houſe, facing Queen-Ann-ſtreet; the end houſe of Stratford Place; and the like: but in general the town houſes are carried up ſimilar to the reſt that compoſe a ſtreet or ſquare, and then become a part of the whole compoſition; which whole ſhould be contrived to harmonize, and make one handſome general effect of elevation; as the ſides of Bedford Square; and Mr. Shepherd's intended idea of Groſvenor Square, when he began the North Side; Portland Place, &c.

The internal diſpoſition of town houſes require much invention, being limited to certain proportions or claſſes within the bills of mortality, by act of parliament, which muſt be conformed to; viz. the largeſt ſizes of houſes, which are conſidered of the firſt rate, are ſuch as exceed nine ſquares of building; thoſe of the ſecond rate, from five to nine ſquares; thoſe of the third rate, from three and a half to five ſquares; and thoſe of the fourth rate not exceeding three and a half ſquares; under theſe limits town houſes are to be built; which act alſo regulates the heights of them, and the thickneſs of walls, chimnies, &c. therefore, thus fettered, the builder is to make his plan: in the firſt place, the artiſt is not confined, but in the ſecond and third he is much limited, where diſpoſition of the ſtaircaſe becomes a ſerious object, in ſome of which, it is at the entrance, in others between the front and back room, receiving its light by a ſky-light and open newell; and, laſtly, in the back part, at the end of a paſſage, within the entrance; all which require judicious management to make the moſt of the rooms, which generally conſiſt of three that are principal; a ſetting room or library, a dining and drawing room; the latter, in ſecond and third rate houſes, are uſually on the one pair ſtory, either front or back, as the ſtaircaſe will admit; the finiſhings of ſuch houſes ſhould be neat, and ornaments few; a receſs for a ſideboard, and groined entrance may be admitted, with plaiſter cornices, and two or three enrichments at moſt, if the ſtory does not exceed twelve feet in height, without a frieze; and, in order to gain the effect of height, the ſide walls cannot be too plain, or the cornice too narrow; and an ornament or ſoffits carried round the room on the ceiling, a method now much practiſed. The one to be preferred of the before named plans, where the dimenſions will admit, is the ſtaircaſe in the center of the building, and the next is the ſtaircaſe at the entrance, both of which admit the back rooms their full extent between the walls; and, if communication is wanted into the back yard, or garden, it is generally done by the ſaſhes down to the floor, or one of the window backs opening, and framed to anſwer the others: the number of windows is generally governed by the aſpect, and openneſs of the ſituation, or the extent of the front; one or two piers in the room will be the conſequence, which are certainly conſiderations with reſpect to light, proportion, and mode of furniture, the windows in general being from three feet to four feet ſix; and five feet and upwards, if plate glaſs, as three ſquares wide are moſtly preferred, and thoſe window heights about twice their width; but if down to the floor, they are generally more; the two pair ſtory ſometimes two ſquares, or twice their width, and ſometimes one ſquare and a half; the attics, one ſquare, and ſometimes, when above a cornice, only half a ſquare, in conformance to the ſcheme of elevation.

The offices, or domeſtic part of town houſes, are moſtly under the principal floor, which are frequently very offenſive, particulary the ſmell from the kitchen, and the noiſe from the ſervants hall, which, if poſſible, are frequently detached, and covered with lead or copper, and the flues run into the party wall of the main building; this is a practice moſtly followed in houſes approaching to, or about nine ſquares; if larger, the plan is more at liberty: and, in order to keep them in other reſpects ſweet, proper drains and ſtink traps are eſſential conſiderations: moſt other conveniences depend on the circumſtances of the families they are intended for; and the arrangement of them, on the judgment of the Architect or builder, to whom they are entruſted.

Ornaments in Architecture require a very nice diſcrimination, and much judgment in the Architect to apply them, that they may be ornaments at all; they conſiſt of ſeveral claſſes; viz. blank doors, blank windows, &c. for ſake of ſymmetry; ruſtics, pilaſters, columns, arches, intercolumniations, baluſtrades, facias, bas and alto relievos, in tablets and medallions, niches, vaſes, ſtatues, &c.

Where blank windows are neceſſary, a glazed ſaſh ſhould be fixed therein, or it no longer anſwers the intended purpoſe; blank doors ſeldom occur but within ſide a houſe, and anſwers very well for ſcenery to make the houſe appear larger, or for ſymmetry to anſwer a real door, but ſhould be uſed ſparingly in rooms, unleſs very large ones, to compleat the ſymmetry of one ſide, and frequently a jib door leading to a private apartment ſhould be preferred; as the appearance of too many doors give an idea of cold, and looks uncomfortable. Ruſtic baſements to buildings frequently produce a happy effect; alſo ruſtic quoins; they are either ſquare or champhered; but when applied to the ſhafts of columns they look very heavy; as in ſome of the works of Meſſ. Gibbs, Shepherd, and others; alſo the projecting key-ſtones to arches, as is ſeen in Groſvenor Square, South Audley Street, &c. Pilaſters and columns, when properly applied, are the moſt graceful ornaments in building; they are conſidered ornamental when attached or inſulated; and they muſt be properly ſupported, and alſo appear to ſupport their entablature, and ſometimes an attic; and, when detached, become the principal ſupports of arches, groins, and vaulted roofs; temples, porticos, pediments, &c. and, when ſo applied, certain rules for their diſtance govern their application, as will be ſhewn hereafter, and deſcribed by intercolumniations. Arches or arched receſſes in fronts of houſes, ſometimes have a good effect, but are ſeldom pleaſing above the baſements, except in a few inſtances; arched or groined entrances, to reduce the height of narrow paſſages, anſwer extremely well; and if made of ſolid materials between the ground and principal floor, ſerve a double purpoſe, as they keep out noiſe and ſmell; and wherever they can be applied, they are a goodefence againſt fire.

But to return to ornaments; tablets, medallions, with bas and alto relievos, ſtatues, buſts, niches, and vaſes, ſhould be very carefully introduced; alſo enriched ceilings, moldings, foliage, &c. as in general we ſee them ſtuck about ſo profuſely and improperly, that they become a ſacrifice to ornament; the late improvement in the art of molding and caſting ornaments in plaiſter, compoſition, and artificial ſtone, have rendered them ſo common, and ſo miſapplied, that it is offenſive to true taſte; notwithſtanding, good models from regular deſigns, calculated for the purpoſe by an Architect of judgment, never fail to pleaſe.

Before we proceed to the proportions of the ſeveral orders of Architecture, agreeable to Sir William Chambers, namely, Tuſcan, Doric, Ionic, Corinthian, and Compoſite, to give a good general idea of the whole, have introduced columns of each order, accompanying an arch with proper dreſſings, bearing the general proportion of the order to which they belong, with its impoſt and archivolt, &c.

See Plate I. TUSCAN. Plate II. DORIC. Plate III. IONIC. Plate IV. CORINTHIAN. Plate V. COMPOSITE, in this *Syſtem of* ARCHITECTURE, taken from the much eſteemed works of Monſieur De La Foſſe, an Architect of the firſt eminence in Paris: they are proportioned by modules and parts, each module being a ſemi-diameter, divided into eighteen parts; all of them are accurately figured; the ornaments by which they are decorated ſerve to ſhew a variety; but muſt be applied agreeably to the purpoſe of the intention of the building.

Of Regular Mouldings there are eight; which are the Ovolo, the Talon, the Cyma, the Cavetto, the Torus, the Aſtragal, the Scotia, and the Fillet.

The names of theſe are alluſive to the forms; and their forms are adapted to the uſes which they are intended to ſerve.

The Ovolo and Talon, as they are ſtrong at their extremities, are fit for ſupports; the Cyma and Cavetto, though improper for that purpoſe, being weak in their extreme parts, and terminating in a point, are well contrived for coverings to ſhelter other members: for the tendency of their contour is very oppoſite to the direction of falling water; which for that reaſon cannot glide along their ſurface, but muſt neceſſarily drop. The Torus and Aſtragal, being ſhaped like ropes, are intended to bind and fortify the parts on which they are employed: but the uſe of the Fillet and Scotia, is only to ſeparate and diſtinguiſh other mouldings, to give a graceful turn to the profile, and to prevent that confuſion which would be occaſioned by joining ſeveral curved members together.

That the inventors of theſe Mouldings meant to expreſs ſomething by their different figures will ſcarcely be denied; and that theſe were their deſtinations may be deduced, not only from their figures, but from the practice of the Ancients in their moſt eſteemed works: for if we examine the Panthæon, the Three Columns, the temple of Jupiter Tonans, the fragments of the Frontiſpiece of Nero, the Baſilica of Antoninus, the Forum of Nerva, the Arches of Titus and Septimius Severus, the Theatre of Marcellus, and indeed almoſt every ancient building, either at Rome, or in other parts of Italy, and France, it will be found that, in all their profiles, the Cyma and the Cavetto are conſtantly uſed as finiſhings, and never applied where ſtrength is required; that the Ovolo and Talon are always employed as ſupporters to the eſſential members of the Compoſition, ſuch as the Modillions, Dentils, and Corona; that the chief uſe of the Torus and Aſtragal is to fortify the tops and bottoms of Columns, and ſometimes Pedeſtals, where they are frequently cut in the form of ropes; as on the Trajan Column, in the Temple of Concord, and on ſeveral fragments both at Rome and at Niſmes in Languedoc; and that the Scotia is employed only to ſeparate the members of Baſes, for which purpoſe the Fillet is likewiſe uſed, not only in Baſes but in all kinds of Profiles.

There are various manners of deſcribing the Contours of the Mouldings: but the ſimpleſt and beſt is to form them of quadrants of circles, by which means the different depreſſions and ſwellings will be ſtrongly marked, the tranſitions made without any angle, and the projections be agreeable to the doctrine of Vitruvius, and the practice of the Ancients; thoſe of the Ovolo, Talon, Cyma, and Cavetto, being equal to their height, that of the Scotia to one third thereof, and thoſe of the curved parts of the Torus and Aſtragal to one half of it.

On particular occaſions, however, it may be neceſſary ſometimes to encreaſe and at other times to diminiſh theſe projections, according to the ſituation or other circumſtances attending the profile. When it ſo happens the Ovolo, Talon, Cyma, and Cavetto, may either be deſcribed from the ſummits of equilateral triangles, or compoſed of quadrants of the Ellypſis; the latter of which is to be preferred, becauſe it produces a ſtronger oppoſition of light and ſhade, and by that means, makes the figure more diſtinct. The Scotia may likewiſe be formed of Ellyptical portions, or of quadrants of the circle, by which means its projection may either be encreaſed or diminiſhed: but the curved part of the Torus and Aſtragal muſt always be ſemicircular, and the encreaſe in their projection be by ſtreight lines.

In ſome Antiques, and likewiſe in various modern buildings, where the parts are far removed from the eye, or where, from the extraordinary ſize of the ſtructure, it hath not been practicable to give every member its due protection, recourſe hath been had to artifice in order to produce the deſired effect.

An Aſſemblage of Eſſential parts and Mouldings is termed a Profile; and on the choice, diſpoſition, and proportions of theſe, depends the beauty or deformity of the Profile.

The moſt perfect are ſuch as are compoſed of few Mouldings, varied both in form and ſize, fitly applied with regard to their uſes, and ſo diſpoſed that the ſtreight and curved ones ſucceed each other alternately. In every Profile there ſhould be a predominant member, to which all the others ought to be ſubſervient, and ſeem made either to ſupport, to fortify, or to ſhelter it from the injury of the weather; this predominant member ought always to be one of the eſſential ones: thus in a Cornice, the Corona is principal, the Cyma or Cavetto cover it, and the Modillions, Dentils, Ovolo, and Talon ſupport it.

When ornaments are employed to adorn the Mouldings, ſome of them ſhould be left plain, in order to form a proper repoſe: for, when all are enriched, the figure of the Profile is loſt.

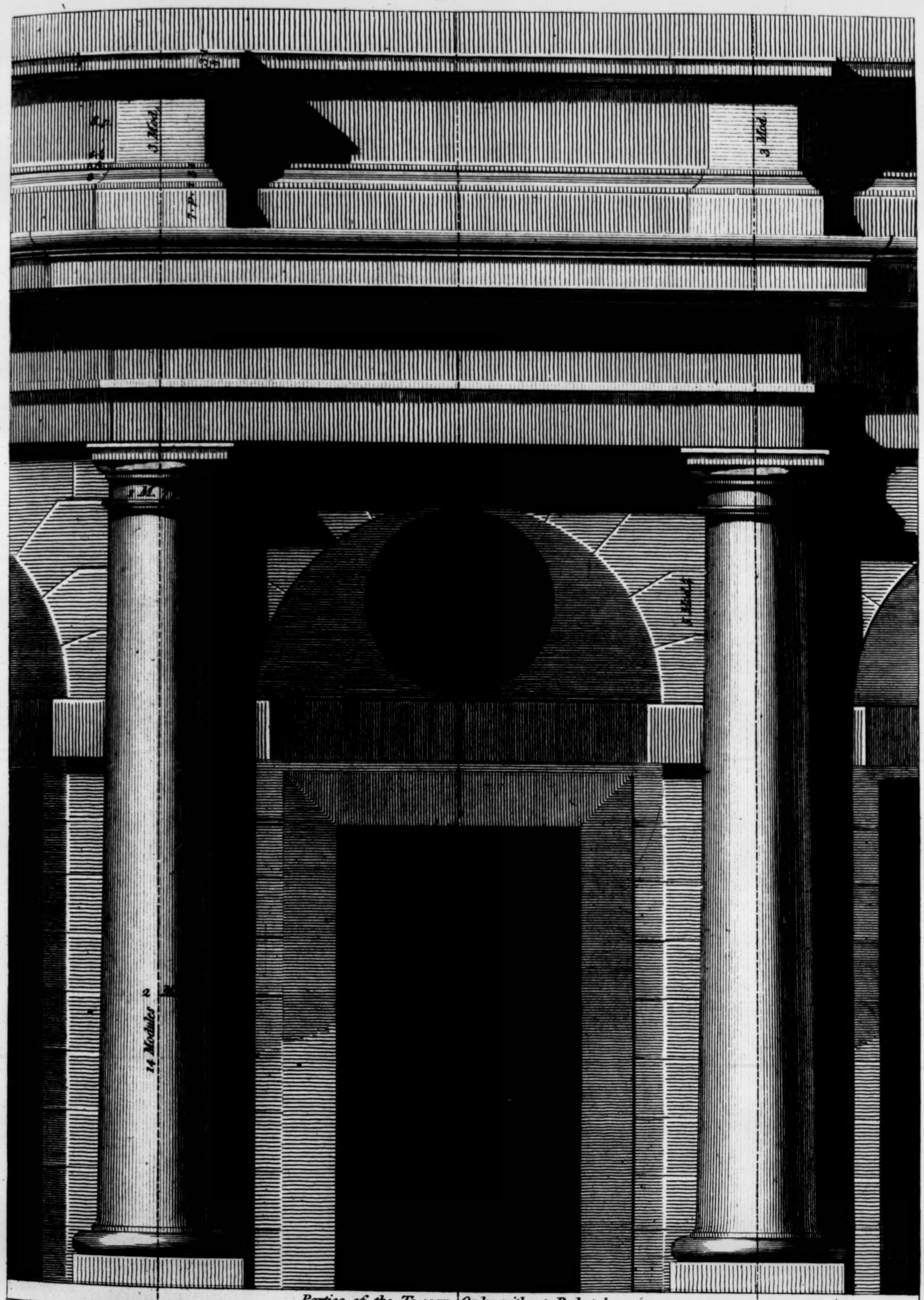
Variety of enrichments muſt not be carried to an exceſs. In Architecture they are only acceſſories; and therefore they ſhould not be too ſtriking, nor capable of long detaining the attention from the main object. Thoſe of the Mouldings in particular ſhould be ſimple and uniform, and never compoſed of more than two different repreſentations upon each moulding; which ought to be cut equally deep, formed of the ſame number of parts, and nearly of the ſame dimenſions, in order to produce one even uninterrupted tint through the whole, that ſo the eye may not be too ſtrongly attracted by any particular part.

When Frizes, or other large Members are to be enriched, the Ornaments may be ſignificant, and ſerve to indicate the Uſe of the Building, or the Qualities and Actions of the Owner: but it is a fooliſh cuſtom to croud every part with Arms, Creſts, Cyphers, and Mottos: for the figures of theſe things are generally bad, and betrays an unbecoming vanity in the patron of the ſtructure.

When objects are near, and liable to cloſe inſpection, every part of the ornament ſhould be expreſſed, and well finiſhed; but when they are much exalted, the detail may be ſlightly touched, or entirely neglected; for it is ſufficient if the general form be diſtinct, and the principal maſſes ſtrongly marked. A few rough ſtrokes, from the hand of a ſkilful maſter, are much more effectual than the moſt elaborate finiſhings of an artleſs imitator.

OF

Tuscan Order – See System of Architecture.


3 Mod.
3 Mod.
14 Modules
1 Mod.
6 Mod. ½
9 Mod. ½
1
2
3
4
5
6 Mod.
2 Modules

Portico of the Tuscan Order without Pedestals.

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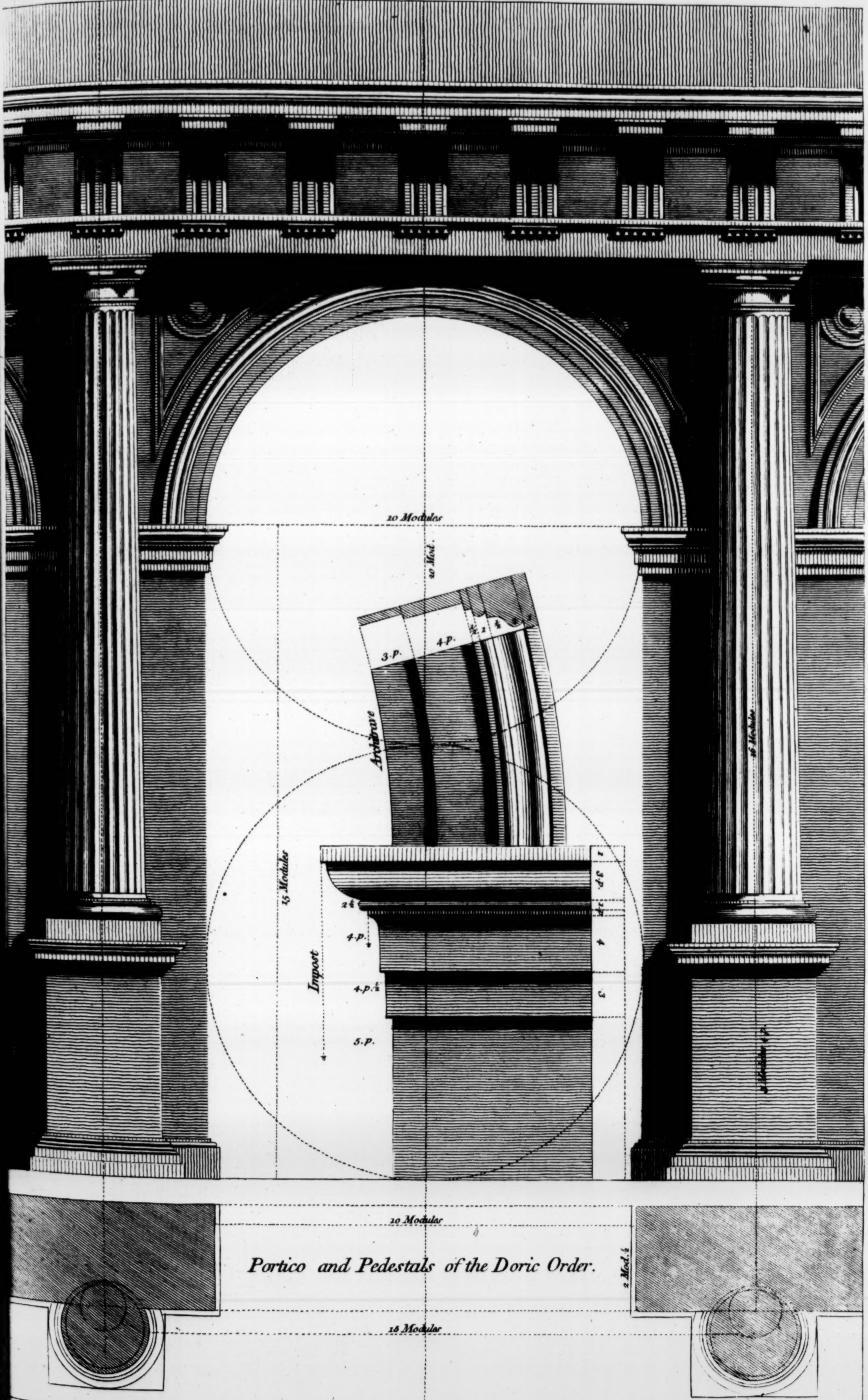
Doric Order, See System of Architecture.

Plate 2.


10 Modules
20 Mod.
3.p.
4.p.
½
1
⅛
Archivolt
15 Modules
Impost
2¼
4.p.
4.p.½
5.p.
1
3.p.
1.p.
4
3
16 Modules
3 Modules 4 p.
10 Modules
2 Mod. ½
18 Modules

Portico and Pedestals of the Doric Order.

Milne del.

Published as the Act directs by C. Cooke, Nº 17, Paternoster Row February 13th 1789.

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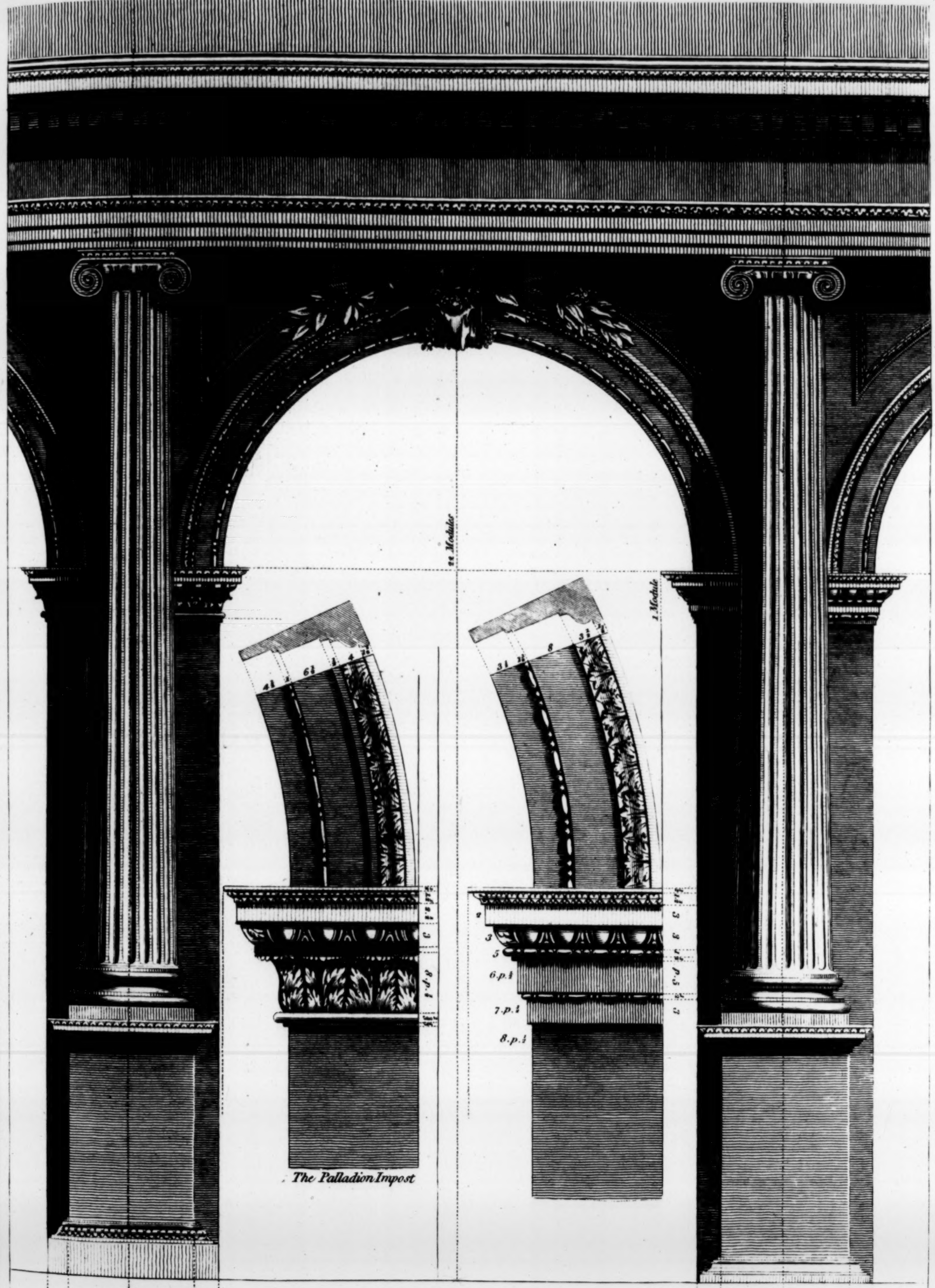
Ionic Order — See System of Architecture.


22 Modules
1 Module
4½
6½
4
3½
8
2
3
5
6.p.¼
7.p.¼
8.p.¼
The Palladion Impost
11 Modules
15 Modules
2 Modules 14 p
4 Modules
2 Modules

Portico of the Ionic Order with Pedestals.—

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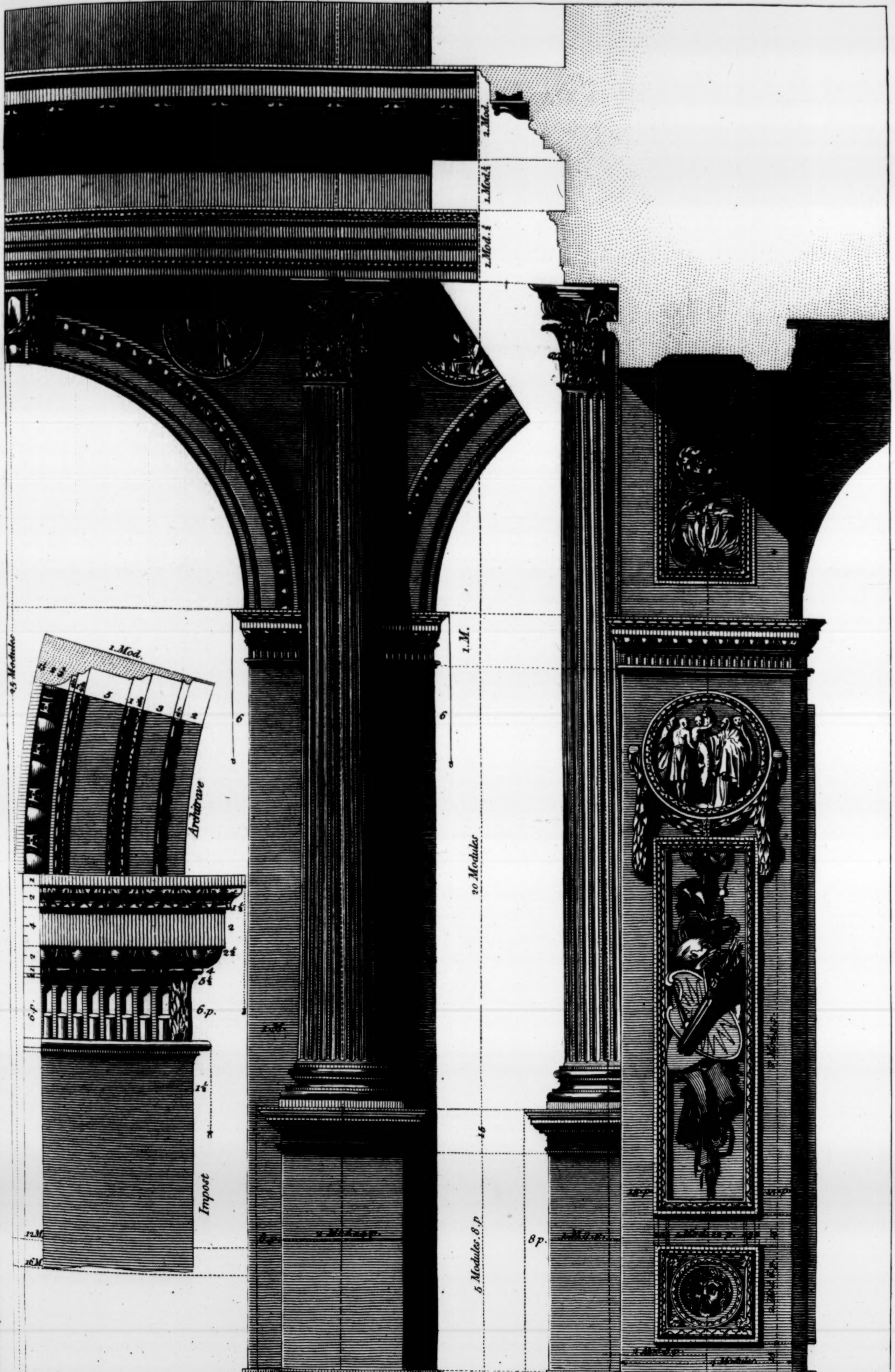
BRITISH 18 MR 63 MUSEUM

Corinthian Order See System of Architecture.


2 Mod.
1 Mod.½
1 Mod.½
1 M.
6
6
20 Modules
5 Modules. 8. p
8 p.
8p.
1 Mod.
25 Modules
Architrave
Impost
6.p.
12M.
16M.
1.M.
6 12 18 2 3 4 5 6 7 8

Front View of the Portico & Pedestal.

Profile View of the Portico.

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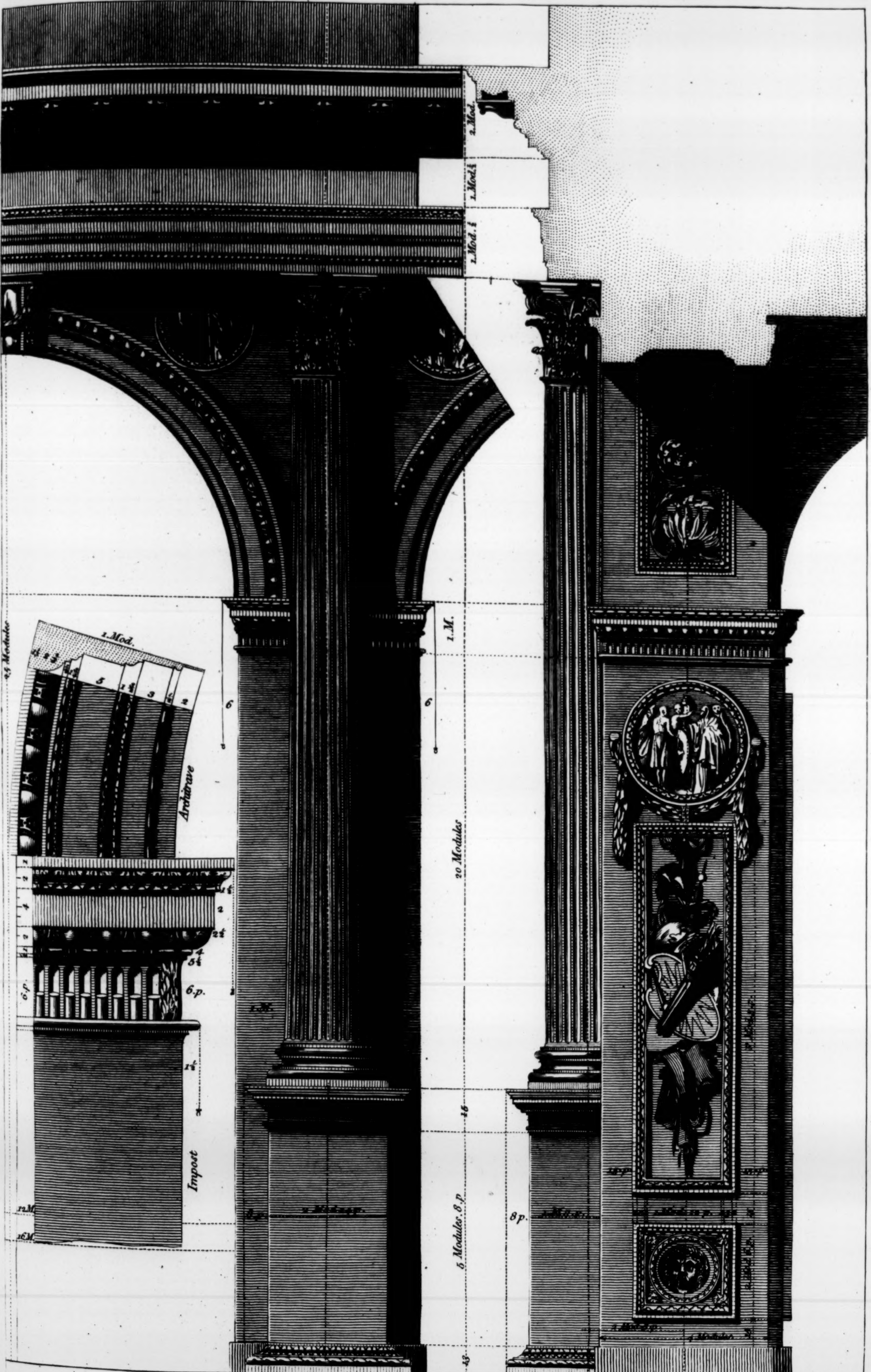
Corinthian Order See System of Architecture.

Plate 4


2.Mod.
1.Mod.
1.Mod.
1.Mod.
1.M.
6
6
20 Modules
Architrave
Impost
6.p.
1.M.
8p.
6 Modules, 8 p.
4 Modules
6 12 18
2
3
4
5
6
7
8

Front View of the Portico & Pedestal.

Profile View of the Portico.

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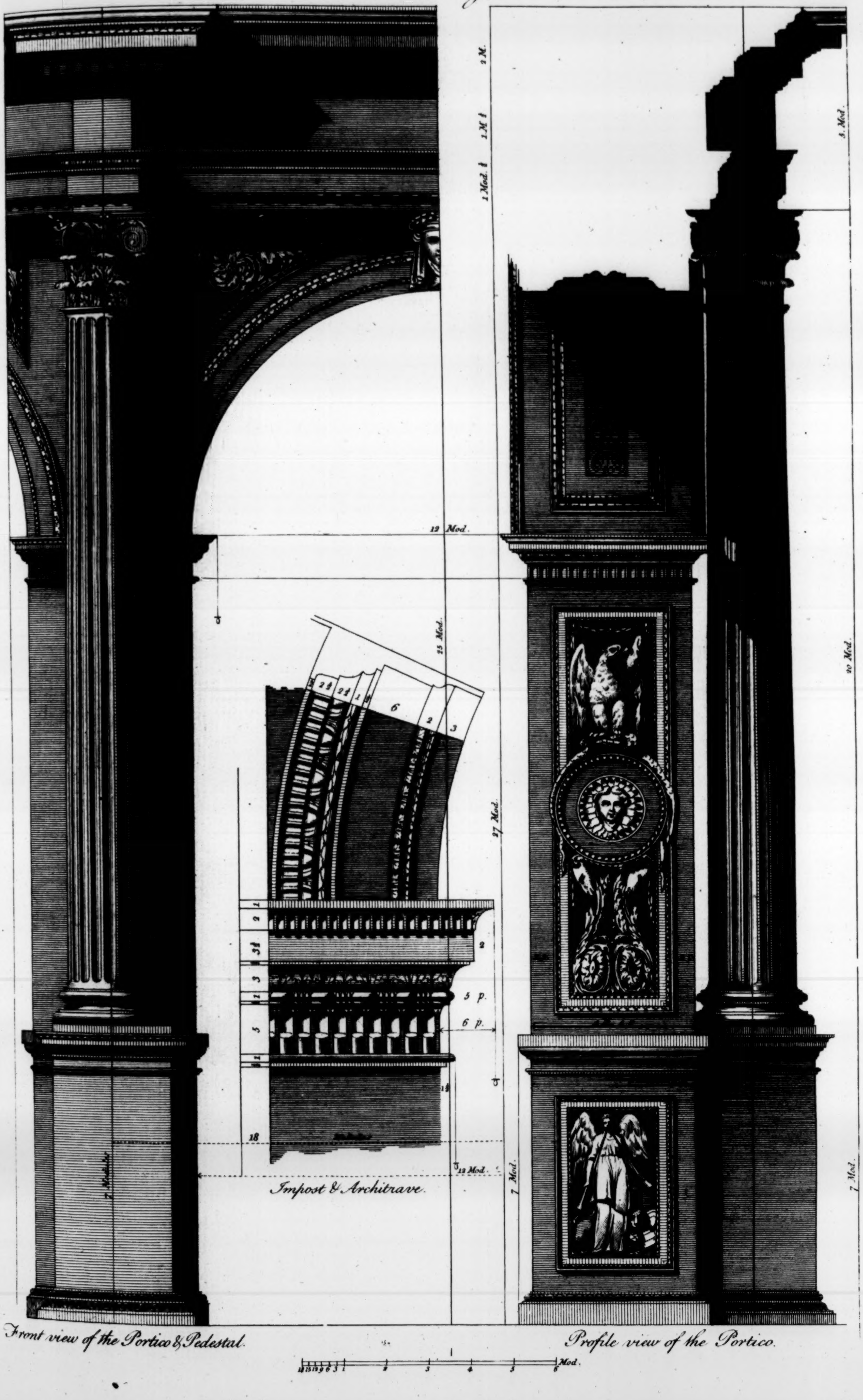
Composite Order. — See System of Architecture.

Plate 5.


2 M.
1 M 1
1 Mod. 1
3 Mod.
12 Mod.
23 Mod.
27 Mod.
20 Mod.
2 1/2
2 1/2
1
6
2
3
2
3 1/2
3
5 p.
6 p.
5
18
12 Mod.
7 Modules
7 Mod.
7 Mod.
Impost & Architrave.
Mod.

Front view of the Portico & Pedestal.

Profile view of the Portico.

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Orders of Architecture according to Sir William Chambers.
See the System.

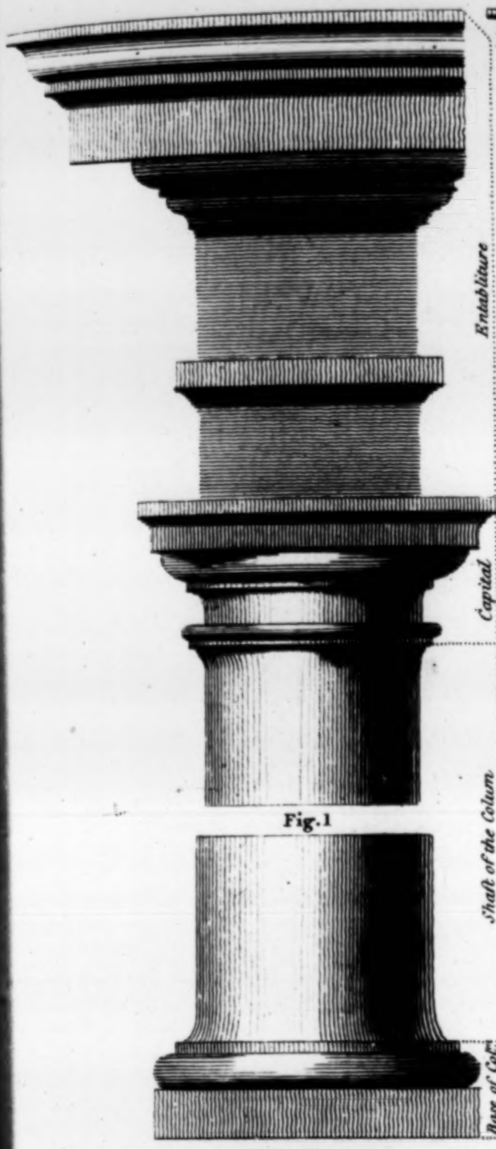

Entablature
Capital
Fig.1
Shaft of the Colum
Base of Colⁿ

Fig.1 the Tuscan Order.

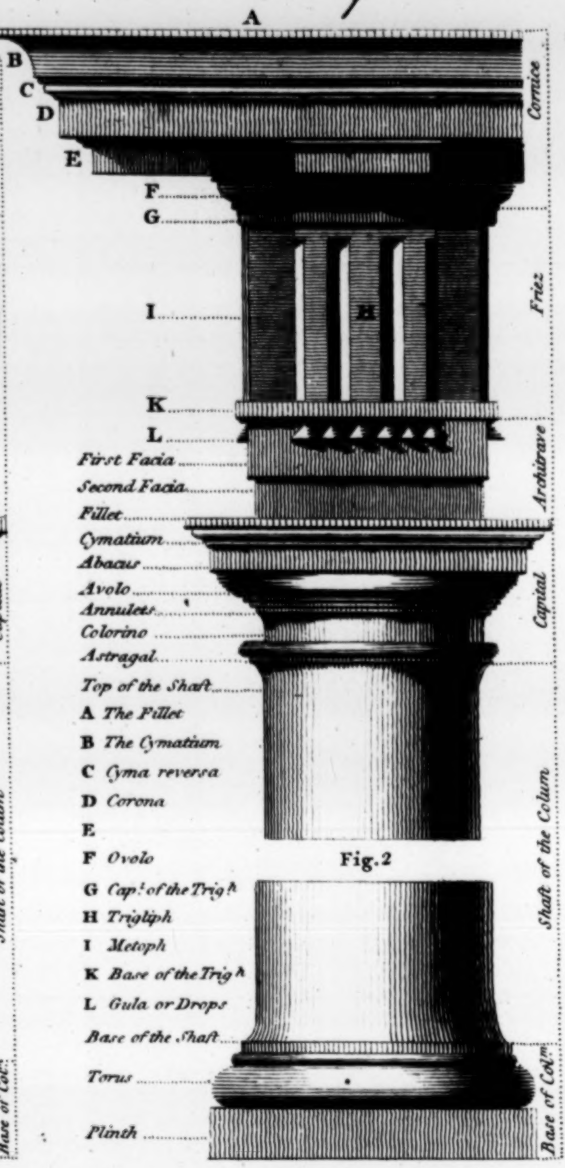

A
B
C
D
E
F
G
Cornice
H
Friz
I
K
L
Architrave
First Facia
Second Facia
Fillet
Cymatium
Abacus
Avolo
Annulets
Colorino
Astragal
Capital
Top of the Shaft
A The Fillet
B The Cymatium
C Cyma reversa
D Corona
E
F Ovolo
G Capˡ of the Trigʰ
H Trigliph
I Metoph
K Base of the Trigʰ
L Gula or Drops
Fig.2
Shaft of the Colum
Base of the Shaft
Torus
Plinth
Base of Colⁿ

Fig.2 the Doric Order.

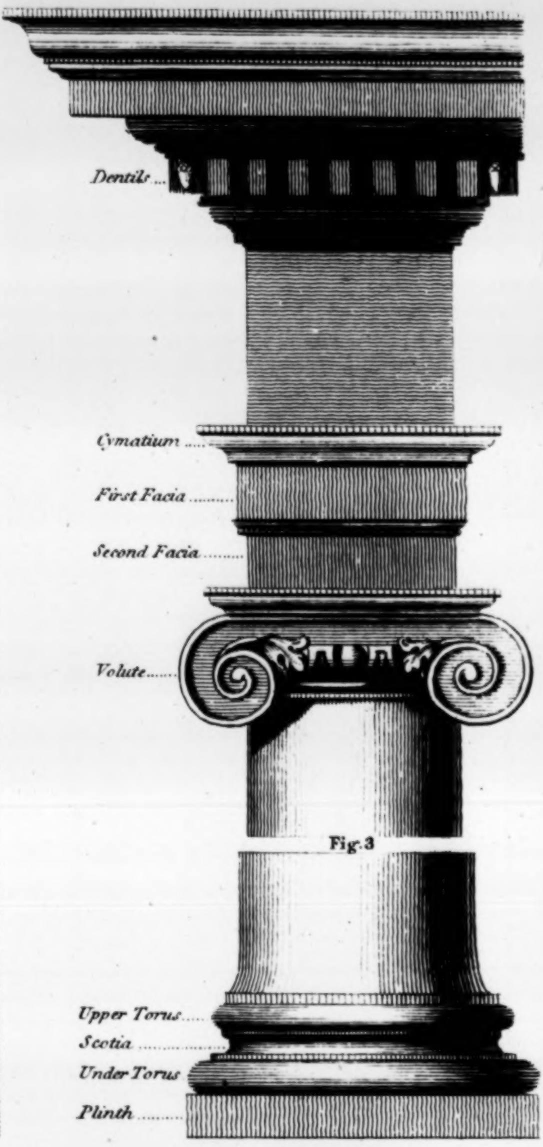

Dentils
Cymatium
First Facia
Second Facia
Volute
Fig.3
Upper Torus
Scotia
Under Torus
Plinth

Fig.3 the Ionic Order.

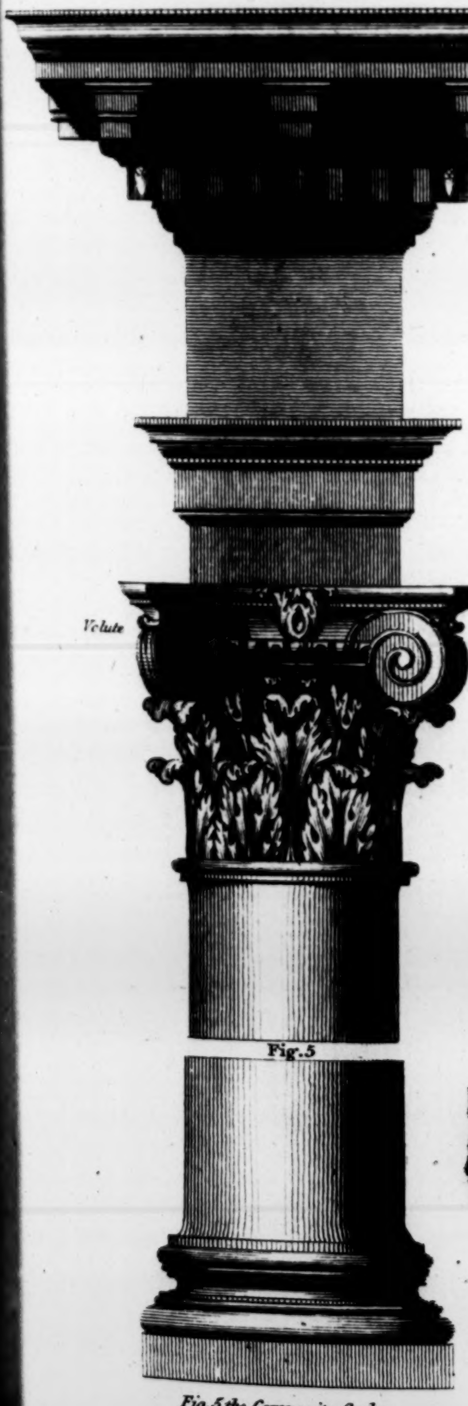
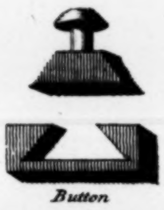
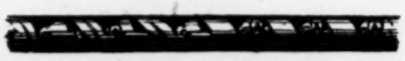
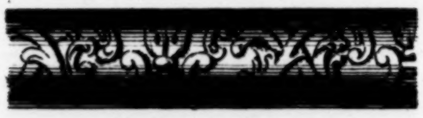
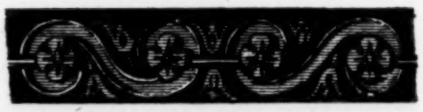

Volute
Fig.5

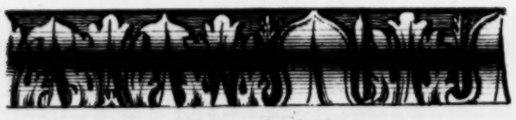
Fig.5 the Composite Order.

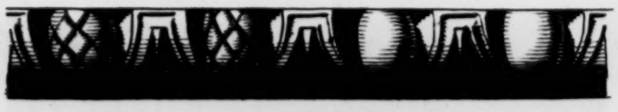

Button

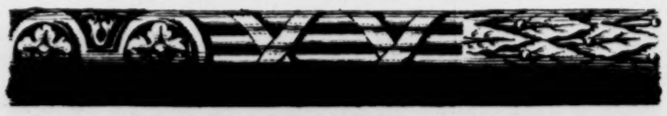

Ornament for the Astrangle.

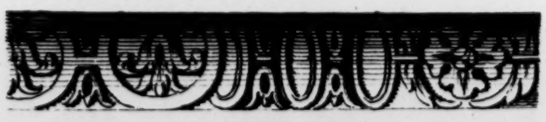

Ornament for the Cyma.


Ornament for the flat members.


Ornament for the Ogee.


Ornament for the Ovolo.


Ornament for the Torus.


Ornament for the Cavetto.

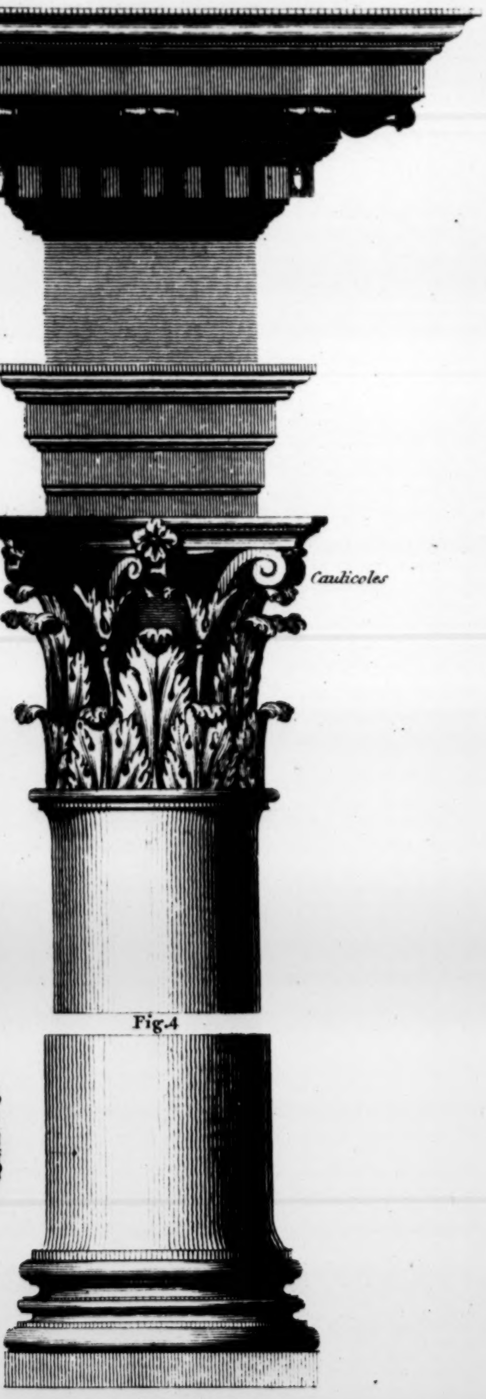

Caulicoles
Fig.4

Fig.4 the Corinthian Order.

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BRITISH
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OF THE ORDERS OF ARCHITECTURE IN GENERAL See PLATE VI.

AN Order conſiſts of two principal Members, the Column and the Entablature; each of which is compoſed of three principal Parts. Thoſe of the Column are the Baſe, the Shaft, and the Capital; and thoſe of the Entablature are the Architrave, the Frize, and the Cornice. All theſe are ſubdivided into many leſſer parts, whoſe number, form, and dimenſions characterize each order, and expreſs the degree of ſtrength, delicacy, richneſs, or ſimplicity peculiar to it.

Of the Five Orders, three are called Grecian; to wit, the Doric, the Ionic, and the Corinthian; and two Latin, the Tuſcan, and the Compoſite.

The ſimpleſt and moſt ſolid of all theſe is the Tuſcan. It is compoſed of few Parts, devoid of Ornaments, and of a Conſtruction ſo maſſive, that it ſeems capable of ſupporting the heavieſt burden; whence it is, by Sir H. Wotton, compared to a ſturdy labourer in homely apparel.

The Doric is next in ſtrength to the Tuſcan; and, being of a grave, robuſt, and maſculine aſpect, is by Scamozzi called the Herculean. As it is the moſt ancient of all the Orders, it retains more of the ſtructure of primitive huts than any of the reſt; having Triglyphs in its Frize to repreſent the ends of the Joiſts; and Mutules in its Cornice, to repreſent the Rafters; its column being likewiſe, in various Antiques, executed without a Baſe, in imitation of the trees uſed in the firſt buildings, without any Plinths to raiſe them above the ground.

The Ionic is of a more ſlender make than either of the abovementioned orders. Its appearance is ſimple, yet graceful and majeſtic; its ornaments are few, nor is there any thing exaggerated, or remarkably ſtriking, in any of its parts: ſo that it is not improperly compared to a ſedate matron, in decent rather than magnificent attire.

The Corinthian, ſays Sir H. Wotton, is a column laſciviouſly decked, like a wanton courtezan. Its proportions are extremely elegant. It is divided into a great variety of members, and enriched with a profuſion of ornaments. Scamozzi calls it the Virginal: and indeed it has all the delicacy in its make, with all the gaiety, gaudineſs and affectation in its dreſs, peculiar to young girls.

The Compoſite is, properly ſpeaking, only a ſpecies of the Corinthian; and therefore retains, in a great meaſure, the ſame character.

Columns, in the opinion of Scamozzi, ſhould not be leſs than ſeven of their diameters in height, nor more than ten; the former being a good proportion in the Tuſcan, and the latter in the Corinthian order. The practice of the ancients, in their beſt works, is conformable to this precept: for which reaſon, according to the doctrine of Vitruvius, the Tuſcan columns are ſeven diameters in height, the Doric eight, and the Ionic nine, (as Palladio and Vignola have done,) and the Corinthian and Compoſite ten; which laſt is a mean between the proportions obſerved in the Pantheon, and in the three columns, both which are accounted excellent models of the Corinthian order.

The height of the Entablature, in all the Orders, is made one quarter of the height of the column; which was the common practice of the ancients, who, in all ſorts of Entablatures, ſeldom exceeded or fell much ſhort of that meaſure.

Nevertheleſs Palladio, Scamozzi, Alberti, Barbaro, Cataneo, de L'Orme, and others of the Modern Architects, have made their Entablatures much leſs in the Ionic, Compoſite, and Corinthian Orders, than in the Tuſcan or Doric. This, on ſome occaſions, may be not only excuſable but highly commendable; particularly where the intercolumniations are large, (as in a ſecond or third Order,) or in private houſes, or inſide decorations, where lightneſs may be preferred to dignity, and where expence, and every impediment to the conveniency of the fabric, is carefully to be avoided: but to ſet entirely aſide a proportion, which ſeems to have had the general approbation of the Ancient Artiſts, is preſuming too far.

Of two manners uſed by Architects to determine the dimenſions of the mouldings, and the leſſer parts that compoſe an Order, is choſen the ſimpleſt, readieſt, and moſt accurate; which is by the Module, or ſemi-diameter of the Column, taken at the bottom of the Shaft, and divided into thirty Minutes.

Monſieur Blondel, in his book entitled *Reſolution des quatre principaux Problêmes d'Architecture*, teaches various manners of diminiſhing Columns; the beſt and ſimpleſt of which is by means of the inſtrument which Nicomedes invented to deſcribe the Firſt Conchoid: for this, being applied at the bottom of the Shaft, performs at one ſweep both the ſwelling and the diminution; giving ſuch a graceful form to the Column, that it is univerſally allowed to be the moſt perfect practice hitherto diſcovered. The Columns in the Pantheon, accounted the moſt beautiful among the Antiques, are made in this manner; as appears by the exact meaſures of one of them to be found in *Deſgodet's Antiquities of Rome*. See PLATE VI.

In the remains of Antiquity the quantity of the diminution is various; but ſeldom leſs than one eighth of the inferior diameter of the column, nor more than one ſixth of it. The laſt of theſe is by Vitruvius eſteemed the moſt perfect.

The intention being to give an exact idea of the Orders of the Ancients, are repreſented here under ſuch figures and proportions as appear to have been moſt in uſe in the eſteemed works of the Romans; who, in the opinion of Leo. Bap. Alberti, and other eminent writers, carried Architecture to its perfection. It muſt not however be imagined that the ſame general proportions will on all occaſions ſucceed. They are chiefly collected from the Temples and Public Structures of Antiquity, and may by us be employed in Churches, Palaces, and other Buildings of magnificence, where Majeſty, and Grandeur of manner may be extended to their utmoſt limits, and where, the whole body being generally large, the parts require an extraordinary degree of boldneſs, to make them diſtinctly perceptible from the proper point of view; but in leſs conſiderable edifices, and under various circumſtances other proportions may be preferable.

OF THE TUSCAN ORDER. See PLATE VI.

THERE are no remains of a regular Tuſcan Order among the Antiques: the doctrine of Vitruvius concerning it is obſcure: and the Profiles of Palladio, Scamozzi, Serlio, de l'Orme, and Vignola are all imperfect.

The Deſign here annexed is chiefly imitated from Vignola's, who in this Order hath been almoſt univerſally followed: even Inigo Jones, who was ſo cloſe an adherer to Palladio, having employed Vignola's Profile in York ſtairs, and others of his buildings; but as the Cornice appears far inferior to the reſt of the Compoſition, have not ſcrupled to reject it, and in its place ſubſtitute that of Scamozzi, with ſuch alterations as were evidently neceſſary to render it perfect. The Height of the Column is fourteen Modules, or ſeven Diameters, and that of the whole Entablature three and a half Modules: which being divided into ten equal parts, three of them are for the Height of the Architrave, three for the Frize, and the remaining four for the Cornice, the Capital is in Height one Module; the Baſe, including the lower Cincture of the Shaft, is alſo one Module. And the Shaft, with its upper Cincture and Aſtragal, twelve Modules.

Theſe are the general meaſures of the Order. As to the particular Dimenſions of the minuter parts, they may be collected from the Deſign, where the Heights and Projections are accurately marked; the latter being counted from perpendiculars raiſed at the extremities of the inferior and ſuperior Diameters of the Shaft: a method preferable to that of De Chambray and Deſgodetz, who count from the Axis of the Column; becauſe the relations between the Heights and Projections are more perceptible, and whenever a Cornice or Entablature is to be executed without a Column, which very frequently happens, it requires no additional labour, as the trouble of deducting from each dimenſions the ſemi-diameter of the Column is ſaved.

The Tuſcan Order admits of no Ornaments of any kind; on the contrary it is ſometimes cuſtomary to repreſent, on the Shaft of its Column, ruſtic Cinctures: as at the Pitti of Florence, the Luxembourg at Paris, York Stairs in London, and many other Buildings of note. This practice, however, though frequent, and to be found in the works of ſeveral celebrated Architects, is ſeldom excuſable, as it hides the natural figure of the Column, alters its proportions, and deſtroys the ſimplicity of the whole compoſition. There are few examples of theſe bandages in the remains of antiquity; and, in general, it will be adviſeable to avoid them in all large compoſitions; reſerving the ruſtic work for the intercolumniation, where it may be employed with great propriety, to produce an oppoſition, which will render the aſpect of the whole diſtinct and ſtriking. But in ſmaller works, whoſe parts are few, and therefore eaſily comprehended, they may be ſometimes tolerated. Le Clerc thinks they are proper for gates of Citadels and Priſons, whoſe entrance ſhould be dreadful; and they are likewiſe fit for gates of Gardens or Parks, Grottos, Fountains, and Baths, where elegance of form, and neatneſs of workmanſhip, would be out of character. De L'Orme, who was exceeding fond of theſe Cinctures, hath employed them in ſeveral parts of the Thuilleries, covered with arms, cyphers, and other enrichments. This is quite abſurd: for they can never be conſidered in any other light, than as parts which, to avoid expence and trouble, were left unfiniſhed. We likewiſe find, in different parts of the Louvre, vermiculated ruſtics of which the tracks repreſent flower de luces, and other regular figures: a practice more unnatural than the former; though Monſieur Daviler gravely tells us that it ſhould always be done with propriety, and expreſs a relation to the owner of the ſtructure; that is, the figures ſhould repreſent his Arms, Creſt, Mottos, Cyphers, &c.

The Tuſcan Order, carrying with it an idea of ſtrength and ruſtic ſimplicity, is very proper for rural uſes, and may be employed in Farm-houſes, Stables, Maneges, and Dog-kennels; Green-houſes, Grottos, Fountains, gates of Parks and Gardens; and, in general, in all places where magnificence is not required, and expence is to be avoided. Serlio recommends the uſe of it in Priſons, Arſenals, Treaſuries, Sea-ports, and gates of fortified places; and Le Clerc obſerves, that though the Tuſcan Order, as treated by Vitruvius Palladio, and ſome others, ought to be entirely rejected, yet according to the compoſition of Vignola, there is a beauty in its ſimplicity, which recommends it to eſteem, and entitles it to a place both in private and public buildings, even in Royal Palaces, to adorn the lower apartments, offices, ſtables, and other places that require ſtrength and ſimplicity, where richer and more delicate orders would be improper.

In conformity to the doctrine of Vitruvius, and to the almoſt general practice of all the moderns, have given to the Height of the Tuſcan Column ſeven Diameters, or fourteen Modules; a proportion which is very proper for rural or military works, where an appearance of extraordinary ſolidity is required: but in Town buildings, intended for civil purpoſes, or in interior decorations, the Height of the Column may be fourteen and a half, or even fifteen Modules, as Scamozzi makes it: which augmentation may be made in the Shaft, without changing any meaſures either in the Baſe or Capital: nor need the Entablature be altered; for, as it is compoſed of few parts, it will be ſufficiently bold, though its Height be a little leſs than one quarter of the Height of the Column.

OF THE DORIC ORDER. See Plate VI.

AS this Profile of Vignola's is compoſed in a greater ſtyle, and in a manner more characteriſtic of the Order, than any other, have made choice of it for a model; having, in the general form and proportions, adhered ſtrictly to the original; though in particular member I have not ſcrupled to vary, when obſervation taught they might be improved.

Perfect proportion in Architecture, if conſidered only with regard to the relations between the different objects in a compotion, and as far as it relates merely to the pleaſure of the ſight, ſeems to conſiſt in this, that thoſe parts, which are either principal or eſſential, ſhould be ſo contrived as to catch the eye ſucceſſively, from the moſt conſiderable to the leaſt, according to their degrees of importance in the compoſition, and impreſs their images on the mind before it is affected by any of the ſubſervient members; yet that theſe ſhould be ſo conditioned, as not to be entirely abſorbed by the former, but capable of raiſing diſtinct ideas likewiſe, and ſuch as may be adequate to the purpoſes for which theſe parts are deſigned. The different figures and ſituations of the parts may, in ſome degree, contribute toward this effect: for ſimple forms will operate more ſpeedily than thoſe that are complicated, and ſuch as project will be ſooner perceived than thoſe that are more retired. But dimenſion ſeems to be the predominant quality; or that which acts moſt powerfully on the ſenſe: and this can only be diſcovered by experience. When therefore any number of parts, arranged in a particular manner, and under particular proportions, excite, in the generality of judicious ſpectators, a pleaſing ſenſation, it will be prudent on every occaſion, where the ſame circumſtances ſubſiſt, to obſerve exactly the ſame proportions; notwithſtanding they may in themſelves appear irregular and unconnected.

It may perhaps be objected that the proportions here eſtabliſhed, though good on one occaſion, may on others be faulty. But this objection will be groundleſs, with regard to Capitals and Entablatures: their ſituation, with reſpect to the Order to which they belong, is conſtantly the ſame; and the point of view being more or leſs diſtant, according to the ſize or elevation of the Order, the apparent magnitudes of their parts will conſtantly bear, nearly, the ſame proportion to each other; even though they ſhould be exalted to a ſecond or third ſtory. With regard to Baſes, indeed, their being placed on Pedaſtals, or immediately on the ground, will occaſion ſome difference in their appearance; and when they are raiſed to a ſecond ſtory, their figure and apparent proportions will be conſiderably altered. Nevertheleſs, it doth not ſeem neceſſary to vary their dimenſions in either of theſe caſes: for in the former of the two the alteration would be trifling; and, in the latter, the object is ſo far removed from the eye, that the ſpectator is rather occupied in conſidering the general maſs, than in examining its particular parts, which, on account of their diſtance, are not diſtinctly perceptible.

The Height of the Doric Column, including its Capital and Baſe, is ſixteen Modules, and the Height of the Entablature four Modules; the latter of which being divided into eight parts, two of them are for the Architrave, three for the Frize, and three for the Cornice.

In moſt of the Antiques, the Doric Column is executed without a Baſe: Vitruvius likewiſe makes it without one; the Baſe, according to that Author, having been firſt employed in the Ionic Order, to imitate the Sandal, or covering of a woman's foot. Scamozzi blames this practice; and moſt of the Moderns have been of his opinion; the greateſt part of them having employed the Attic Baſe in this Order. Monſieur de Chambray, however, whoſe blind attachment to the Antique is, on many occaſions, too evident, argues vehemently againſt this practice; which, as the Order is formed upon the model of a ſtrong man, who is conſtantly repreſented bare-footed, is, according to him, very improper; and though the cuſtom of employing a Baſe, in contempt of all ancient authority, hath, by ſome unaccountable and falſe notion of beauty, prevailed, he doubts not but the pureſt eye, when apprized of this error, will eaſily be undeceived; and as what is merely plauſible will, when examined, appear to be falſe, ſo apparent beauties, when not founded in reaſon, will of courſe be deemed extravagant.

Le Clerc's remarks on this paſſage are very judicious; and, as they will ſerve to deſtroy a notion, which is too prevalent among us, ſhall, for the benefit of thoſe, who are unacquainted with the original, tranſlate the whole paſſage. "In the moſt ancient monuments of this Order, ſays he, the Columns are without Baſes; for which it is difficult to aſſign any ſatisfactory reaſon. Monſieur de Chambray, in his Parallel, is of the ſame opinion with Vitruvius, and maintains that the Doric Column, being compoſed upon the model of a naked, ſtrong, and muſcular man, reſembling a Hercules, ſhould have no Baſe; pretending that the Baſe to a Column is the ſame as a ſhoe to a man. But I muſt own I cannot conſider a Column without a Baſe, in comparing it to a man, but I am at the ſame time ſtruck with the idea of a perſon without feet rather than ſhoes: for which reaſon I am inclinable to believe, either, that the Architects of Antiquity had not yet thought of employing Baſes to their Columns or that they omitted them, in order to leave the pavement clear; the Angles and Projections of Baſes being ſtumbling blocks to paſſengers, and ſo much the more troubleſome, as the Architects of thoſe times frequently placed their Columns very near each other: ſo that had they been made with Baſes, the paſſages between them would have been extremely narrow and inconvenient: and it was doubtleſs for the ſame reaſon that Vitruvius made the Plinth of his Tuſcan Column round; that Order, according to his conſtruction, being particularly adapted to ſervile and commercial purpoſes, where conveniency is preferable to beauty. However this be, perſons of good taſte will grant, that a Baſe not only gives a graceful turn to the Column, but is likewiſe of real uſe; ſerving to keep it firm on its plan; and that if Columns without Baſes are now ſet aſide, it is a mark of the wiſdom of our Architects, rather than an indication of their being governed by prejudice, as ſome adorers of Antiquity would inſinuate."

In imitation of Palladio, and modern Architects except Vignola, the Attic Baſe in this Order is uſed: and it is the moſt beautiful of any, though for variety's ſake, when the Doric and Ionic Orders are employed together, the Baſe invented by Vignola, of which a Profile is annexed, may ſometimes be uſed: Bernini has uſed it in the Colonnades of St. Peter's, and it hath been ſucceſsfully applied in many other buildings.

The Ancients ſometimes made the Shaft of the Doric Column priſmatic, as appears by a paſſage in the fourth book of Vitruvius; and at other times they adorned it with a particular kind of ſhallow Flutings deſcribed from the centre of a ſquare, no interval or fillet being left between them; of which ſort there are now ſome Columns to be ſeen at the Temples of Peſto near Naples, and in the church of St. Peter in Catenis at Rome. The former of theſe manners hath not been imitated by any of the moderns: nor is the ſecond very frequent; Scamozzi blames it for its want of ſolidity, the projecting angles between the Flutings being eaſily broken, and very ſubject to moulder.

Vitruvius gives the Height of the Doric Capital one Module, and all the moderns, except Alberti, have followed his example. Nevertheleſs, as it is of the ſame kind with the Tuſcan, they ſhould both bear nearly the ſame proportion to the Heights of their reſpective Columns; and conſequently the Doric Capital ought to be more than one Module, and accordingly it is ſo both at the Coliſeum, and in the Theatre of Marcellus; being in the former of theſe buildings upwards of thirty-eight Minutes, and in the latter thirty-three Minutes.

The Height of the whole Capital thirty-two Minutes, and in the Form and Dimenſions of the particular members, have deviated but little from the profile of the Theatre of Marcellus. The Frize, or Neck, is enriched with Huſks and Roſes as in Palladio's Deſign, and as it has been executed by Sangallo at the Farneſe, and by Cigoli in the Cortile of the Strozzi at Florence, as well as in ſeveral buildings of note in this city. The Projection of theſe Huſks and Flowers muſt not exceed that of the upper Cincture of the Column.

The Architrave is one Module in Height, and compoſed only of one Faſcia and a Fillet, as at the Theatre of Marcellus: the Drops are conical, as they are in all the Antiques; and not pyramidal, as they are very improperly made by moſt of our Engliſh workmen.

The Frize and Cornice are each of them one Module and a half in Height: the Metope is enriched with a Bull's ſkull, adorned with a Garland of Beads; in imitation of thoſe on the temple of Jupiter Tonans, at the foot of the Capitol. In ſome antique fragments, and in a greater number of modern buildings, the metopes are alternately enriched with theſe ox-ſkulls, and pateras; but they may be filled with any other ornaments of good forms, and frequently with greater propriety. Thus, in military ſtructures, heads of Meduſa, or the Furies; thunderbolts, and other ſymbols of horror, may be introduced: likewiſe helmets, daggers, and garlands of laurel, or oak. But ſpears, ſwords, quivers, bows, cuiraſſes, ſhields, and the like, muſt be avoided; becauſe the real dimenſions of theſe things are too conſiderable to find admittance in ſuch ſmall compartments; and repreſentations in miniature always carry with them an idea of littleneſs. In Sacred Buildings, cherubs, chalices, and garlands of palm or olive, may be employed; likewiſe doves or other ſymbols of moral virtues; and in private houſes, creſts and badges of dignity, may ſometimes be ſuffered, though ſeldom; and indeed never, when they are of ſuch formal and inſipid figures, as ſtars and garters, crowns, coronets, mitres, truncheons, and the like; the bad effects of which may be ſeen at the treaſury in St. James's Park, and in many other places.

Too much variety in the ornaments of the Metopes muſt be avoided, for fear of deſtroying the unity of the compoſition: and it is beſt never to introduce more than two different repreſentations, which could not conſiſt of above one, or at moſt two objects, each, of ſimple forms, and not overcharged with ornaments. In the diſpoſition of theſe care muſt be taken to place them with Symmetry: thoſe on the right correſponding with thoſe on the left; wherefore, when a Triglyph happens to be in the middle of a Front, it becomes neceſſary to couple the middle ones, by filling the two Metopes, on each ſide of the central Triglyph, with the ſame ſort of ornaments; (as at the gate of Burlington-Houſe) diſpoſing the reſt alternately throughout the whole Front, as uſual. It is likewiſe to be obſerved, that the Ornaments of the Metopes are not to project ſo much as at Bow-Church, and at General Wade's Houſe in Burlington-Garden; where they are far more ſtriking than the Triglyphs, which ought to be predominant; being eſſential and principal parts in the compoſition. Palladio, in the Baſilica of Vicenza, has given to the moſt elevated parts of the Ox-Skulls and pateras very little more projection than that of the Triglyph, and in this he has copied the Ancients, who ſeldom or never gave more projection to any Ornament than that of the border in which it was encloſed; as appears by thoſe inimitable fragments in the Villa Medici, and many otherr in different parts of Rome. The Channels of the Triglyph in their Plan commonly form a right angle; but, to give them more effect, a narrow channel may be cut in the inner angle from top to bottom, and quite to the ſolid of the Frize.

In the Cornice we have deviated very little from the original. Le Clerc, who, in his Doric Profile, has imitated that of Vignola, makes the Mutules as broad as the Capital of the Triglyph. Mr. Gibbs hath followed his example; and they have been executed in this manner at a couple of doors to houſes on the North-Side of Lincoln's Inn Fields. But Vignola's method is preferable, who makes them only as broad as the Triglyph. The ornaments of the Soffit are nearly the ſame as thoſe of Vignola: they ſhould be entirely wrought in the ſolid of the Corona, and have no projection beyond it. There is no neceſſity for cutting them deep. In moſt of Palladio's buildings, they do not enter above two minutes, and that is ſufficient.

Of all the Orders the Doric is moſt difficult to diſtribute, on account of the large Intervals between the Triglyphs. At the Coliſeum they are omitted; and ſo they are in the Colonnades of St. Peter's, and in ſeveral other buildings at Rome. This indeed obviates the difficulty; but it likewiſe deprives the Order of one of its principal ornaments, without which it is very little preferable to the Tuſcan.

The Ancients employed the Doric in Temples dedicated to Minerva, to Mars, and to Hercules; whoſe grave and manly diſpoſitions ſuited well with the character of this Order. Serlio ſays it is proper for Churches dedicated to Jeſus Chriſt, St. Paul, St. Peter, or any other Saints remarkable for their fortitude, in expoſing their lives for the Chriſtian faith. Le Clerc recommends the uſe of it in all kinds of Military Structures; as Arſenals, Gates of fortified places, Guard-houſes, &c. and it may likewiſe be employed in the Houſes of Generals, or other Martial men, in Mauſoleums erected to their memory, or in Triumphal Bridges and Arches built to celebrate their victories.

The Height of the Doric Column here is ſixteen Modules; which, in buildings where Majeſty is required, is a good proportion: but in others it may be ſlenderer. Thus Vitruvius makes the Doric Column in Porticos higher by half a Diameter than in Temples; and moſt of the modern Architects have on ſome occaſions followed his example. In private houſes therefore it may be $16\frac{1}{3}$, $16\frac{1}{2}$, or $16\frac{2}{3}$ Modules high; and in interior decorations even ſeventeen Modules, and ſometimes a trifle more; which encreaſe in the Height may be made entirely on the Shaft, as in the Tuſcan Order, without changing either the Baſe or Capital. The Entablature may remain unaltered; for it will be ſufficiently high.

OF THE IONIC ORDER.

AMONG the Ancients, the form of the Ionic Profile appears to have been more poſitively determined, than that of any other order; for in all the Antiques at Rome (the Temple of Concord excepted) it is exactly the ſame, and agreeable to the decription Vitruvius hath given of it.

The modern Artiſts have likewiſe been unanimous in their opinion; all of them, excepting Palladio and his imitators, having employed the Dentil, Cornice, and the other parts of the Profile, nearly as they are found in the Coliſeum, the Temple of Fortune, and the Theatre of Marcellus.

Annexed to the Ionic Order there is a Deſign of the Antique Profile, collected from different Antiquities at Rome. The Height of the Column is eighteen Modules, and that of the Entablature four Modules and a half, or one quarter of the Height of the Column, as in the other Orders; which is a trifle leſs than in any of the regular Antique Ionics. The Baſe is Attic, as in all the Antiques, and the Shaft of the Column may be plain, or fluted with twenty-four Flutings, or twenty only, as at the Temple of Fortune; whoſe Plan may be a trifle more than a ſemi-circle, as at the Temple of Jupiter Tonans, and the Forum of Nerva, becauſe they then appear more diſtinct; and the Fillet, or Interval between them, muſt not be broader than one third of the breadth of a Fluting, nor narrower than one quarter thereof. The Ornaments of the Capital are to correſpond with the Flutings of the Shaft; and there muſt be an Ove above the middle of each Fluting. The Volutes are to be traced according to Goldman's method, which is the beſt.

The three parts of the Entablature bear the ſame proportion to each other, in this as in the Tuſcan Order. The Frize is plain, as being moſt ſuitable to the ſimplicity of the reſt; and the Cornice is almoſt an exact Copy from Vignola's Deſign, in which there is a grandeur of ſtile, that none of his competitors have arrived at.

In interior decorations, where much delicacy is required, the Height of the Entablature may be reduced even to one fifth of the Column, by obſerving the ſame method, and making the Module only four fifths of the ſemi-diameter.

As the Doric Order is particularly affected in buildings dedicated to male Saints, ſo the Ionic is uſed in ſuch as are erected to female Saints of the Matronal ſtate. It is likewiſe employed in Halls of Juſtice, in Libraries, Colleges, and other Structures, that have any relation to Arts or Letters, in private Houſes and in Palaces, to adorn the Women's Apartments, and, ſays Le Clerc, in all places conſecrated to peace and tranquility. The Ancients uſed it in Temples dedicated to Juno, to Bacchus, to Diana, and other Deities, whoſe diſpoſitions held a medium between the ſevere and effeminate.

OF THE COMPOSITE ORDER. Plate VI.

STRICTLY ſpeaking, the Ancients had but four Orders: the Compoſite was not conſidered by them as a diſtinct production. Vitruvius expreſsly tells us, Book IV. Chap. I. that on Corinthian Columns other Capitals of various kinds were employed; which nevertheleſs ought not to change the names of the columns, becauſe their proportions remained ſtill the ſame.

The Moderns, however, have ranked the Compoſite with the four orders mentioned by Vitruvius; having, among the great number of Capitals to be met with in the remains of antiquity, choſen for a model that which hath been uſed in the Triumphal Arches, in the Temple of Bacchus, and the Baths of Diocleſian; rather, as agreeing more with the deſcription of Vitruvius, (who obſerves that they were compoſed of the Ionic, Doric, and Corinthian) than from any preference in point of beauty to many others.

It doth not appear that the Ancients affected any particular form of Entablature to this Capital. Sometimes the Cornice is entirely plain, as in the Temple of Bacchus, at others, as in the Arch of Septimius Severus, it is enriched with Dentils, differing very little from the Ionic; and in the Arch of Titus there are both Dentils and Modillions; the whole form of the Profile being the ſame with the Corinthian, as executed in the Antiques at Rome.

The following is an extract from Sir William Chambers; therefore we ſhall uſe his own words:

" The Height of the Column is twenty Modules, and that of the Entablature five: the Baſe is Attic, and its meaſures the ſame as in the Doric and Ionic Orders; but as the Module is leſs, all its parts are of courſe more delicate. The Shaft is enriched with Flutings, which may be to the number of twenty, or twenty-four, as in the Ionic Order: for there is no reaſon why their number ſhould be augmented. The Module is leſs; the Flutings will therefore be leſs likewiſe, and correſpond exactly with the character of the reſt of the Compoſition.

" The Capital is of the ſame kind that all the Moderns have employed in this Order, and enriched with leaves of the Acanthus, as all the Antique Capitals of this ſort are. With regard to the method of tracing it, few directions will ſuffice: for the Deſigns are all exactly figured. The Curvatures of the Abacus are deſcribed from the ſummits of equilateral triangles; the projection of the Volutes is determined by a line drawn from the extremity of the Aſtragal to the extremity of a horn of the Abacus; and the projection of the Leaves is determined by another line drawn from the Fillet below the Aſtragal, parallel to the former.

" The manner of executing both theſe, and all other enriched Capitals, is, generally ſpeaking, bad. I do not, however, mean to accuſe our Engliſh workmen of wanting capacity: a great number of them are excellent, and, in neatneſs of execution, outdo, perhaps, thoſe of any other country whatever: but, from the parſimony of their employers, and, in ſome degree, for want of perfect ſkill and facility in deſigning, their performances are often flat, without intention or effect; in ſhort, to the laſt degree inſipid.

“ Many, even of our greateſt Architects, have too much neglected the detail; having employed their attention wholly on the general diſpoſition of their Compoſitions. This neglect, though authorized by great examples, ought by no means to be imitated: it is the buſineſs of the Architect to attend to the minuteſt object, as well as to the moſt conſiderable. If the entire execution of the fabric be left to his direction, the faults that are committed will be ſtated to his account: and therefore it will be prudent in him to chuſe good workmen, and to furniſh them with proper models, and preciſe inſtructions; in which he will ſhew the extent of his capacity, and diſtinguiſh himſelf from the common herd of thoſe who aſſume the title of Architects. The moſt maſterly diſpoſition, incorrectly executed, can only be conſidered as a ſketch in Painting, or as an excellent piece of Muſic performed by Country Fidlers.

“ The Foot of the Leaves of the Capital muſt not project beyond the upper part of the Shaft of the Column, as at St. Carlo in the Corſo at Rome, and at the Banqueting-Houſe in London; for nothing is uglier: neither is the lower row of them to bend forwards, as in many of the Antiques, and in ſome Modern Buildings, becauſe they then hide a great part of the upper Leaves, and give a diſagreeable form to the whole Capital. The different bunches that compoſe the Leaves muſt be ſtrongly marked, and maſſed in a diſtinct manner. The Sprigs, that ſpring from between the upper ones, are to be kept flat upon the Vaſe; and the Ornaments of the Volutes are not to project beyond the Fillets that encloſe them. Theſe are all the directions that can well be given in writing: but thoſe who would excel in works of this kind muſt conſult Nature, and thoſe Buildings, Ancient or Modern, in which they have been executed with care and judgment.

“ The parts of the Entablature bear the ſame proportion to each other, as in the Ionic and Tuſcan Orders. The Architrave is nearly the ſame with thoſe of Palladio, Vignola, and the Baſilica of Antoninus. The Frize is enriched with Foliages, in imitation of thoſe at Nero's Frontiſpiece; whoſe moſt prominent parts ought never to project beyond the uppermoſt Moulding of the Architrave.

“ The Cornice is imitated from Scammozzi, and differs from the Corinthian only in the Modillions, which are flat. The Soffit of the Intervals between the Dentils muſt be hollowed upwards, behind the little Fillet in Front, as they are in moſt of the Antiques; which occaſions a dark ſhade, that marks the Dentils more diſtinctly: and the ſame muſt be obſerved in the Ionic and Corinthian Orders. The Roſes in the Soffit of the Corona are not to project beyond its horizontal Surface; and care muſt be taken not to vary them ſo much as at St. Peter's of the Vatican, becauſe the Unity of the Compoſition ſuffers thereby. The Modillions or Dentils might with almoſt as much propriety be varied: it will be beſt therefore to make them all alike, as they are in moſt of the Antiques, and at Mr. Spencer's Houſe in the Green Park; that ſo they may not ſtrike the beholder as diſtinct objects, but as parts of one great whole. Or they may be of two kinds, which occaſions more variety, and no confuſion: for the ideas ſucceed each other ſo rapidly, that the third takes place before the firſt is in any degree obliterated; ſo that nearly the ſame effect is produced as by a continued ſucceſſion of the ſame object. But though this variety be allowable in ſmall objects, which the eye peruſes at a ſingle glance, and in ſuch as are merely acceſſory, and do not influence the general form of the Compoſition; yet it is by no means to be tolerated in Columns, and other large or eſſential parts, which, from the number of their conſtituent points, are not conveyed to the mind at once, either with eaſe or perfect clearneſs; and therefore, if varied, cannot fail of exciting confuſed ideas.

“ The Romans uſed the Compoſite Order more frequently in their Triumphal Arches than in any other Buildings; meaning, as Serlio ſuppoſes, to expreſs their dominion over thoſe nations that invented the Orders of which this is compoſed. It may, ſays Le Clerc, be uſed with propriety, wherever Elegance and Magnificence are to be aſſembled; but it is more particularly adapted for Buildings intended to commemorate any ſignal Event, or to celebrate the Virtues and Actions of Conquerors or Legiſlators: becauſe the Capitals, and other Ornaments, may be compoſed of Emblems and alluſive Repreſentations; which is agreeable to the cuſtom of the Ancients; as appears by multitudes of Fragments of Capitals, and other Members of Architecture, to be ſeen in different parts of Rome.

“ The Compoſite Entablature may be reduced to two ninths of the Column, (which, to avoid Fractions, I ſhall call four Modules and a half) by making the Module only nine tenths of the ſemidiameter, and obſerving the meaſures as in the Deſign; and there will be a Dentil in the outer Angle, as in the Ionic Order. It may likewiſe, if required, be reduced to one fifth, by making the Module four fifths of the ſemi-diameter: though, in caſes where it is neceſſary to diminiſh it ſo much, it will be beſt to employ the Ionic Cornice; which, being compoſed of fewer parts, will ſtill retain an air of grandeur, notwithſtanding the ſmallneſs of the whole maſs.

“ Moſt Authors give the laſt place to the Compoſite Order, as being the laſt invented, and a Compound, which of courſe ought to be preceded by all the Simples. I have followed wiih Scamozzi's method; his arrangement appearing to me the moſt natural: for his Orders ſucceed each other according to their degrees of ſtrength, and in the progreſſion that muſt abſolutely be obſerved whenever they are employed together.”

OF THE CORINTHIAN ORDER.

THE moſt perfect Model of the Corinthian Order, among the Antiques at Rome, is generally allowed, upon the whole, to be the three columns in the Campo Vaccino; the remains, as is thought, of the Temple of Jupiter Stator. Palladio in his fourth book, where he gives the Profile at large, acknowledges that he never had ſeen any work better executed, or more delicately finiſhed; that all its parts are beautifully formed, well proportioned, and artfully combined; which two laſt qualities are taken to be ſignified by his *Beniſſimo Inteſi.*

With theſe favourable ſentiments it is remarkable, that, in his deſign of the Corinthian Order, he hath ſo far deviated from this excellent original as ſcarcely to leave the ſmalleſt ſhadow of reſemblance to it.

The Column is twenty Modules high, and the Entablature five; which proportions are a medium between thoſe of the Pantheon and of the three Columns. The Baſe of the Column may either be Attic or Corinthian: they are both beautiful. Palladio and Scamozzi have employed the Attic Baſe, enriched with Aſtragals: but ſo frequent a repetition of the ſame form hath a bad effect, as may be ſeen at the Church of St. Martin's in the Fields, and at the Bank.

If the Entablature be enriched, the Shaft of the Column may be fluted: provided it be not compoſed of variegated Marble: for a diverſity of colours renders even ſmooth ſurfaces confuſed, and ornaments of Sculpture only ſerve to make the confuſion greater. The Flutings may be filled to one third of their height with Cablings, as in the inſide of the Pantheon; which will ſtrengthen the lower part of the Column, and make it leſs liable to injury. But if the Columns are not within reach, or ſubject to be hurt by Paſſengers, theſe are better omitted: for the general hue of the Column will then be more even. In ſome very rich Buildings, the Cablings are compoſed of Reeds, Ribands, Huſks, Flowers, &c. (at the Thuilleries in Paris there are ſome exquiſitely wrought by Jean Gougeon's own hand,) but it is better to reſerve ſuch niceties for interior decorations. In the exterior, whatever doth not contribute to the general effect of the whole building, is in a great meaſure uſeleſs, and an expence that might more judiciouſly be employed in places where it would be more attended to. In general, exceſſive ornaments, though they encreaſe the magnificence of a building, always deſtroy the grandeur of its effect. The parts that in themſelves are large, and ſo formed and diſpoſed as to receive broad maſſes and ſtrong impreſſions of light and ſhade, will of courſe excite great ideas: but if they are broken into a number of ſmall diviſions, and their ſurface ſo varied as to catch a thouſand impreſſions of light, demi-tint, and darkneſs, the whole will be confuſed, trifling, and incapable of cauſing any grand emotions.

The Capital is enriched with olive-leaves, as almoſt all the Antiques at Rome of this order are; the Acanthus being ſeldom employed but in the Compoſite. De Cordemoy, however, prefers the Acanthus; and obſerves that the flexible ſprigs, which accompany the leaves of that plant, may more naturally be ſuppoſed to form the Contour of the Volutes, than the ſtiff branches of a laurel or olive. It is ſtrange, ſays he, that people ſoon ceaſe to eſteem what is natural: nature and reaſon muſt always be violated, and we prefer a confuſed jumble of little pointed leaves of the olive or laurel, to the ſimple and graceful Contours of the Acanthus.

With regard to the manner of tracing and working the Capital, the deſigns, together with what hath been ſaid on the ſame head under the Compoſite order, will ſufficiently explain it.

The diviſions of the Entablature bear the ſame proportion to each other as in the Tuſcan, Ionic and Compoſite orders. The Frize is enriched with a Baſs Relief, compoſed from various fragments in the Villa Medici at Rome. The parts and ornaments of the Cornice are all regularly diſpoſed: the Coffers in the Soffit of the Corona are ſquare, and the borders round them alike on all ſides; as they are at the Arch of Titus, and as Palladio hath made them: a precaution which Vignola neglected.

The Corinthian Entablature may be reduced to two ninths, or one fifth of the Height of the Column, by the ſame rule as in the Ionic and Compoſite Orders. But when it is neceſſary to make it ſo ſmall as one fifth, it will be beſt to uſe the Ionic Entablature, as Palladio hath done in the Periſtyle of the Olympic Theatre at Vicenza, and in many others of his buildings; or to retrench the Dentils of the Cornice, as in Serlio's and Scamozzi's Profiles; the part of the Cornice under the Modillion-Band being compoſed only of the Ovolo and Oge ſeparated by a Fillet; as at the Temples of Trevi and of Sciſi in Umbria, mentioned by Palladio in his fourth Book.

The Corinthian order is proper for all buildings, where Delicacy, Gaiety, and Magnificence are required. The Ancients uſed it in Temples dedicated to Venus, Flora, Proſerpine, and Nymphs of the Fountains; becauſe the Flowers, Leaves, and Volutes, that adorned it, ſeemed well adapted to the Delicacy of theſe Deities. As it is the moſt Magnificent of all the Orders, it is extremely proper for Palaces, public Squares, and Churches dedicated to the Virgin Mary, or other Virgin Saints; and on account of its Gaiety it may likewiſe be uſed in Theatres, Banqueting-Rooms, and all Places conſecrated to Mirth and Pleaſure.

Several ſorts of leaves are applied to compoſe the capitals of the Corinthian and Compoſite columns, viz. the acanthus, parſley, olive, laurel, oak, &c. &c. Sketches of ſome of thoſe leaves appear in the plate of the Orders.

PILASTERS.

PILASTERS differ from columns only in their plan; which is a ſquare, as that of columns is round. Their baſes, capitals, and entablatures, have the ſame parts, with the ſame heights and projections, as thoſe of columns: and are alſo diſtinguiſhed by the ſame names.

The column is undoubtedly more perfect than the pilaſter. However they may be employed with great propriety on many occaſions. Some authors declaim againſt pilaſters, becauſe, according to them, they do not admit of diminution. But this is a miſtake; there are many inſtances, in the remains of antiquity, of their being diminiſhed. Scamozzi always gave his pilaſters the ſame diminution as his columns: Palladio and Inigo Jones have likewiſe diminiſhed them in many of their buildings.

Pilaſters are employed in churches, galleries, halls, and other interior decorations, to ſave room; for, as they ſeldom project beyond the ſolid wall above one quarter of their diameter, they do not occupy near ſo much ſpace as columns. They are likewiſe uſed in exterior decorations; ſometimes alone, inſtead of columns, on account of their being leſs expenſive; as in Bedford Square, &c. and ſometimes they accompany columns, being placed behind them to ſupport the architraves, where they enter the building.

The projection of pilaſters are various and muſt be ſuited to the ſtyle of the Architecture they are to accompany: they are frequently adorned with flutings, in the ſame manner as thoſe of columns; and ſometimes ſunk with a pannel to receive foliage, &c. at the Adelphi.

Attics very properly follow the pilaſters; being nothing more than ſquare piers and pedeſtals with their cornices. The place of Attics, therefore, is at the uppermoſt extremity of a building, to which they ſerve as a crown, or very properly make a finiſhing for the other orders, when they have been uſed in the ſtructure. The baſe, dye, and cornice, of which they are compoſed, may bear the ſame proportions to each other as thoſe of pedeſtals do; and the baſe and cornice may be compoſed of the ſame mouldings as thoſe pedeſtals.

PERSIANS, CARYATIDES, AND TERMINI.

BESIDES columns and pilaſters, it is ſometimes cuſtomary to employ repreſentations of the human figure, to ſupport entablatures in buildings. The male figures are called Perſians; and the female, Carians, or Caryatides.

The Perſians are ſo called from a victory gained over the Perſians by Pauſanias, who having brought home ſpoils and trophies to the Athenians, they fixed upon Perſian figures for thoſe which ſhould ſupport entablatures, and thus kept in mind that there were once Perſian ſlaves in Athens. To repreſent theſe conquered people in the loweſt ſtate poſſible, they loaded them with the heavieſt entablature, viz. that of the Doric order. In proceſs of time, however, other figures beſides thoſe of Perſians were introduced, and other entablatures put over them; but the name was ſtill retained.

The proper Caryatides are women dreſſed in long robes, after the Aſiatic manner; and the origin of the device was as follows. The Carians had been long at war with the Athenians; but being at length totally vanquiſhed, their wives were led away captives; and, to perpetuate the memory of this event, trophies were erected, in which figures of women dreſſed in the Caryatic manner, were uſed to ſupport entablatures like the Perſians; and though other female figures were afterwards uſed in the ſame manner, the name of Caryatides was always retained.

The ancients made frequent uſe of Perſians and Caryatides, and delighted in diverſifying them a variety of ways. The modern artiſts have followed their example; and there are a great many compoſitions of this kind to be met with in different parts of Europe.

Indecent attitudes, diſtorted features, and all monſtrous productions, ought to be avoided, of which there are various examples in Gothic buildings. On the contrary, the attitudes ſhould be ſimple and graceful, the countenance always pleaſing, though varied and ſtrongly marked agreeable to the nature of the object repreſented.

Termini are ſometimes employed, inſtead of Perſians or Caryatides, to ſupport the entablatures of monuments, chimney-pieces, and ſuch like compoſitions. Theſe figures owe their origin to the ſtones uſed by the ancients to mark the limits of particular poſſeſſions.

PEDESTALS.

MOST writers conſider the Pedeſtal as a neceſſary part of the order, without which it is not complete. It is indeed a matter of little importance whether it be conſidered in that light, or as a diſtinct compoſition: we ſhall therefore treat of a pedeſtal as a diſtinct body, having no more connection with the order than an attic, a baſement, or any other part with which it may on ſome occaſions be aſſociated.

A pedeſtal conſiſts of three principal parts; the baſe, the dye, and the cornice. The dye is always nearly of the ſame figure; being conſtantly either a cube or a parallelopipedon: but the baſe and cornice are varied and adorned with more or fewer mouldings, according to the ſimplicity or richneſs of the compoſition in which the pedeſtal is employed. Hence pedeſtals are, like columns, diſtinguiſhed by the names of *Tuſcan*, *Doric*, *Ionic*, *Corinthian*, and *Compoſite*.

With regard to the proportion that pedeſtals ought to bear to that of the columns they ſupport, it is by no means fixed. Both the ancients and moderns vary greatly on this head. Vignola's proportions are generally reckoned the beſt. He makes his pedeſtals in all the orders of the ſame height, viz. one third of the column; and as their breadth of courſe increaſes or diminiſhes in the ſame degree as the diameters of their reſpective columns do, the character of the order is always preſerved, which, according to any other method, is impoſſible.

As to the diviſions of the pedeſtals; if the whole height be divided into nine parts, one of them may be given to the height of the cornice, two to the baſe, and the ſix remaining to the dye. The breadth of the dye is always made equal to that of the plinth of the column. The projection of the cornice may be made equal to its height; and the baſe being divided into three parts, two of them will be for the height of the plinth, and one for the mouldings, whoſe projection muſt be leſs than that of the cornice.

INTERCOLUMNIATIONS.

COLUMNS are either engaged, or inſulated; and, when inſulated, are either very near the wall, or at a conſiderable diſtance from it. Engaged columns, or ſuch as are near the walls of a building, are not limited in their intercolumniations, as theſe depend on the breadths of the arches, windows, niches, or other decorations placed between the columns. But columns that are entirely detached, and perform alone the office of ſupporting the entablature, as in periſtyles, porches and galleries, muſt be near each other, for the ſake both of real and apparent ſolidity.

The intercolumniations among the ancients were various. Thoſe uſed in the Ionic and Corinthian orders were the pycnoſtyle, of which the interval was equal to one diameter and a half of the column; the ſyſtyle, whoſe interval was equal to two diameters; the euſtyle, to two and a quarter; the diaſtyle to three, and the aræoſtyle to four. In the Doric order, they uſed other intercolumniations, regulating them by the triglyphs, one of which was always placed directly over the middle of each column; ſo that they were either ſyſtyle, monotriglyph, of one diameter and a half; diaſtyle, of two diameters; and the Tuſcan intervals were very wide, ſome of them being above ſeven diameters, which was very practicable, as the architraves were of wood.

Sometimes, on account of the windows, doors, niches, and other decorations, which correſpond with the intercolumniations of the periſtyle, or gallery, it is not impoſſible to make the intervals ſo narrow as euſtyle, or even as diaſtyle: wherefore the moderns, authoriſed by ſome few examples of the ancients, where grouped columns are employed, have invented a manner of diſpoſing them, called by Perrault aræoſtyle, which admits of a larger interval, without any detriment to the apparent ſolidity of the building. This kind of diſpoſition is compoſed of two ſyſtyle intercolumniations; the column that ſeparates them being approached towards one of thoſe at the extremities, ſufficient room only being left between them for the projection of the capitals; ſo that the great ſpace is three diameters and a half wide, and the little one half a diameter.

In periſtyles, galleries, or porticos, all the intercolumniations muſt be equal; but in a loggia, or porch, the middle interval may be broader than the others, by a triglyph or modillion, or three or four dentils; unleſs the columns at the angles be coupled, or grouped with pilaſters; in which caſe, all the intervals ſhould be of the ſame dimenſions.

When buildings are very ſmall, as is frequently the caſe in temples and other inventions uſed for ornamenting gardens, the intercolumniations may be broader, in proportion to the diameter of the columns, than uſual; becauſe, when they are nearer each other than three feet, there is hardly room for a bulky perſon to paſs between them.

ARCHES.

ARCHES are not ſo magnificent as colonnades; but they are more ſolid and leſs expenſive. They are proper for triumphal entrances, gates of cities, of palaces, of gardens, and of parks, and in general for all openings that require an extraordinary breadth.

There are various manners of adorning arches. Sometimes their piers are ruſticated; ſometimes they are adorned with pilaſters, termini, or caryatides; and ſometimes they are made ſufficiently broad to admit niches or windows. The circular part of the arch is either ſurrounded with ruſtic key-ſtones, or with an archivolt enriched with mouldings; which in the middle, is ſometimes interrupted by a conſole, a maſk, ſerving at the ſame time as a key to the arch, and as a ſupport to the architrave of the order. The archivolt is ſometimes ſupported by an impoſt, at the head of the pier; and at others by columns placed on each ſide of it, with a regular entablature, or architrave and cornice. There are likewiſe inſtances of arcades without piers, the arches being turned on ſingle columns, as in the temple of Faunus at Rome, &c. This practice, however, ought to be ſeldom imitated, as it is neither ſolid nor handſome.

When arches are large, the key-ſtone ſhould never be omitted, but cut in the form of a conſole, and carried cloſe under the ſoffit of the architrave, which on account of its extraordinary length, requires a ſupport in the middle. The impoſts of arches ſhould never be omitted; at leaſt, if they be, a platform ought to ſupply their place. If columns are employed without pedeſtals in arcades, they ſhould always be raiſed on a plinth. In all arches, the circular part ought not to ſpring immediately from the impoſt, but take its riſe at ſuch a diſtance above it as is neceſſary in order to have the whole curve ſeen at the proper point of view.

The void or aperture of arches ſhould never be higher nor much lower, than double their breadth; the breadth of the pier ſhould ſeldom exceed two thirds, nor be leſs than one third, of the breadth of the arch; and the angular pier ought to be broader than the others, by one half, one third, or one fourth; the impoſt ſhould not be more than one ſeventh, nor leſs than one ninth of the aperture; and the archivolt muſt not be more than one eighth, leſs than one tenth of it. The breadth of the conſole muſt, at the bottom, be equal to that of the archivolt; and its ſides muſt be drawn from the centre of the arch; the length of it muſt not be leſs than one and a half of its ſmalleſt breadth, nor more than double. The thickneſs of the pier depends on the breadth of the portico; for it muſt be ſtrong enough to reſiſt the preſſure of its vault. But with regard to the beauty of the building, it ſhould not be leſs than one quarter of the breadth of the arch, nor more than one third.

The firſt Five Plates of this Syſtem give a general Idea of the Effect of Arches, agreeably to the beſt proportions. Several others, beſide the ſemicircular, are frequently employed; a ſegment of almoſt every portion under a ſemicircle, and alſo Eliptical Arches having three centers of variety of proportions, may be ſeen in many inſtances in the preſent new buildings, in and about this Metropolis.

ORDERS ABOVE ORDERS.

When, in a building, two or more Orders are employed, one above another, the laws of ſolidity require the ſtrongeſt ſhould be placed lowermoſt. Hence the Tuſcan muſt ſupport the Doric, the Doric the Ionic, the Ionic the Compoſite or Corinthian, and the Compoſite the Corinthian.

This rule, however, is not always ſtrictly adhered to. Moſt authors place the Compoſite above the Corinthian. There are likewiſe examples where the ſame order is repeated, as in the theatre of Statilus Taurus, and the Coliſeum; and others, where an intermediate order is omitted, and the Ionic placed on the Tuſcan, or the Corinthian on the Doric. But none of theſe practices ought to be imitated.

In placing columns above one another, the axis of all the columns ought to correſpond, or be in the ſame perpendicular line, at leaſt in front.

With regard to the proportions of columns placed above each other, Scamozzi's rule, That the lower diameter of the ſuperior column ſhould conſtantly be equal to the upper diameter of the inferior one, is univerſally eſteemed the beſt, and gives all the columns the appearance of one long tapering tree, cut into ſeveral pieces.

In Britain there are few examples of more than two ſtories of columns in the ſame aſpect; and though in Italy, and other parts of Europe, we frequently meet with three, and ſometimes more, yet it is a practice by no means to be imitated; for there is no poſſibility of avoiding many ſtriking inconſiſtencies, or of preſerving the character of each Order in its intercolumnial decorations.

BASEMENTS.

Instead of employing ſeveral Orders, one above the other, in a compoſition, the ground floor is ſometimes made in the form of a baſement, on which the order that decorates the principal ſtory is placed. The proportion of theſe baſements is not fixed, but depends on the nature of the rooms on the ground-floor. In the palace of the Porti in Vicenza, the height of the baſement is equal to that of the order. In ſome buildings, its height exceeds two thirds of that of the order; and, in others, only half the height of the order. It is not, however, adviſeable to make the baſement higher than the order it ſupports: neither ſhould it be lower than one half of the order.

PEDIMENTS.

Pediments, among the Romans, were uſed only as coverings to their ſacred buildings, till Cæſar obtained leave to cover his houſe with a pointed roof, after the manner of temples. In the remains of antiquity we meet with two kinds of pediments, the triangular and the circular. The former of theſe are promiſcuouſly applied to cover ſmall or large bodies: but the latter, being of a heavier figure, are never uſed but as coverings to doors, niches, windows, or gates.

As a pediment repreſents the roof, it ſhould never be employed but as a finiſhing to the whole compoſition.

The ancients, introduced but few pediments into their buildings, uſually contenting themſelves with a ſingle one to adorn the middle or principal part. But ſome of the moderns, and particularly the Italians, have been ſo immoderately fond of them, that they have introduced them profuſely.

The girder being a neceſſary part in the conſtruction of a roof, it is an impropriety to intermit the horizontal entablature of a pediment, by which it is repreſented, to make room for a niche, an arch, or a window.

In regular architecture, no other form of pediments can be admitted, beſides the triangular and circular. Both of them are beautiful, and when a conſiderable number of pediments are introduced, as when a range of windows are adorned with them, theſe two figures may be uſed alternately, as in the niches of the Pantheon, and in thoſe of the temple of Diana at Niſmes.

The proportion of pediments depends upon their ſize; for the ſame proportions will not do in all caſes.

When the baſe of the pediment is ſhort, its height muſt be increaſed; and when the pediment is long, the height muſt be diminiſhed. The beſt proportion for the height is from one ſixth to one fourth of the baſe, according to the extent of the pediment, and the character of the body it covers. The materials of the roof muſt alſo be attended to.

The tympan is always on a line with the front of the frize; and when large, admits of various ornaments.

BALLUSTRADES.

Ballustrades are ſometimes of real uſe in buildings; and at other times they are only ornamental. Such as are intended for uſe, as when they are employed in ſtair-caſes, before windows, or to incloſe terraſſes, &c. muſt always be nearly of the ſame height; never exceeding three feet and a half, nor much leſs than three. But thoſe that are principally deſigned for ornament, as when they finiſh a building, ſhould be proportioned to the architecture they accompany.

GATES, DOORS, AND PIERS.

There are two kinds of entrances, viz. Doors and Gates. The former ſerve only for the paſſage of perſons on foot; but the latter likewiſe admit horſemen and carriages. Doors are uſed as entrances to churches and other public buildings, to common dwelling-houſes and apartments: and gates ſerve for inlets to cities, fortreſſes, parks, gardens, palaces, &c. The apertures of gates being always wide, they are generally made in the form of an arch, that figure being the ſtrongeſt.

The general proportion for the apertures, both of the gates and doors, whether arched or ſquare, is, that the height be about double the breadth.

The moſt common, and indeed almoſt the only ornaments for gates are the piers by which they are ſupported, and which were originally no more than bare poſts into which the hinges of the gate were driven. Though this, however, is the only proper uſe of piers, it muſt be concealed as much as poſſible, and they muſt ſeem as if placed there only for ornament. As they are to be fixed to the wall before the houſe, ſo they muſt alſo be proportioned to it; and as they are to be ſeen in the ſame view with the front of the houſe, their correſpondence with it is equally neceſſary. They are to be placed on a plinth, and ſomething muſt be allowed by way of ornament and finiſhing at the top. All the luxuriance of fancy may be employed in the decoration of piers: but it will be proper to obſerve this general rule, that the pier being an inferior building, it muſt never be richer than the front of the houſe. If, for inſtance, the front of the houſe is ornamented with columns of the Doric order, the Ionic muſt not be uſed in the piers; and it will be found better to omit columns altogether, than to make uſe of the Tuſcan order for piers in any caſe. If the Ionic or Corinthian orders are employed in the front of the houſe, the Doric or Ionic may be uſed with propriety in the piers. One piece of ornament is almoſt univerſal in piers, namely, a niche with its ſeat, made as if for the conveniency of weary travellers. On this account, it will be proper to raiſe the columns on pedeſtals, becauſe the continued moulding from their cap will be a good ornament under the niche. The baſe of the columns ought always to be the Attic.

Inſide-doors, however ſmall the building may be, ſhould never be narrower than two feet nine inches; nor ſhould they ever, in private houſes, exceed three feet ſix inches in breadth, which is more than ſufficient to admit the bulkieſt perſon. Their height ſhould at leaſt be ſix feet three or four inches; otherwiſe a tall perſon cannot paſs without ſtooping. In churches, palaces, &c. where there is a conſtant ingreſs and egreſs of people, the apertures muſt be larger. The ſmalleſt breadth that can be given to a gate is 8½ or 9 feet, which is but juſt ſufficient for the paſſage of a coach.

WINDOWS.

THE firſt conſideration with regard to windows, is their ſize which varies according to the climate, the deſtination of the building, &c. In Britain, the windows of the ſmalleſt private houſes are commonly from 3 to 3½ feet broad; and being generally twice their breadth in height, or ſomewhat more, in the principal apartments, they generally riſe to within a foot or two of the cielings of the rooms, which are frequently no higher than 10 feet, and at moſt 12 or 13. But, in more conſiderable houſes, the apartments are from 15 to 20 feet high, and ſometimes more; and in theſe the windows are from 4 to 5, and 5½ feet broad, and high in proportion.

Theſe dimenſions are ſufficient for dwelling-houſes of any ſize in this country; when they are larger, they admit too much of the cold air in winter. But churches, and other buildings of that kind, may have larger windows, proportioned to the ſize of the ſtructures.

The proportions of the apertures of windows, depend upon their ſituation. Their breadth in all the ſtories muſt be the ſame; but the different heights of the apartments make it neceſſary to vary the height of the windows likewiſe. In the principal floor, it may be from $2\frac{1}{8}$ of the breadth to $2\frac{1}{3}$, according as the rooms have more or leſs elevation. In the ground ſtory, where the apartments are lower, the apertures of the windows ſeldom exceed a double ſquare; and, when they are in a ruſtic baſement, they are frequently made much lower. The height of the windows of the ſecond floor may be from 1½ of their breadth to $\frac{4}{5}$; and Attics and Mezzanines may be either a perfect ſquare, or ſomewhat lower.

The windows of the principal floor are generally moſt enriched. The ſimpleſt method of adorning them is, with an architrave ſurrounding the aperture, and ſometimes crowned with a frize and cornice level, or with a pediment.

DESIGN AND EXECUTION.

Design is divided into three heads, viz. the Plan or Ichnography; the Elevation, or Orthography; and the Section or Internal Scenography. To theſe belong extenſive, artful, and fertile *Invention:* true Taſte for beautiful forms and harmonious proportion: alſo ſound geometrical and philoſophical Judgment.

INVENTION.

Invention is indiſputably neceſſary to the purpoſe of deſign, whether for public or private uſe; the arrangement of rooms or apartments for oratory, ſtate, public buſineſs, routs, viſitors, retiring, eating, reading, ſtudy, dreſſing, living, ſleeping, and other purpoſes, together with their appendages and inferior offices of all denominations required to be annexed thereto, whether of a public or private nature, connection; convenience and good arrangement, are the great eſſentials.

TASTE.

Taſte for conſtructing and introducing of forms that pleaſe and facinate the beholder, with regard to the Plan, Elevation, Section, Convenience and beautiful Proportions.

As to the Plan: the arrangement, proportion, and decoration of rooms for the purpoſes they are intended ſeparately; and connected, reſpectively.

As to the Elevation, Character ſuitable to the purpoſe the building is intended for; Correctneſs in the ſtyle of Architecture made choice of; Harmony in the whole maſs of building; and beautiful proportional forms of the conſtituent parts of which it is compoſed; if to advance, or recede, to be well connected; in which much optical knowledge muſt be obſerved.

JUDGMENT.

Judgment, geometrical and philoſophical; the geometrical conſiſts in conſtructing the building upon true principles, that the architect may form his deſign, ſo as it may be put into execution with firmneſs and durable materials, and that the artiſt conſtructs with ſuch that are attainable. The Philoſophical conſiſts in the knowledge of the quality of materials of all kinds, and to judge what are moſt proper for the intended purpoſe, and of foundations natural and artificial; alſo earths, waters, metals, timber, &c.

The Executive part of Architecture may be divided under two heads; the Foundation and Structure.

A foundation is the bottom on which the ſtructure is to be raiſed, and may be natural or artificial.

A natural foundation is ſuch as require no artificial aſſiſtance, as ſtone, gravel, hard clay, ſand or earth, that hath been undiſturbed, called maiden; and ſuch as is ſufficient to receive and bear the intended ſtructure; to attain the knowledge of which, it is not only neceſſary to ſee the ſurface, if the building be maſſy; but to be acquainted with the ſtrata to a conſiderable depth; for which purpoſe the digging of a well is recommended, and the boreing with a worm borer in ſeveral parts of the foundation, to be ſatisfied the whole is of the ſame or a ſimilar texture; this is an eſſential point, and in which the philoſophical and experimental judgment of the architect muſt be carefully exerciſed.

An Artificial foundation is ſuch as when the earth cannot be ſunk ſufficiently low to come at a permanent natural one, without an increaſed or enormous expence; it then becomes neceſſary to invent an artificial one: if the bottom ſhould be looſe earth, rubbiſh, bog, or quagmire, the driving of Piles becomes requiſite; they ſhould be ſhod with iron, and drove to a depth till they reſiſt the engine or inſtrument with which they are driven, or are ſufficiently firm, and in quantity and proportion as the bottom may require, and the ſtructure weighty. The tops muſt be cut off perfectly level and morticed, and a grating of timber framed thereon; the cavities filled with brick or ſome hard material, and the whole planked (green timber is preferable). If the foundation ſhould be leſs uncertain, and the building not too weighty, tranſverſe pieces of timber, called ſleepers, laid at convenient diſtances, extending longer than the firſt courſes of brick or ſtone are wide; and planks laid thereon, may anſwer the purpoſe; and at all events buildings of magnitude, or great weight, ſhould be ſecured by turning reverſe arches under all the openings; and if the voids are large, the material ſhould be ſtone, if not, brick will do, as thoſe arches, if a ſegment of a circle require a longer radius; therefore ſtone is better bond, and which, if not ſo ſecured, fiſſures and ſettlements in the upper arches, and other parts of the building, are frequently the conſequence. See Plate VIII.

STRUCTURE.

THE Structure is any kind of building, erected upon the foundation, and is generally compoſed of timber, brick, or ſtone, or thoſe materials united. The various branches that compoſe the ſame, I ſhall divide under their different heads, all which it is the province of the Architect to underſtand perfectly, as to the quality and quantity of materials, the preferable way of diſpoſing and uniting them, and the value of the various articles and labour requiſite thereto.

The carpenters or timber work comprehends all the framing of the ſtructure, ſuch as the preparing to make a ſecure artificial foundation; the bond timbers, which ſhould always be halved and dovetailed at all the angles of the building, and the croſs walls thereof and the joinings ſcarfed; the lintels laying over all the voids, or doors, windows, &c. Wood, bricks, worked in the walls, where it is found neceſſary to fix wood dreſſings in the finiſhing, as grounds, architraves, &c. The naked floors, which are of three different ſorts, as expreſſed in Plate VIII.

Obſerve, to lay the ends of all girders, or principal timbers, on piers or poſts of partitions, and avoid placing them over openings, or any timbers, near chimney flues; and when flues do interfere, to frame trimming joiſts, as to the front of a chimney, or to the well hole of a ſtair-caſe.

The carcaſe-framing in timber buildings, partitions, ceilings, floors, raiſing plates, roofs, &c. &c. ſome ſpecimens of each, with their deſcriptive technical terms, are in the ſame plate, together with the proper pitches for the ſeveral coverings of buildings now in uſe.

The various finiſhings of wood-work within and about the ſtructure, is called the joiner's work, all which is uſually done in this country, with deal imported from Norway, Sweden, and Ruſſia; the quality and ſeaſoning of which are the principal eſſentials, and are employed in floors, doors, columns, architraves, chimney-pieces, moldings, dados, wainſcotings, linings, partitions, porticos, &c. as the ſkill of the Architect ſhall direct. Sometimes the floors, doors, ſaſhes, &c. are executed in wainſcot; and ſometimes the doors and ſaſhes are of mahogany; and when ſo, thoſe materials ſhould each be of the very beſt quality. The floors, doors, and other finiſhings, are of various qualities, both as to materials and labour, and are performed in a variety of ways, the expence governing the mode, and ſhould be appropriated with that judgment in the various buildings and apartments as they ſeverally deſerve, particularly obſerving, that white deal never be uſed without doors; it is a cheaper article, and is moſt proper for bedchamber floors and pannelling, being leſs liable to ſhrink than yellow; the yellow is conſiderably harder, and ſaturated with turpentine, therefore more fit to endure uſe and weather.

The brickwork is the next within our conſideration; moſt writers on that ſubject have preſcribed certain rules for depths under ground, and alſo thickneſſes; which rules no longer exiſt, as it is uſual to ſink till you meet with a firm foundation, and even in ſome inſtances, office buildings and ſmall houſes are erected on the ſurface of the ground; and when they are ſunk for offices under ground, if the bottom is firm, ſix or eight courſes of brick work is ſunk below the floor thereof: a ſection of each wall, agreeably to the Act of Parliament, is given in Plate VIII. which will ſerve to ſhow the preſent practice without further explanation, obſerving to make voids over voids, and ſolids over ſolids, to make all chimney flues with eaſy ſweeps, and free from ſudden checks; and that the brickwork be worked proper bond, perfectly level, and a cloſe joint with mortar made of quick lime, and drift ſand well incorporated; and to work reverſe arches, under openings, as doors and windows, &c. with arches over the ſame, notwithſtanding the lintells, as beforementioned, as that practice was much uſed by the ancients, which may be ſeen in many of their ruins where the timber is totally decayed. Alſo particular attention muſt be had to ſufficient drains and ſewers, to convey away the waſte water, ſoil, &c. and that ſtink traps be placed therein to prevent nauſeous ſmells. When maſonry is to be uſed with brickwork, the beſt way, if poſſible, is to leave the brickwork in ſuch a manner that the ſtone may be inſerted afterwards; but when that cannot be done, bond-ſtones muſt be introduced in the wall with the brickwork, and the whole worked with leiſure, the joints very cloſe, and the mortar tough; as the number of joints in proportion to the ſtone will ſettle ſomething, which deſtroy the union of the ſtone and brick; particularly in aſhler fronts, the bond and fabrick having been frequently ruined by not paying a proper atttention to the management thereof. The quality of ſtone ſhould particularly engage the attention of the architect, as it frequently happens that it is impregnated with ſalts, or are from too near the earthly bed of the quarry, or a ſoft ſtrata; in either caſe, very little time will make it ſcale and mutilate, which is a mortifying circumſtance after ſuch extra expence and labour. The ſtone work of Somerſet place is an example of excellent maſonry, particularly facing the Strand. Of coverings to houſes, ſlate is by much the moſt preferable, which is executed a variety of ways, and the qualities of ſlate are ſeveral. The Weſtmoreland is conſidered the ſtrongeſt and beſt. A patent for ſlating in a ſingular manner has lately expired, and is much practiced by Mr. Wyatt, and for ſome reaſons may be preferred, as it will admit the pitch of the roof to be conſiderably leſs than any other material, except lead or copper, and is a very reaſonable covering conſidering it does not require the roof to be boarded; but when it is uſed, care muſt be taken to admit ſufficient circulation of air into the roof, or it will be liable to decay.

In London it becomes neceſſary to have lead or copper gutters, with a parapet wall or ſtone blocking, and the water conveyed down by pipes; but in the country, dripping eves, in elevated ſituations, are to be preferred, as the autumnal ſeaſon ſo frequently ſtop the gutters and pipes, together with ſnow, &c. that capital houſes frequently ſuffer very much by the overflowing, unleſs they are ſingularly conſtructed, that the water may eſcape before it is poſſible to find its way within the building, as deſcribed in Plate VIII.

The external walls, with inſide, ſhould be battened for the plaiſtering, unleſs the walls are very thick, or the bricks hard and not abſorbent; care ſhould be taken that the ſand uſed for the purpoſe is not ſalt, drift ſand is the beſt and ſhould be uſed ſoon after it is made, or the lime will otherwiſe deſtroy the hair; floated plaiſtering is always to be preferred, although attended with rather more expence. Plaiſter ceilings made ornamental, and ſome rooms ſtuccoed and pannelled, the cornices enriched, and other ornaments introduced as medallions, tablets, &c. when done with judgment, and in a good ſtyle, and exquiſite workmanſhip, are very proper finiſhings for bettermoſt rooms. External plaiſtering very ſeldom ſtand the weather, as it is rare any compoſition hitherto invented anſwer the purpoſe; one great reaſon is, that when attempted, ſufficient care is not taken to prevent the wet getting into the brickwork at the back of the plaiſter coat; it is evident, that plaiſtering of good ſtone lime and clean drift ſand, in proper proportions and carefully worked, will ſtand, if the walls are battened and lathed, which certainly will endure as long as the timber and lath, on which it is worked, which many inſtances in very old towns and cities in England teſtify. Many attempts have been made to introduce materials to anſwer the purpoſe of lead or copper for gutters, but none have yet had the deſired effect; caſt lead is moſt preferable, and that not too thin; nor ſhould the joints be ever ſoldered, as in either caſe the effect of weather will crack that material, and cauſe drips, which is afterward an everlaſting expence.

The glazing may be done a variety of ways; cottages and inferior tenements with common glaſs in lead; the better ſort with Newcaſtle crown in ſaſhes; and the beſt wainſcot, mahogany, or metal ſaſhes, glazed with London crown or plate glaſs; in elegant rooms the latter is to be preferred, as objects ſeen from within are rendered more perfect in their appearance, and that glaſs does not eaſily admit objects to be ſeen in the rooms from without.

The article of painting is very eſſential to the preſervation of timber and iron-work, and equally ſo with reſpect to ornament; ſtucco'd walls are rendered very light and elegant by painting; and the ſcene will admit of change whenever the rooms require freſh painting; colours diſpoſed of with harmonizing taſte in a houſe, are a very great ornament; even plainneſs, in other reſpects, is much ſet off and enlivened by painting; but without ſide all timber and iron-work require it for its preſervation; ſo much ſo, that it ſhould be made a conſideration in all building and repairing leaſes granted for long terms, that the tenant do paint every ſeven years, twice at leaſt, in oil, as the caſe may require, particularly in ſouth and ſouth-weſt aſpects; external dreſſings, as architraves, frontiſpieces, and cornices of wood, have a very good effect if ſanded upon the laſt coat of paint, which not only gives the appearance of ſtone, but adds to its durability.

It very frequently happens, that the Architect is conſulted in the furniture of houſes; and, if a man of taſte, he is certainly moſt proper to give deſigns to furniſh the principal ſuite of apartments, as he will take care to harmonize all the parts, making together one general uniſon in the ſtyle with the whole; the contrary is ſometimes ſeen, as in a houſe in Portman Square, where you are conveyed through a ſuite of rooms, in the Grecian, French, Etruſcan, and Indian taſte; which mixture of ſcenes have an odd effect on the viſitor, not unlike enchantment, at leaſt I judge from experience.

Bridge Building is an art of great latitude, particularly where they extend over large and rapid rivers; and are in general built with timber, ſtone, or brick; of timber bridges none is found by experience ſo capable of being kept in repair as the moſt ſimple conſtruction; viz. that of a ſcaffold, ſuch as Putney Bridge, becauſe any timber contained therein can be eaſily removed, when decayed, and others ſupplied; for inſtance, if framed on a geometrical conſtruction, as Kew Bridge, Walton Bridge, and the like; the neceſſary mortices and tenons, being expoſed to the weather, ſoon decay, and cannot eaſily be replaced; it ſometimes happens that it is neceſſary the bridge ſhould be conſtructed of timber, as draw-bridges, and the like; one of which, of a forty feet opening, has been lately built from a deſign of my own at Newhaven, in Suſſex. There is a bridge of a very extraordinary nature at Schaffhauſen, in Switzerland, forming two arches of an almoſt incredible ſpan. Stone Bridges, of conſequence, have lately made great advances in England; no leſs than eight having been built acroſs the river Thames within a very few years; and many other very capital ones over other rapid rivers; and, from the experience in that art, the Engliſh are arrived at great perfection; not only of wood and ſtone bridges, we boaſt of one lately built of caſt-iron; at Colebrooke Dale, in Shropſhire; but, for the more extraordinary conſtruction of ſtone bridges, France, by the advantage of immenſe ſtone, have gone greater lengths in geometrical ſchemes than we are able to do with our materials; the Pont Nuelly contains five arches of 120 French feet each, and is perfectly level from end to end; and ſome other bridges, of ſingle arches, of an enormous ſpan; the abutments being properly ſecured, the ſingularity of the arch, and the long radius of the ſtone, are the principles of the conſtruction.

Within the laſt thirty years Architecture has been making gradual advances to excellence; and, with a degree of triumph, is poſſeſſing herſelf of Great Britain for her throne, and there to erect her ſtandard; and, if induſtry and perſeverance have a claim, the capital is certainly deſerving of ſo noble and honourable a gueſt.

The Seminaries therein, for the improvement of deſign, are truly worthy of applauſe, and to which moſt of our living artiſts owe much of their ſkill; particularly the Society of Arts, Manufactures, and Commerce, whoſe firſt exhibition was in 1760; the Incorporated Society of Artiſts of Great Britain, by Royal Charter, inſtituted 26 January, 1765; the Royal Academy, at Somerſet Place, under the immediate patronage of the King, where honorary premiums for deſign in Architecture are given; candidates ſent to Rome to compleat their ſtudies, free of expence; a courſe of lectures, elucidated by drawings of that ingenious artiſt, Thomas Sandby, Eſq; the profeſſor; and an annual public exhibition of the works of various artiſts; (by which means, it is preſumed, the expences are ſupported, as there is no known fund for the purpoſe;) together with the valuable publications of Palladio, Inigo Jones; the Ruins of Palmyra and Balbec, by Wood; the Ruins of Athens, by Stewart; Spalatro, the Diocleſian Palace, by Robert Adams; the Ionian Antiquities, collected by Parrs, for the Deletanti Society; the Ruins of Pœſtum; and many foreign publications imported; all which, artiſts of the preſent day ſeize with avidity for their improvement; which certainly is a means of eſtabliſhing in them true principles, and correct taſte; together with the ſuperior advantages of the experimental knowledge of the art by public buildings, new ſquares, ſtreets, bridges, &c. carrying on in and about the metropolis, with ſo much judgment and alacrity; all which cannot fail to render England the firſt ſchool of Architectural Study in the known world.

We have only to lament, that the materials of this country are inferior to thoſe where the art has been formerly carried to ſo great a degree of excellence; or, I doubt not, but the artiſts and workmen of this capital, are equal in taſte and abilities to the ancients. The tide and folly of reſtleſs faſhion are ſometimes rather too apt to warp them from their better judgment; which may be eaſily accounted for, as their employers whims frequently require to be gratified; but, when abſurd, ſhould be got the better of, if poſſible, as all improprieties are placed to the account of the artiſt, whoſe reputation muſt ſuffer in the judgment of the public.

The Six firſt Plates to elucidate the foregoing Syſtem, are ſelected from various works. The two latter I have deſigned, and ſhall engrave; they are meant to illuſtrate the Principles of Executive Deſigns, Hiſtorical Circumſtances, and Periods of the different Stages of Architecture in this Country, which, I truſt, will exhibit great Novelty, and will be found both uſeful and entertaining.

CHURCH-STREET, PADDINGTON. *JOHN PLAW.*

Military Architecture, or Fortification. See the latter Syſtem.

Naval Architecture. See the Art of Ship Building.

ARCHITHALASSUS, a ſynonyme of that curious ſhell called the Admiral-ſhell.

ARCHITRAVE, in architecture, that part of a column which lies immediately upon the capital, being the loweſt member of the entablature. Over a chimney, this member is called the mantle-piece; and over doors or windows, the hyperthyron.

ARCHITRICLINUS, in antiquity, the maſter or director of a feaſt, charged with the order and œconomy of it, the covering and uncovering of the tables, the command of the ſervants, and the like.

ARCHIVAULT, in architecture, implies the inner center of an arch, adorned with mouldings running over the faces of the arch-ſtones, and bearing upon the impoſts. It has only a ſingle face in the Tuſcan order, two faces crowned in the Doric and Ionic, and the ſame mouldings as the architrave in the Corinthian and Compoſite.

ARCHIVE, or Archives, a chamber or apartment wherein the records, charters, and other papers and evidences, of a ſtate, houſe, or community, are preſerved, to be conſulted occaſionally. Thus we ſay, the archives of a college, of a monaſtery, &c. The archives of antient Rome were in the temple of Saturn; the archives of the court of Chancery in England are in the Roll's-office.

ARCHMARSHAL, in the Germanic polity, denotes the grand marſhal of the empire, a dignity belonging to the elector of Saxony.

ARCHON, a term applied by ſome authors to divers officers, both civil and religious, under the Eaſtern or Greek empire. Thus biſhops are ſometimes called *archontes*; and the ſame may be ſaid of the lords of the emperor's court. We alſo read of the *archon of the antimenſia, archon of archons, grand archon, archon of churches, archon of the goſpel, archon of the walls, &c.*

ARCHPRIEST, Archpresbyter, in church government, ſignifies a prieſt or preſbyter eſtabliſhed in ſome dioceſe, with a pre-eminence over the reſt.

There are archpreſbyters ſtill ſubſiſting in the Greek church, who are veſted with moſt of the functions and privileges of chorepiſcopi or rural deans.

ARCHTREASURER, is a name given to the great treaſurer of the German empire.

This office was created with the eighth electorate, in favour of the elector Palatine, who had loſt his former electorate, which was given to the duke of Bavaria, by the emperor Ferdinand II. who took it away from Frederic V. elector Palatine, after the battle of Prague, where he was defeated in maintaining his election to the crown of Bohemia.

The dignity of archtreaſurer was conteſted between the elector of Brunſwick, who claimed it in virtue of his deſcent from the elector of Frederic and the elector Palatine.

ARCHILUTE, Arcileuto, in muſic, is a large lute, having its baſs ſtrings lengthened after the manner of the theorbo, and each row doubled, either with a little octave or an uniſon. It is uſed by the Italians for playing a thorough baſs.

ARCTIC, in aſtronomy, is an epithet given to the north pole.

It is called the *arctic pole*, on account of the conſtellation of the little bear, in Greek called αρκτος; the laſt ſtar in the tail of which nearly points out the north pole.

Arctic *Circle* is a leſſer circle of the ſphere, parallel to the equator, and 23° 30′ diſtant from the north pole; from whence its name. This, and its oppoſite, the antarctic, are called the two polar circles; and may be conceived to be deſcribed by the motion of the poles of the ecliptic, round the poles of the equator.

ARCTIUM, Burdock, in botany, is a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ Capitatæ.

The calyx is globular; with ſcales having hooks reflected at the tops.

There are three ſpecies, viz. the lappa or common burdock, the tomentoſum, and the perſonata.

The tender ſtems of the common kind, deprived of the bark, may be boiled and eat like aſparagus. When raw, they are good with oil and vinegar.

The ſeeds, which have a bitteriſh ſubacrid taſte, are recommended as very efficacious diuretics, given either in the form of emulſion, or in powder to the quantity of a dram.

The roots, which taſte ſweetiſh, with a ſlight auſterity and bitteriſhneſs, are eſteemed aperient, diuretic, and ſudorific; and ſaid to act without irritation, ſo as to be ſafely ventured upon in acute diſorders.

ARCTOPHYLAX, (from αρκτος, *bear*, and Φυλαττω, *I guard*,) in aſtronomy, a conſtellation, called *Bootes*.

ARCTOPUS, in botany, is a genus of the polygamia diœcia claſs; and in the natural method ranking under the 45th order, Umbellatæ. The umbella of the male is compound; the involucrum conſiſts of five leaves; the corolla has five petals; the ſtamina are five; and two piſtilli: the umbella of the hermaphrodite is ſimple; the involucrum is divided into four parts, is ſpinous, large, and contains many male flowers in the diſk. There is but one ſpecies of arctopus, viz. the echinatus, a native of Ethiopia.

ARCTOTIS, in botany, is a genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ-diſcoides. The receptacle is briſtly; the corona of the pappus is pentaphyllous; and the calyx is imbricated with ſcales looſe at the top.

It is commonly called anemoſpermos, from the reſemblance of its ſeeds to thoſe of the anemone.

There are 11 ſpecies; all of which are natives of Ethiopia, and the Cape of Good Hope.

ARCTURUS, in aſtronomy, is a fixed ſtar, of the firſt magnitude, in the conſtellation of Arctophylax, or Bootes.

This ſtar was known to the ancients, as in the following verſe of Virgil:

> *Arcturum, pluviaſque Hyades, geminoſque Triones.*
>
> Vide Job ix. 9. xxxviii 32.

ARCUATION, in gardening, ſignifies a method of raiſing trees by layers, which is done in the following manner: viz.

Strong mother-plants muſt be planted in a clear border, in a ſtraight line, about ſix feet aſunder. When theſe have ſhot five or ſix main branches from the root, and as many collateral branches, the former muſt be bent to the ground, and there faſtened. The ſmall branches muſt be covered three inches deep upon the joints, and have a large baſon of earth made round them to hold the water.

About the middle of September they may be opened, and, if they have taken root, may be immediately removed into the nurſery; but if they have not ſufficiently extended their roots, they muſt be ſuffered to remain till the ſpring, and then tranſplanted.

ARCUCCIO, Arcutio, in mechanics, is a machine made of a board, covered with pieces of hoops, like the tilt of a waggon; uſed in Italy to prevent children from being overlaid and ſmothered by nurſes or others.

Every nurſe in Florence is obliged to lay her child in an arcutio, under pain of excommunication.

ARDASSES, in commerce, is the coarſeſt of all the ſilks of Perſia; and as it were the refuſe of each kind. In this ſenſe, they ſay, the *legis*, the *houſets*, the *choufs*, and the *payas ardaſſes*, to ſignify the worſt of thoſe four ſorts of Perſian ſilks.

ARDASSINES, in commerce, called in France *ablaques*: a very fine ſort of Perſian ſilks, little inferior in fineneſs to the fourbaſtis, or rather cherbaſſis, and yet it is little uſed in the ſilk manufactures of Lyons and Tours, becauſe that kind of ſilk will not bear hot water in the winding.

ARDEA, in ornithology, is a genus of the order of grallæ. The general characters of this order are theſe: The bill is ſtraight, ſharp, long, and ſomewhat compreſſed, with a furrow that runs from the noſtrils towards the point; the noſtrils are linear; and the feet have four toes.

Under this genus Linnæus comprehends the grus or crane, the ciconia or ſtork, and the ardea or heron.

There are 26 ſpecies, the principal of which are thoſe following, viz.

1. The pavonia, or crowned crane, which has an erect briſtly creſt, with the temples and two wattles naked. The head is black; the creſt yellowiſh, tipped with black at the top; the wings white; the feathers of the tail black, and of an equal length.

It is a native of Africa, particularly the coaſt of Guinea, as far as Cape Verd; at this laſt place they are ſaid to be exceedingly tame, and will often come into the court-yards to feed with the poultry. Theſe birds are often kept in our menageries, and, with ſhelter of nights, live a good while. Their chief food is ſuppoſed to be worms, and ſuch other things as the heron tribe uſually feed on; alſo vegetables of all kinds. It often ſleeps on one leg; runs very faſt; and not only flies well, but continues on the wing for a long time together. The fleſh is very tough.

2. The virgo has a ſtraight greeniſh bill and crimſon irides.

The crown of the head is aſh-colour; the upper part of the neck behind, and all the under parts, to the breaſt, black; the back, rump, and tail, and all the under part from the breaſt, are of a bluiſh aſh-colour: behind each eye ſprings a tuft of long white feathers, which decline downwards, and hang in an elegant manner: the quills and tail are black at the ends; the legs black.

This ſpecies is found in many parts of Africa and Aſia, where they frequent marſhes and rivers, their food is fiſh, like moſt of the heron genus. It is frequently kept in manageries, being endowed with great gentleneſs of manners, added to its being an elegant bird.

3. The leucogeranos of Pallas, or Siberian crane of Pennant, is four feet and an half when ſtanding erect. The bill is of a red colour; the irides are white: the plumage is white as ſnow, except the 10 firſt greater quills, with the coverts of them, which are black; the legs are long and red. This ſpecies inhabits the marſhes and lakes in Siberia. They are ſhy birds, and always upon their guard againſt an enemy; having a centinel to warn them of an approach: on the leaſt alarm they cry aloud, not unlike the ſwan, and fly off directly.

The ſportſman finds, in courſe, much difficulty in approaching them within gunſhot; for as they ſtand near five feet high from the ground, they are enabled to eſpy him at a greater diſtance. Sometimes the ſportſman approaches them under cover of a ſtalking horſe, or other object; at other times a ſmall dog will divert their attention, as they will without fear attack the dog, while his maſter gets within reach.

In breeding time, they are more bold, and will defend their young even againſt men, ſo that it is dangerous to come near their haunts. The male and female guard the neſt by turns.

4. The grus, or common crane, has a naked papillous crown; the prime feathers of the wings black; the body aſh-coloured; the prime feathers of the tail ragged.

This ſpecies is far ſpread, being met with in great flocks throughout northern Europe and Aſia; in Sweden, Ruſſia throughout, and Siberia as far as the river Anadyr, migrating even to the arctic circle. In Kamtſchatka they are only ſeen on the ſouthern promontory; are migratory, returning northward to breed in the ſpring, and generally chooſing the ſame places which had been occupied by them the ſeaſon before. In the winter they inhabit the warmer regions, ſuch as Egypt, Aleppo, India, and alſo the Cape of Good Hope, changing place with the ſeaſon.

In their migrations they frequently fly ſo high as not to be viſible; their paſſing only being known by the noiſe they make, which is louder than any other bird.

In France they are ſeen in ſpring and autumn; but are accounted mere paſſengers.

This ſpecies ſeems to have been formerly a native of Britain; as we find by Willoughby, (page 52,) that there was a penalty of twenty pence for deſtroying an egg of this bird; and Mr. Ray ſays, that in his time they were found during the winter in large flocks in Lincolnſhire and Cambridgeſhire: but at preſent the inhabitants of thoſe counties are ſcarcely acquainted with them; ſo that theſe birds ſeem now to have forſaken our iſland.

5. The Americana, or hooping crane, is a native of America: the crown of the head and temples are naked and papillous; the forehead, nape of the neck, and prime wing feathers, black; but the body is white: the under part of the head, as far as the lower chap, is red; the beak is yellowiſh, and jagged at the point; the feet red, and the prime tail-feathers white.

This ſpecies, frequent the mouths of the Savnana, Aratamaha, and other rivers near St. Auguſtine: in ſpring going to the north to breed, like the common crane, and returning, like that bird, to the ſouth in autumn.

In the ſummer they are found in Hudſon's Bay, at which place they arrive in May, and retire in September; and are chiefly met with in unfrequented places, in the neighbourhood of lakes, where they breed. The neſt is made on the ground, compoſed of graſs and feathers. They lay two white eggs, like thoſe of the ſwan, and ſit 20 days; the young are at firſt yellow, changing to white by degrees. Their food is chiefly worms and inſects, which it ſearches for at the bottom of ponds.

The natives of Hudſon's Bay call this ſpecies Wapawuchechauk.

6. The argil, or hurgil, is a very large ſpecies; from tip to tip of the wings meaſuring 14 feet 10 inches; and from the tip of the bill to the claws ſeven feet and a half: the bill is 16 inches round at the baſe, of different colours, and nearly of triangular ſhape; the feathers of the back and wings are very ſtrong, and of an iron colour; thoſe of the breaſt long: over the belly a great deal of down, of a dirty white: the legs and half the thighs are naked: the naked parts full three feet in length.

This monſter, as Ives terms it, inhabits Bengal, and is alſo found at Calcutta; at the laſt place, called Hurgill, or Argill. It majeſtically ſtalks along. The common opinion of the natives is, that the ſouls of the Bramins poſſeſs theſe birds. On opening one of theſe, a terapin, or land tortoiſe, 10 inches long, was found in its craw.

In Sumatra there is a great variety of the ſtork kind; ſome of a prodigious ſize, and otherwiſe curious; as the Boorong Cambing, and Booringoolar.

The ſame ſpecies ſeems to have been remarked by Mr. Smeathman in Africa, while reſident there; an adult of one of which will often meaſure ſeven feet when ſtanding erect. He deſcribes the plumage much the ſame as in Mr. Ives's bird; adding, that the gape is monſtrouſly wide; the head is covered with white down, thinly diſperſed, appearing not unlike a greyheaded man: on the middle of the neck before, a long, conic membrane, like a bladder, ſprinkled very thinly with ſhort down, riſing or falling as the animal moves the beak, and always appearing inflated. Theſe birds aſſemble in companies.

A young bird of this ſpecies was brought up tame, and preſented to the chief of the Bananas, where Mr. Smeathman lived; and being accuſtomed to be fed in the great hall, ſoon became familiar; duly attending that place at dinner-time, the ſervants were obliged to watch it narrowly, and to defend the proviſions with ſwitches in their hands; but, notwithſtanding this, it would frequently ſnatch off ſomething; it was once known to have purloined a whole boiled fowl, which it ſwallowed in an inſtant.

Its courage is not equal to its voracity; for a child of eight or ten years old would ſoon put it to flight with a ſwitch; though at firſt it ſeems to ſtand upon its defence, by threatening with its enormous bill widely extended, and crying out with a loud hoarſe voice, like a bear or a tiger.

It is an enemy to ſmall quadrupeds, as well as birds and reptiles; and deſtroys fowls and chickens, though it dare not attack a hen with her young openly: it preys alſo on rats, young kittens, and the like; and has been known to ſwallow a cat whole.

This bird uſed to fly about the iſland, and rooſt very high among the ſilk cotton trees; when it ſaw the dinner carrying acroſs the yard, it would dart from its ſtation, and enter promiſcuouſly with the women who carried in the diſhes.

7. The ciconia, or white ſtork, has naked eye-balls, and black prime wing-feathers. The ſkin below the feathers, as alſo the beak, feet, and claws, are of a blood colour. It is a native of Europe, Aſia, and Africa.

It feeds upon amphibious animals, and is ſuch an enemy to ſerpents, that it is reckoned almoſt a crime to kill a ſtork.

Storks are birds of paſſage; they ſpend the ſummer in Europe, and diſappear all at once; they go off to Egypt, Ethiopia, &c. before winter, and do not return till about the middle of March.

8. The major, or common heron, has a black creſt depending from the back part of the head, an aſh-coloured body, a black line and belt on the neck and breaſt. It is a native of Europe. It is remarkably light in proportion to its bulk, ſcarce weighing three pounds and an half: the length is three feet two inches. The body very ſmall, and always lean; the ſkin ſcarce thicker than gold-beater's ſkin.

It commits great devaſtation in our ponds; but being unprovided with webs to ſwim, nature has furniſhed it with very long legs to wade after its prey. It generally builds in trees, though ſometimes in high cliffs over the ſea, commonly in company with others, like rooks. It makes its neſt of ſticks, which it lines with wool, and lays five or ſix large eggs, of a pale green colour. During incubation, the male paſſes much of his time perched by the female. They deſert their neſts during the winter, excepting in February, when they reſort to repair them.

It was formerly a bird of game in England for heron-hawking, and was ſo favourite a diverſion of our anceſtors, that laws were enacted for the preſervation of the ſpecies; and the perſon who deſtroyed their eggs was liable to a penalty of twenty ſhillings for each offence.

Not to know the hawk from the heron-ſhaw was an old proverb, taken originally from this diverſion; but, in courſe of time, ſerved to expreſs great ignorance in any ſcience. In after times this proverb was abſurdly corrupted to, He does not know a *hawk* from a *hand-ſaw*.

This bird was formerly much eſteemed as food, and made a favourite diſh at the tables of the great, and is valued at the ſame rate as a pheaſant. It is ſaid to be very long-lived: by Mr. Keyſler's account it may exceed ſixty years; and, by a recent inſtance of one that was taken in Holland, by a hawk belonging to the Stadtholder, its longevity is again confirmed, the bird having a ſilver plate faſtened to one leg, with an inſcription, importing it had been before ſtruck by the elector of Cologne's hawks in 1735.

9. The garzetta, or egret, is creſted behind; the body is white, the beak black, and the feet greeniſh. It is an elegant bird, and weighs about one pound; the length twenty-four inches, and to the end of the legs thirty-two. It is a native of the Eaſt.

But formerly it was very frequent in Britain, as appears by ſome of the old bills of fare: in the famous feaſt of archbiſhop Neville, where we find no leſs than a hundred aſterides, egrets or egrittes, as it is differently ſpelt.

Perhaps the eſteem they were in as a delicacy during thoſe days, occaſioned their extirpation in our iſlands; abroad they are ſtill common, eſpecially in the ſouthern parts of Europe, where they appear in flocks.

The ſcapulars and the creſt were formerly much eſteemed as ornaments for caps and head-pieces; ſo that aigrette and egret came to ſignify any ornament to a cap, though originally the word was derived from *aigre, a cauſe de l'aigreur de ſa voix*.

10. The herodias, or criſtata maxima, is creſted behind, has a duſky-coloured back, reddiſh thighs, and the breaſt ſpeckled with oblong black ſpots. It is four feet and a half when erect; the beak is about eight inches from the angle of the mouth to the end of it; and the creſt is made up of long, narrow, brown feathers, the longeſt being five inches in length, which it can erect and let fall at pleaſure.

It is a native of Virginia, and feeds not only upon fiſh and frogs, but on lizards, efts, &c.

11. The ſtellaris, or bittern, has a ſmooth head; it is variegated through the whole body with dark-coloured ſpots of different figures and ſizes.

It is a native of Europe, and inhabits chiefly the fen-countries; where it is found ſkulking among reeds and ſedges: its uſual poſture is with the head and neck erect, and the beak pointed directly upwards.

It will ſuffer perſons to come very near it without riſing; and has been known to ſtrike at boys and ſportſmen, when wounded, and unable to make its eſcape.

It flies principally about the duſk of the evening, and then riſes in a very ſingular manner, by a ſpiral aſcent, till it is quite out of ſight. It makes a ſtrange noiſe when it is among the reeds, and a different, and a very ſingular one, as it riſes on the wing in the night.

It builds its neſt with the leaves of water-plants, on ſome dry clump among the reeds, and lays five or ſix eggs of a cinerous green colour.

The food of the bittern is chiefly frogs; not that it rejects fiſh, for ſmall trouts have been met with in their ſtomachs.

In the reign of Henry VIII. it was held in ſo much eſteem at table, that it was valued at one ſhilling. Its fleſh has much the flavour of a hare, and nothing of the fiſhineſs of that of the heron.

12. The violacea, or creſted bittern, has a white creſt; the body is variegated with black and white, and bluiſh below. Theſe birds are ſeen in Carolina in the rainy ſeaſons: but in the Bahama iſlands, they breed in buſhes growing among the rocks in prodigious numbers, and are of great uſe to the inhabitants there; who, while theſe birds are young and unable to fly, employ themſelves in taking them for the delicacy of their food. They are, in ſome of theſe rocky iſlands, ſo numerous, that in a few hours two men will load one of their calapatches, or little boats, taking them perching from off the rocks and buſhes, they making no attempt to eſcape, though almoſt full grown.

They are called by the Bahamians crab-catchers, crabs being what they moſtly ſubſiſt on; yet they are well taſted, and free from any rank or fiſhy favour.

ARDENT, in rhetoric, implies ſomething partaking of the ſame heat or favour as fire; and frequently uſed in figurative language, to ſignify an extraordinary zeal. Hence,

Ardent *Fever*, a ſynonyme of a burning fever.

Ardent *Spirits*, which imply thoſe diſtilled from fermented vegetables, and are ſo volatile as to catch fire eaſily, and to burn with great vehemence.

ARDENTES, in hiſtory, an appellation given to thoſe afflicted with the Ignis Sacer, or Eryſipelas. They were thus called, as ſeeming to be ſcorched or burnt with the diſeaſe. Hence the abbey of St. Genevieve in Paris is called *Domus Ardentium*, indicating that great numbers were cured of that diſtemper at the ſhrine of this ſaint, in the reign of Lewis VI.

ARDERS, in huſbandry, denotes the fallowings or plowings of land.

ARDUINA, in botany, is the boaſted lycium, of the pentandria claſs and monogynia order. The characters are few, viz. The corolla has but a ſingle petal; the ſtigma is bifid. The fruit is a double celled, being with a ſingle ſeed.

AREA, in general, denotes any plain ſurface on which we can walk, &c. The word is Latin, importing more properly a threſhing-floor; and his derived from *arere*, "to be dry."

Area, in geometry, denotes the ſuperficial content of any figure. Thus, if a figure, e. g. be in form of a ſquare, its ſide 40 feet, its area will be 1600 ſquare feet; or it contains 1600 little ſquares, each a foot every way.

AREB, is a kind of imaginary money uſed in the dominions of the great mogul. Four arebs are equal to one crou, or 100 lacs; one lac to 100,000 roupees.

ARECA, the Fauſel-Nut, in botany, is a genus of the order of palmæ pennatifoliæ.

The male has no calyx, but three petals, and nine ſtamina; the female has no calyx; the corolla has three petals, and the calyx is imbricated. There are two ſpecies, viz.

1. The cathecu, a native of India. This has no branches, but its leaves are very beautiful: they form a round tuft at the top of the trunk, which is as ſtraight as an arrow. It grows to the height of 25 or 35 feet, and is a great ornament in gardens.

The fruit which it bears is about the ſize of a walnut, and when ripe is aſtringent, but not unpalatable, and the ſhell is yellowiſh.

Of this fruit there is a prodigious conſumption in the Eaſt Indies, there being ſcarce any perſon, from the richeſt to the pooreſt, who does not uſe it; and the trade it produces is incredible.

The chief uſe that is made of areca is to chew it with the leaves of betel, mixing with it lime made of ſea-ſhells.

In order to chew it, they cut the areca into four quarters, and take one quarter of it, which they wrap up in a leaf of betel, over which they lay a little of the lime; afterwards they tie it, by twiſting it round.

This bit prepared for maſtication is called *pinang*; which is a Malayan word uſed all over the Eaſt Indies. The pinang provokes ſpitting very much, whether it be made with dried or freſh areca; the ſpittle is red, which colour the areca gives it. This maſtication cools the mouth, and faſtens the teeth and gums.

The Europeans who live at Batavia, or Malaca, and in the Sunda and Molucca iſlands, uſe pinang as much as the Indians do; and by waſhing their teeth they preſerve them white.

When eaten by itſelf, it impoveriſhes the blood, and cauſes the jaundice; but is not attended with theſe inconveniences when mixed in the uſual way with betel.

The beſt areca of the Indies comes from the iſland of Ceylon. The Dutch Eaſt-India company ſend great quantities of it in their ſhips to the kingdom of Bengal. The ſame company ſend ſome of it from time to time to Surat and Amadabat, for the uſe of the dyers in the dominions of the grand mogul.

2. The oleracea, or true cabbage-palm, is the moſt beautiful, and perhaps the talleſt, of all trees. The trunk is perfectly ſtraight, and marked with rings at the veſtigiæ of the footſtalks of the leaves. Near the ground it is about ſeven feet in circumference; but tapers as it aſcends, and attains the height of 170 or 200 feet. The bark is of an aſh colour till within 25 or 30 feet of the extremity of the tree; when it alters at once to a deep ſea-green, which continues to the top.

About five feet from the beginning of the green part upwards, the trunk is ſurrounded with its numerous branches in a circular manner; all the lowermoſt ſpreading horizontally with great regularity; and the extremities of many of the higher branches bend wavingly downwards, like ſo many plumes of feathers.

The branches are ſomewhat round underneath, and ſlightly grooved on the upper ſide; and are likewiſe decorated with a very great number of green pennated leaves: ſome of theſe are near three feet long, and an inch and an half broad, growing narrower towards their points, as well as gradually decreaſing in length towards the extremities of the branches.

As there are many thouſand leaves upon one tree; every branch bearing many ſcores upon it, and every leaf being ſet at a ſmall and equal diſtance from each other, the beauty of ſuch a regular lofty group of waving foliage, ſuſceptible of motion by the moſt gentle gale of wind, is not to be deſcribed.

The leaves produce from their texture a ſort of thread, which is uſed in making cordage of every kind, as well as fiſhing-nets, and is eſteemed ſtronger than thoſe uſually made from any other material.

Upon removing the large leaves, or branches, which ſurround the top of the trunk a little way above the beginning of the green bark, what is called the cabbage, is diſcovered lying in many thin, ſnow-white, brittle flakes, in taſte reſembling an almond, but ſweeter.

This ſubſtance, which cannot be procured without deſtroying the tree, is boiled, and eaten with mutton by the inhabitants of the Weſt Indies, after the ſame manner as turnips and cabbage are uſed with us; thongh it muſt appear the height of extravagant luxury, to fell ſo ſtately a tree, which would be an ornament to the moſt magnificent palace in Europe, to gratify the taſte of any epicure, eſpecially as there is but a very ſmall part of it eatable. That part called the cabbage-flower, grows from the part where the aſh-coloured trunk joins the green part already deſcribed.

Its firſt appearance is a green huſky ſpatha, growing to above 20 inches long, and about four broad; the inſide being full of ſmall white ſtringy filaments, full of alternate protuberant knobs, the ſmalleſt of theſe reſembling a fringe of coarſe white thread knatted: theſe are very numerous, and take their riſe from larger footſtalks; and thoſe footſtalks likewiſe are united to different parts of the large parent ſtalk of all.

As this huſky ſpatha is opened while thus young, the farinaceous yellow ſeed in embrio, reſembling fine ſaw-duſt, is very plentifully diſperſed among theſe ſtringy filaments, which anſwer the uſe of apices in other more regular flowers: theſe filaments being cleared of duſt, are pickled, and eſteemed the beſt pickles either in the Weſt Indies or in Europe.

But if the ſpatha is not cut down and opened whilſt young; when it grows ripe it will burſt; then the incloſed part, which whilſt young and tender is fit for pickling, will by that time have acquired an additional hardneſs, become ſoon after ligneous, grow buſhy, conſiſting of very many ſmall leaves, and in time produce a great number of ſmall oval thin-ſhelled nuts, about the bigneſs of unhuſked coffee-berries: theſe, being planted, produce young cabbage-trees.

The ſockets or grooves, formed by the broad part of the footſtalks of the branches, are uſed by the negroes as cradles for their children.

On the inner ſide of the very young footſtalks are tender pellicles, which when dried make writing paper.

The trunks ſerve as gutterings; the pith makes a ſort of ſago; and the nuts yield oil by decoction.

In the pith alſo, after the trees are felled, there breeds a kind of worms, or grubs, which are eaten and eſteemed a great delicacy by the French of Martinico, St. Domingo, and the adjacent iſlands.

Theſe worms, according to father Labat, are about two inches long, and of the thickneſs of one's finger; the head is black, and attached to the body without any diſtinction of neck. Their preparation for the table is as follows: they are ſtrung on wooden ſkewers before a fire; and as ſoon as heated, are rubbed over with raſpings of cruſt, ſalt, pepper, and nutmeg: this powder abſorbs all the fat, which during the cookery would otherwiſe eſcape; when properly roaſted, they are ſerved up with orange or citron ſauce.

Thoſe worms, when expoſed for ſome time to the ſun, yield an oil which is of great efficacy in the piles.

This oil ſhould never be heated before its application to the part affected; as repeated experiments have evinced that its ſpirit is totally diſſipated by the fire.

ARENA, in Roman antiquity, was a place where the gladiators fought; ſo called from its being always ſtrewed with ſand, to conceal from the view of the people the blood ſplit in the combat. Nero is ſaid to have ſtrewed the arena with gold duſt.

ARENARIA, or ſandwort, in botany, is a genus of the decandria trigynia claſs; and in the natural method ranking under the 22d order, caryophyllæ.

The calyx has five open leaves; the petals are five, and entire; the capſule is unilocular, and contains many ſeeds.

There are 17 ſpecies, and only ſeven of which are natives of Britain, viz.

The peploides, or ſea-ſandwort; the trinervis, or plantain-leaved ſandwort; the ſerpylli-folia, or leaſt ſandwort; the ſaxatilis, or mountain-ſandwort; the laricifolia, or larchleaved ſandwort; and the rubra, or purple-flowered ſandwort.

ARENARII, in antiquity, were gladiators who combated with beaſts in the arena, or amphitheatre. The arenarii were ſlaves of the loweſt rank; ſo that, though manumitted, they were not capable of being Roman citizens. They were the ſame with what were otherwiſe called beſtiarii.

ARENARIUM, in eccleſiaſtical hiſtory, denotes a cemetery or burying-ground. The arenaria were properly a kind of pits, or holes, under ground, in which the ancient Chriſtians not only buried their dead, but held their religious aſſemblies in times of perſecution.

ARENATION, in medical preſcription, implies the method of treating patients, by cauſing them to put their feet into warm ſand, as a dry bath, for the removal of obſtructions in the inteſtines and abdominal veſſels.

AREOLA, among anatomiſts, denotes the coloured circle ſurrounding the nipple of the breaſt.

AREOPAGUS, or rock of Mars, in hiſtory, implies a ſovereignty tribunal at Athens, famous for the juſtice and impartiality of its decrees, to which the gods themſelves are ſaid to have ſubmitted their differences.

Plutarch attributes the eſtabliſhment of the Areopagus to Solon. But authentic hiſtory records that it was originally inſtituted by Cecrops, in the year of the world 2553, the year in which Aaron died. But the beſt authorities allow, that it had been neglected, and attribute to him the honour of its reſtoration.

The city of Athens, before this famous court was eſtabliſhed, was governed by tribunals of a circumſcribed juriſdiction, which were multiplied by the moſt trifling accidents, which took no fixed political or civil form.

As each of thoſe tribunals could only act in proportion to the power delegated to it, it was impoſſible that ſo many different and unequal impreſſions ſhould give to the great machine of the ſtate, that uniform and regular movement which, by an impulſe always the ſame, would keep each part in the ſituation it ſhould maintain with relation to the whole.

To effect this univerſal and harmonious power, it was neceſſary to unite the different channels of public authority, which, by being too much diſtributed, loſt their force. This authority Solon collected, and placed it all in the court of Areopagus, which conſequently became the main ſpring of the government.

The judges of this court now took cognizance of crimes of every kind; and the ſame tribunal which inflicted capital puniſhment on murder, poiſoning, burning of houſes, theft, &c. ſtruck at the roots of thoſe crimes, by arraigning idleneſs, luxury, and debauchery.

Equally attentive to ſtimulate the indolence of the young, and the languor of the old, theſe ſage judges rouſed in the one laudable ambition to ſerve the ſtate, and reſtored to the others their former activity.

Satisfied that extremes produce the ſame effects, they thought the public had as much to fear from the exceſs of wealth as from the gripe of poverty.

Hence they exacted a minute account of the effects of every individual. And from this great ſeverity to idle citizens, who inſtead of being uſeful members in a ſtate, are its banes and its diſhonour, health was conſtantly retained in the legiſlature.

The ſtate was not ſatisfied with having eſtabliſhed good laws, but were extremely careful to ſee that they were obſerved. With this view, they had divided the city into quarters, and the country into cantons. Thus every thing paſſed under their eyes; nothing eſcaped them; they were acquainted with the private conduct of every citizen. Thoſe who had been guilty of any irregularity were cited before the magiſtrates, and were reprehended, or puniſhed in proportion to their miſdemeanour.

The Areopagites obliged the rich to relieve the poor. They repreſſed the intemperance of the youth by a ſevere diſcipline. Corruption in magiſtrates was ſuppreſſed by the puniſhments denounced againſt it; and the old men, at the ſight of the employments of the young, felt themſelves animated with a decree of juvenile vigour and activity.

The aſſiduous and painful exerciſe of their office made the Areopagites feel all the inconvenience of the ſituation of their tribunal, which was on the ſummit of a hill, and which was aſcended with difficulty; they therefore determined to remove it to a part of the city called the royal portico. It was a ſquare, expoſed to all the inclemencies of the weather.

When the judges, who aſſembled there in profound ſilence, had taken their places, they were incloſed by a thread, or cord, drawn around them.

They held their aſſemblies in the night, that their attention to public affairs might not be diverted by external objects; and, adds Lucian, that they might only be influenced by the arguments, and not by the preſence and action of the ſpeakers. This circumſtance explains a paſſage in Athenææs, who tells us, that none knew the numbers or faces of the Areopagites.

The cuſtom of adminiſtring juſtice in the open air was not peculiar to them. It was followed by all the other tribunals when they tried for murder; for two reaſons: 1ſt, That the judges, the ſworn protectors of innocence, might not be hurt by being under cover with criminals, whoſe hands were polluted with blood. 2dly, That the accuſer and the accuſed might not be under the ſame roof.

When all the members of the ſenate were convened, a herald enjoined ſilence, and ordered the people to retire. As ſoon as they had departed, the aſſembly proceeded to buſineſs; and as they deemed the leaſt preference a flagrant injuſtice, the cauſes which they were to determine were drawn by a kind of lottery; and the ſame chance which brought them up, diſtributed them to different numbers of judges, ſmall or great, according to the importance of the ſeveral cauſes.

In early times, the parties themſelves ſtated their cauſe in a ſimple manner. The eloquence of advocates was thought a dangerous talent, fit only to varniſh crimes. But afterwards the Areopagus, on this point, relaxed from their ſeverity: at firſt the accuſed, and ſoon after the accuſers, were permitted to engage thoſe to make the attack and the defence, whoſe profeſſion it was to exert the art of ſpeaking, for others, with accuracy and elegance.

Sextus Empiricus ſeems not to have ſufficiently diſtinguiſhed times, where he ſays, that the court of Areopagus did not ſuffer thoſe who are to be tried at their bar to avail themſelves of the abilities of others. What undoubtedly led him into that miſtake, was an inviolable cuſtom of that tribunal, which prohibited, in pleadings, all that warm and pictureſque oratory which ſeduces the judgment and inflames the paſſions. When the ſuffrages were collected, each perſon gave his in ſilence. They voted with a ſmall flint, which they held betwixt the thumb and the two next fingers, and which they put into one of the two urns that ſtood in a corner of the hall. One ſtood before the other. The firſt was called the *urn of death*; the ſecond, the *urn of compaſſion*. That of death was of braſs, and was termed *proper*; that of compaſſion was of wood, and was termed *improper*. The judges commonly brought their flint to the aſſembly, and put it into the urn; but that all the ſuffrages might be collected, the herald took the two urns, and preſented them, one after another, to every ſenator, commanding him, in the name of the republic, no longer to defer his acquittal or condemnation.

After the ſuffrages were collected, they were taken out of the two urns, and put into a third vaſe of braſs. They were then counted; and as the number of white or of black flints was higher or inferior, one of the judges drew with his nail a ſhorter or a longer line on a tablet with a waxen ſurface, on which the reſult of each cauſe was marked. The ſhort line expreſſed *acquittal*; the long, *condemnation*.

With regard to the emoluments of the judges, they were as moderate as thoſe of the advocates. The length of the proceſs did not enhance its expence; and when the deciſion of a cauſe was poſtponed till the next day, the committee were only paid an obolus on that day. Hence Mercury, in Lucian, is ſurpriſed that ſuch ſenſible old men as the ſenators of Areopagus were, ſhould ſell at ſo low a price the trouble of aſcending ſo high.

As to the number of the judges which compoſed the Areopagus, ſome authors, attentive only to a part of Solon's regulations, by which he enacted, that for the future, none but the nine archons ſhould be admitted members of the Areopagus, have imagined, that this tribunal was filled anew every year, and that it never conſiſted of more than nine magiſtrates. This opinion, and ſome others, are refuted by the circumſtantial account which Diogenes Laertius gives us of the condemnation of Socrates. This great man had wiſhed to ſubſtitute a rational hypotheſis for the fabulous and extravagant ſyſtem of religion, which prevailed in his time. His project, however laudable, appeared impious in the eye of ſuperſtition. Information was laid againſt him before the Areopagus, and he had as many accuſers as fellow-citizens. After the charges and the anſwers were heard, they proceeded to ſuffrages. The opinions were divided, but not equally, for the number of thoſe who condemned him exceeded by 281 the number of thoſe who declared him innocent. He made an ironical reply to this iniquitous ſentence, by telling his judges, that he took it for granted, they would admit him to a maintenance in the Prytanæum. On this ſarſcaſm, 80 of thoſe who had voted in his favour forſook him, went over to the oppoſite party, and condemned him to die. Here then we have 361 judges who condemn; to whom if we add thoſe who perſiſt in acquitting him, the number muſt be conſiderable.

Before this tribunal St. Paul was called to give an account of his doctrine, and converted Dionyſius one of their number.

The end of this court of judicature is as obſcure as its origin, which was derived from very remote antiquity. It exiſted, with the other magiſtracies, in the time of Pauſanias, i. e. in the 2d century. The term of its ſubſequent duration is not aſcertained; but a writer, who lived under the emperors Theodoſius the Elder and Younger, in the 5th century, mentions it as being then extinct.

ARETHUSA, in mythology, the daughter of Nereus and Coris, and the companion of Diana, who changed her into a fountain to deliver her from the purſuit of her lover Alpheus.

Arethusa, in botany, is a genus of the gynandria diandria claſs; and in the natural method ranking under the 7th order, Orchideæ.

The generic character is taken from the nectarium, which is tubular, ſituated at the bottom of the corolla, and the inferior labium fixed to the ſtylus. There are four ſpecies; all natives of America, except the capenſis, which is only found at the Cape of Good Hope.

ARETIA, in botany, is a genus of the pentandria monogynia claſs; and in the natural method ranking under the 21ſt order, Pretiæ. The corolla is divided into five parts; the tube of the corolla ovated; and the capſule globular, and conſiſts of but one cell. There is but one ſpecies, viz. the alpina.

ARETOLOGI, or Aretalogi, in antiquity, were a ſort of philoſophical jeſters, chiefly of the Cynic or Stoic tribe, who, having no ſchool or diſciples of their own, attended the tables of great men, and entertained them in their banquets with diſputations on virtue, vice, and other popular topics.

ARETOLOGY, in philoſophy, implies the whole doctrine of morality, which defines virtue and the mode of acquiring it.

ARGAL, the ſame as tartar.

ARGEA, or Argei, in Roman antiquity, were thirty human figures, made of ruſhes, thrown annually by the prieſts, or veſtals into the Tiber, on the day of the ides of May. The original inſtitution of this cuſtom was, that the barbarous nation who firſt inhabited theſe parts caſt all the Greeks they could meet with into the Tiber: for Argians was a common name for all Grecians: but Hercules perſuaded them to quit ſo inhuman a practice, and to purge themſelves of the crime by commemorating this ſolemnity.

ARGEMONE, or Prickly Poppy, in botany, is a genus of the monogynia order, belonging to the polyandria claſs; in the natural method the 27th order, Rhæadeæ.

The corolla conſiſts of ſix petals; the calyx triphyllous; and the capſule ſemivalved.

There are three ſpecies, all natives of the Weſt Indies.

ARGENT, is the common French heraldic word for ſilver, of which metal all white fields or charges are ſuppoſed to conſiſt.

Argent of itſelf is uſed in heraldry to ſignify purity, innocence, beauty, and gentleneſs; and, according to G. Leigh, if it is compounded with

Gul.	it ſignifies	boldneſs;
Azu.		courteſy;
Ver.		virtue;
Pur.		favour;
Sab.		religion.

ARGENTARIA *Creta*, or ſilver chalk, in natural hiſtory, is a pure white earth, found in Pruſſia, much eſteemed for cleaning plate.

ARGENTARIUS, in Roman antiquity, was a ſynonymous term for a money changer or banker. The argentarii were monied people, who made a profit either by the changing, or lending of money at intereſt. Theſe had their *tabernæ*, or offices, in the *forum Romanum*, built there as early as the reign of L. Tarquinius Priſcus.

The argentarii and fœneratores were much hated on account of their covetouſneſs and extortion.

ARGENTATI Milites, in antiquity. Livy, lib. vi. ſpeaks of *argentati milites*, as diſtinguiſhed from *aurati*. Aquinas ſuppoſes theſe to have been ſimilar to the argyraſpides and chryſaſpides; but the deſcriptions do not quadrate. Livy only repreſents the argentati as cloathed in white linen coats.

ARGENTIL, in botany, is a ſynonyme of the aphanes, parſley piert, or parſley breakſtone.

ARGENTINA, in ichthyology, is a genus of fiſhes belonging to the order of abdominales. The generic characters of which are, the teeth are in the tongue as well as the jaws; the branchioſtege membrane has eight radii or rays; the anus is near the tail; and the belly-fins conſiſt of many rays.

There are two ſpecies, viz.

1. The ſphyræan has 15 rays in the fin at the anus; the air-bladder of this ſpecies is conical on both ſides, and ſhines like ſilver.

2. The carolina has likewiſe 15 rays in the fin near the anus; the tail is forked, and the lateral lines are ſtraight. It inhabits the freſh waters of Carolina.

ARGENTINUS, in mythology, was a deity worſhipped by the ancients, as the god of ſilver coin; as Æſculanus, whom they made his father, was the god of braſs money, which was in uſe before ſilver.

ARGENTUM, in natural hiſtory, is ſynonymous with Silver.

Argentum *Album*, in old records, imply ſilver coin or pieces of bullion that anciently paſſed for money. By Doomſday tenure, ſome rents to the king were paid in *argento albo*, common ſilver pieces of money: other rents in *libris urſis et penſatis*, in metal of full weight and purity: in the next age, that rent which was paid in money, was called *blanch fearm*, and afterwards *white rent*; and what was paid in proviſions, was termed *black mail*.

Argentum *Dei*, God's penny, in Law anciently ſignified earneſt-money, or money given to bind a bargain; in ſome places called *erles*, or *arles*, and by the civilians and canoniſts, *arrhæ*.

Argnetum *Muſivum*, in the fine arts, is a maſs conſiſting of ſilver-like flakes, uſed for the colouring of plaſter-figures, and for other purpoſes, as pigment.

It conſiſts of an amalgam of equal parts of tin, biſmuth, and mercury. It is to be mixed with white of eggs, or ſpirit varniſh, and then applied to the intended work, which is afterwards to be burniſhed.

Argentum *Vivum*, mercury or quickſilver, is the ſame as Mercury.

ARGIL, in ornithology, denotes a ſpecies of ardea, or heron.

ARGILLA, clay, in natural hiſtory, is ſynonymous with Clay.

ARGIVI, or Argeii, in geography, denotes the people of Argeia or Argolis.

ARGO, in mythology, was a ſhip celebrated by the poets: being that in which the Argonauts, of whom Jaſon was the chief, made their expedition in queſt of the golden fleece.

Jaſon having happily accompliſhed his enterpriſe, conſecrated the ſhip to Neptune, in the Iſthmus of Corinth; from whence it was tranſlated into heaven, and made a conſtellation.

Argo *Navis, the Ship Argo*, in aſtronomy, denotes a conſtellation in the ſouthern hemiſphere, whoſe ſtars, in Ptolemy's catalogue, are 45; in Tycho's, 11; in the Britannic catalogue, 64.

ARGONAUTA, in entomology, is the name of a genus of ſhell-fiſh belonging to the order of vermes teſtacea. The ſhell conſiſts of one ſpiral involuted valve.

There are two ſpecies, viz.

1. The argo, with a ſubdented carina, which is found in the Mediterranean Sea and Indian ocean.

The ſhell ſeems no thicker than a piece of paper; and the fiſh that inhabits it is a ſepia.

It has been imagined that men firſt learned the method of ſailing in veſſels from what they ſaw practiſed by this creature.

When it is to ſail, it extends two of its arms on high; and between theſe ſupports a membrane, which it throws out on this occaſion: this ſerves for its ſail; and the two other arms it hangs out of the ſhell, to ſerve occaſionally either as oars or as a ſteerage; but this laſt office is generally ſerved by the tail. When the ſea is calm, it is common to ſee numbers of theſe creatures diverting themſelves with ſailing about in this manner; but as ſoon as a ſtorm riſes, or any thing gives them diſturbance, they draw in their legs, and take in as much water as makes them ſomewhat heavier than the ſea-water in which they ſwim, and then they they ſink to the bottom.

The manner of their voiding this abundant water, when they would riſe again, is by a number of holes, of which their legs are full.

2. The cymbium, with a blunt plaited carina. This ſpecies is very ſmall, and is found in the Mediterranean Sea, and the Bay of Biſcay.

ARGONAUTIC, implies ſomething belonging to the Argonauts.

The argonautic expedition is one of the greateſt epochas or periods of hiſtory which Sir Iſaac Newton endeavours to ſettle, and from thence to rectify the ancient chronology. This he ſhows to have been about thirty years earlier than the taking of Troy, and 43 years later than the death of Solomon.

ARGONAUTICA, in literary hiſtory, denotes poems on the ſubject and expeditions of the argonauts.

We have the *Argonautics* of Orpheus in epic verſe, publiſhed by H. Stephens; the *Argonauticon* of Valerius Flaccus, in eight books of Latin heroics, in imitation of Apollonius, with reſpect to which Burman obſerves that the imitator has often ſurpaſſed the original; the *Argonautics* of Apollonius Rhodius, an heroic poem, conſiſting of four books, *opus*, as Quintilian calls it, *non contemnendum*.

ARGONAUTS, in antiquity, a company of illuſtrious Greeks, 51 in number who embarked along with Jaſon, in the ſhip Argo, from Colchis, with a deſign to obtain the golden fleece.

Argonauts *of St Nicholas*, was a military order inſtituted by Charles III. king of Naples, in the year 1382, for the advancement of navigation.

They wore a collar of ſhells, incloſed in a ſilver creſcent, whence hung a ſhip with this device, *Non credo tempori*, "I do not truſt time."

Hence theſe Argonaut knights came to be called *knights of the ſhell.* They received the order of St. Baſil, archbiſhop of Naples; and held their aſſemblies in the church of St. Nicholas, their patron.

ARGOPHYLLUM, White-leaf, in botany, a genus of the monogynia order, belonging to the pentandria claſs of plants. The capſule is trilocular; the nectarium is pyramidal, pentagonous, and the length of the corolla.

There is but one ſpecies, the netidum or gloſſy, a native of New Caledonia.

ARGUMENT, in rhetoric and logic, denotes an inference drawn from the premiſes; the truth of which is held indiſputable, or at leaſt highly probable.

Argument, in matters of literature, denotes the abridgment or heads of a book, hiſtory, comedy, chapter, &c.

ARGUMENTATION, is the act of inventing or framing arguments, of making inductions, and drawing concluſions.

Argumentation, according to Cicero, is the delivering or unfolding of an argument.

The matter of argumentation, is propoſitions; the form, their due diſpoſition, with regard to one another, ſo as a concluſion may be drawn from them.

Argus *Shell*, is a ſpecies of porcelain-ſhell, beautifully variegated with ſpots, reſembling in ſome meaſure thoſe in a peacock's tail.

ARGUTIÆ, in rhetoric, are witty and acute ſayings, which commonly ſignify ſomething further than what at firſt ſight they ſeem to import.

Argutiæ *ab Alluſione*, are thoſe in which alluſion is made to ſome hiſtory, fable, ſentence, proverb, or the like.

Argutiæ *a Comparatis*, when two things are compared together, which yet at firſt ſight appear very different from each other, but ſo as to make a kind of ſimile or diſſimile.

Argutiæ *a Repugnantibus*, is when two things meet in a ſubject, which yet regularly cannot be therein; or when two things are oppoſed to each other, yet the epithet of the one is attributed to the other.

ARGYRASPIDES, or Argyroaspides, in antiquity, were perſons armed with ſilver bucklers, or bucklers ſilvered.

Theſe, according to Quintus Curtius, made the ſecond corps of Alexander's army; the firſt was the phalanx.

According to Juſtin's account, lib. xii. cap. 7. Alexander having penetrated into India, and extended his empire as far as the ocean; for a monument of his glory, ordered the armour of his ſoldiers, and the houſings of his horſes, to be adorned with ſilver.

And hence commanded them to be called *argyraſpides,* from the Greek *αργυρος*, *ſilver*, and *ασπις*, *buckler*.

ARGYRIPÆ, is the ſame as argos hippium.

ARIADNÆA, in Grecian antiquity, were two feſtivals at Naxos, in honour of two women named Ariadne. One of them was the daughter of king Minos, they had, in the ſolemnity, dedicated to her, a ſhew of ſorrow and mourning; and, in memory of her being left by Theſeus near the time of child-birth, it was uſual for a young man to lie down and counterfeit all the agonies of a woman in labour.

This feſtival is ſaid to be firſt inſtituted by Theſeus, to atone for his ingratitude to that princeſs.

The other Ariadne was thought to be of a gay and ſprightly temper; and therefore her feſtival was obſerved with muſic and other expreſſions of mirth and joy.

ARIANS, in church hiſtory, denote the followers of Arius, a preſbyter of the church of Alexandria, about the year 315; who maintained, that the Son of God was totally and eſſentially diſtinct from the Father; and that he was the firſt and nobleſt of thoſe beings whom God had created; and was the inſtrument by whoſe ſubordinate operation he formed the univerſe; therefore inferior to the Father both in nature and dignity; and that the Holy Ghoſt was not God, but created by the power of the Son.

ARICINA, in mythology, was a ſurname of Diana; under which appellation ſhe was honoured in the foreſt Aricine, ſo called from Aricia a princeſs of the blood-royal of Athens.

Hippolytus, to whom this princeſs was married, is ſaid to have erected a temple to Diana in this foreſt.

ARIDAS, a kind of taffety, manufactured in the Eaſt Indies from a ſhining thread which is produced from certain herbs, whence they are ſtyled *aridas of herbs.*

ARIDED, in aſtronomy, is a fixed ſtar of the ſecond magnitude in the ſwan's tail.

ARIDULLAM, in natural hiſtory, is a kind of zarnich found in the Eaſt Indies.

ARIDURA, in the materia medica, implies a declenſion in the animal functions; hence all conſumptive, hectic or decaying of the corporeal ſyſtem are defined as Aridmaical complaints.

ARIES, in zoology, is ſynonymous with Ovis.

Aries, the battering ram, the ſame as the Battering *Ram.*

Aries, in aſtronomy, is a conſtellation of fixed ſtars, drawn on the globe, in the figure of a ram. It is the firſt of the twelve ſigns of the zodiac, from which a twelfth part of the ecliptic takes its denomination.

ARIETATION, in natural hiſtory, is a ſynonymous term with Earthquake.

ARILLUS, is a technical term, invented by Linnæus, and defined to be the proper exterior coat or covering of the ſeed, which falls off ſpontaneouſly.

All ſeeds are furniſhed with an arillus; for in many, a dry covering, or ſcarf-ſkin, ſupplies its place. In Jeſſamy; hound's tongue, *cynogloſſum*; cucumber; fraxinella, *dictamnus*; ſtaff-tree, *celaſtrus*; ſpindle-tree, *euonymus*; African ſpiræa, *dioſma*; and the coffee-tree, *coffea*; it is very conſpicuous.

The different ſkins or coverings of the ſeeds of plants are adapted for receiving the nutritive juices, and tranſmitting them within.

ARIMANIUS, in mythology, was the evil good of the ancient Perſians.

The Perſian Magi held two principles: a good dæmon, or god, and an evil one: the firſt was deemed the author of all good, and the other of all evil: the former they ſuppoſed to be repreſented by light, and the latter by darkneſs, as their trueſt ſymbols.

ARISI, a ſynonymous term for the rice of India.

ARISTA, in botanical language, implies the long needle like beard, generally called the awn of grain: barley and bire have very long and conſpicuous characters of this deſcription.

ARISTÆUS, in mythology, is ſynonymous with Equirinus, or Aquarius.

ARISTIDA, in botany, is a genus of the triandria dygnia claſs, or 4th natural order, gramina. The generic characters of which are; the calyx has a double valve, the corolla one valve, and ariſted with 3 awns at the point.

There are three ſpecies, viz. 1. The Aſcenſionis, a native of Aſcenſion Iſland. 2. The Americana, a native of Jamaica; and 3. The Plumoſa, a native of South America.

ARISTOCRACY, in national polity, implies a form of government, where the ſupreme authority is lodged in the nobility. This of all forms is the moſt liable to error, as faction and undue influence frequently overturn the juſt rights of juriſprudence. The republic of Venice is in many reſpects a form of government under this deſcription, but in others partakes of oligarchy. The beſt government in the power of human wiſdom to form, is that of two or three eſtates in the repreſentation of the people, headed by a limitted monarchy; where emulation ſeldom fails to reward thoſe whoſe deſerts merit the attention of the king and country they ſerve.

ARISTOTELIA, in antiquity, denote annual feaſts celebrated in honour of Ariſtotle, by the citizens of Stagira, out of gratitude for his having obtained a charter to rebuild their city from Alexander; which had been deſtroyed by Philip his father.

ARISTOTLEAN, or Aristotelian, implies ſomething that relates to Ariſtotle's philoſophy.

ARISTOTUS, in ichthyology, is a ſynonymous term for the ſhad.

Arithmetic is juſtly ſtiled the baſis of Mathematical Learning; for all the other branches are in ſome meaſure beholden to it, although it ſtands ſolely independent, and fixed upon its own principles.

It is therefore eſſentially neceſſary for every perſon, who deſires to attain a competent knowledge of the mathematics, to go regularly through the ſeveral rules of arithmetic, and to make himſelf fully acquainted with the properties of numbers.

In this Syſtem, I have arranged the ſeveral parts in the moſt natural order; having gone through Addition, Subtraction, Multiplication, and Diviſion of whole numbers, *and Reduction alſo, before I have entered upon Addition, Subtraction, &c. of* broken numbers, *or thoſe of different denominations; as it would be abſurd to expect any one to add up numbers, conſiſting of various denominations, (eſpecially where the ſums are large) without a previous knowledge how to reduce a Number of one denomination to that of another.*

I have alſo introduced Fractions and Decimals before the Rule of Three and other parts of Arithmetic, by which means the ſtudent is enabled to purſue the quickeſt and beſt methods of computation; and thereby much time is ſaved, which otherwiſe would be employed in purſuing ſuch inelegant and tedious forms of operation, as are in no caſe accommodated to the diſpatch of buſineſs.

In the Rule of Three I have given a better method of ſtating and judging of the nature of the queſtions, than has been hitherto in uſe.

I have likewiſe introduced ſeveral new methods of contracting Arithmetical Operations, and have advanced additional Caſes in ſome Rules, which I believe have never before appeared. Such are to be found under the Articles Multiplication, Rule of Three, Fellowship, Interest, Alligation, &c. *and in particular I have given the inveſtigation of a* GENERAL METHOD OF EXTRACTING THE ROOTS OF ALL POWERS BY PROPORTION, *together with another new and expeditious way of* extracting the Cube Root.

I have every where, either introduced more expeditious methods of operation, than have hitherto been given, or followed the beſt improvements of the moſt valuable authors, namely, Mr. Malcolm, Dr. Hutton, Mr. Emmerſon, Mr. Bonnycaſtle, &c.

Nothing in this Syſtem is inſerted upon the bare credit of others, having carefully gone through every computation; I have alſo extended the ſubject to its utmoſt limits, ſo that there is nothing belonging to it, but what is here amply treated of.

Excise Office, Broad Street. *R. MOODY.*

A NEW SYSTEM OF ARITHMETIC.

ARITHMETIC, from the Greek Αριθμετικὴ, is the art of numbering, or the art of computing by numbers.

When a number is made up, or compoſed of intire units, or individuals, it is called a *whole* number. That which is not ſo compoſed, but contains part of an unit, is named a *fractional* number. When an unit contains ten, an hundred, a thouſand, ten thouſand, &c. of ſuch parts, they are termed *decimal* parts, and the Arithmetic of Numbers in which they occur, is called *decimal Arithmetic*. When twelve of the parts make an unit, they are ſtiled *duodecimal* parts; and the Arithmetic thereof is named *duodecimal Arithmetic*.

If ſixty of the parts go to an unit, they are called *ſexageſimal* parts, and the proper management thereof in computations is termed *ſexageſimal Arithmetic*.

In general, every other kind of Arithmetic is named *common* or *vulgar Arithmetic*, except ſpecious or univerſal Arithmetic, for which ſee ALGEBRA.

That Arithmetic was practiſed very early in the world is beyond doubt, for the idea of number is conveyed from every thing about us; but when, where, or by whom it was firſt taught, there are no certain records. The Moſaic account of the Antedeluvian world affords a ſtrong preſumption, that the art of numbering had arrived to a tolerable degree of perfection before the flood. For their dividing the year into months and days, ſo little differing from the preſent diviſion of time, together with their ſtrict chronology of events, ſuch as the beginning, progreſs, and end of the Flood. The births, and ages of the patriarchs, &c. all argue their knowledge of numbers.

Wherefore, I cannot ſubſcribe with thoſe who think the art had its riſe among the Phœnicians, who are reputed to have been the firſt merchants after the Flood; though I doubt not but they cultivated and improved it; and it is probable, that by them it was carried into Egypt, and that it paſſed from thence into Greece.

In order to render Arithmetical computations uſeful to ſociety, the firſt thing would be to eſtabliſh ſome common method of notation, on which computations might be founded. It would then be natural to enquire into the relations and properties of numbers, and to invent methods of operation.

The Greeks, Hebrews, and other Eaſtern nations in their notation, uſed the letters of the alphabet; but their methods were confined and very incommodious, which rendered their computations exceeding difficult and laborious, as is obſervable from the ſpecimens in ſome of the fragments of Pappus, and the Commentaries of Utocius on Archimedes Treatiſe of the Circle.

The method of notation now in uſe with us, is ſaid to have been received from the Arabians, who learnt it of the Indians. The time of its invention is unknown; but that neither the ancient Greeks nor Romans were acquainted with it, is almoſt certain. For Maximus Planudes, who wrote about the beginning of the 14th century, is the firſt Greek writer who has treated of Arithmetic according to the preſent mode of numbering, which was at leaſt three hundred years after it was known in Europe. For Doctor Wallis has clearly evinced that a monk, named Gerbertus, (afterwards Pope Sylveſter II.) who did not die till A. D. 1003, was well acquainted with our notation, having learned it in Spain, from whence he carried it into France many years before his death.

It is reported that it came into Spain by means of the Moors; and it is almoſt certain, that it was in uſe in England as early as the middle of the 12th century. There is a book extant of Joannes de Sacra Boſco, which was written in England about the middle of the 13th century, according to the preſent notation; and conſiderable improvements had been here made in this kind of computations before then.

The oldeſt treatiſe on the theory of Arithmetic is comprized in the 7th, 8th, and 9th books of Euclid's Elements. It relates chiefly to the doctrine of Proportion, and Prime, and Compoſite Numbers. The next is that of Nichomacus, the Pythagorean; his treatiſe conſiſts chiefly of the diviſion of numbers into certain kinds and claſſes, as Plain, Solid, Triangular, Quadrangular, and other ſpecies of figurate numbers: alſo numbers odd and even, &c. Some are of opinion that Nichomacus lived before Euclid.

Boethus, who wrote a Latin Treatiſe of Arithmetic in the time of Theodorick, the Goth, is the next remarkable author on this ſubject; he, however, it is ſuppoſed took moſt of his works from Nichomacus. Afterwards Pſellus, and Jodochus Willichius, wrote in Greek, but none of theſe were acquainted with the Arabian notation. The firſt author of any conſequence who uſed the modern way of computing, was Jordanus of Namur. He flouriſhed about A. D. 1200: and his Arithmetic was afterwards publiſhed and demonſtrated by Joannes Faber Stapulenſis in the 15th century; who alſo himſelf publiſhed a treatiſe containing moſt of the propoſitions of Euclid and Boethus, with many other curious and uſeful theorems. The ſame author alſo wrote a book under the title of Algoriſmus Demonſtratus, illuſtrating the new art of computation by Arabic Figures, the manuſcript of which, as Doctor Wallis informs us, is in the Savillian Library at Oxford.

In A. D. 1499, an Italian, named Lucas de Burgo, publiſhed a valuable Treatiſe of Arithmetic, both as to Theory and Practice. Alſo in the courſe of the following century, Nicholas Tartaglia, an Italian; Clavius and Ramus, both Frenchmen; Stifelius and Heniſchius, Germans; Buckley, Diggs, and Record, &c. Engliſhmen; employed themſelves in improving the art.

Theſe have been followed by Wingate, Tacquet, Moor, Parſon, Baker, Kerſey, Wells, Kocker, Fiſher, and a variety of other authors too tedious to mention; indeed, authors on this ſubject are become almoſt innumerable.

Having given a ſhort hiſtorical account of Arithmetic, I ſhall proceed to ſhew its operations.

ARTICLE I.

NOTATION.

DEFINITION.

I. Notation is the art of expreſſing properly and methodically any propoſed number in figures or characters.

II. Number is the name of that idea or notion, under which, things, being conſidered, are ſaid to be *one* or *many*.

III. Every number is expreſſible by the due ordering of the following figures; viz. 1, which, of itſelf, ſignifies One, or an Unit; 2, which denotes two; 3, three; 4, four; 5, five; 6, ſix; 7, ſeven; 8, eight; 9, nine; 0, nothing.

IV. A whole number is compoſed of entire units.

V. A fractional number is either only ſome part or parts of an unit, or is compoſed both of entire units, and of ſome part or parts of an unit. In the former caſe, it is named a proper fraction; in the latter, it is called a mixed number.

VI. A whole number is alſo of two ſorts, ſimple and compound.

A ſimple whole number conſiſts either of entire units, tens, hundreds, thouſands, &c. not exceeding nine.

A compound whole number conſiſts not of either units, tens, hundreds, thouſands, &c. alone, but of ſome two or more of theſe combined.

For inſtance, ten, twenty, (or two tens) fifty, (or five tens) one hundred, three hundred, five thouſand, &c. are ſimple whole numbers. And twelve, (or ten and two) twenty-four, (or twenty and four) an hundred and forty-five, three thouſand two hundred and ſixty, &c. are compound whole numbers.

VII. As all units (under ten) are expreſſed by the nine digits, 1, 2, 3, 4, 5, 6, 7, 8, 9, ſo all ſimple whole numbers of tens, hundreds, thouſands, &c. are expreſſed by the ſame figures with cyphers annexed; tens having one cypher annexed; hundreds, two; thouſands, three, &c.

Thus 10, ſignifies ten; 20, twenty; 30, thirty; 40, forty; 300, three hundred; 5000, five thouſand, &c.

COR. Hence, a cypher, though of itſelf, or when alone, ſignifies nothing, yet, when placed to the right of any figure, it increaſes its value tenfold.

VIII. As compound whole numbers conſiſt of different ſimple whole numbers combined together, ſo ſuch numbers are expreſſed by the combining or joining together the ſeveral figures denoting them. Thus twenty-five conſiſts of 20 and 5; the cypher in the former denoting that there are no units, and ſignifies 20 without any addition; but, putting the five in the cypher's place, we have 25, which is the true expreſſion for twenty-five.

Again: three hundred and ſixty-four, conſiſts of 300, 60, and 4; but joining theſe together, 60 and 4 make 64, and joining this to 300, the whole is 364.

Furthermore, eight thouſand, four hundred and ſeventy-five, conſiſts of 8000; 400, 70, and 5; and 70 and 5 make 75; alſo 75 and 400, make 475; and 475 and 8000, make 8475, the propoſed number; and ſo for others.

COR. I. Hence the firſt place towards the right hand of any whole number, conſiſts of units; the ſecond, of tens; the third, of hundreds; the fourth, of thouſands; &c. the value of any figure being increaſed or decreaſed in value, according as its ſtation is removed one place more to the left or right hand.

COR. II. Hence, by this management, any number, however great, is eaſily and readily expreſſed.

Here follows a table, denoting the values of any number, to the hundred thouſand of millions.

Hundreds of Thouſands of Millions.	Tens of Thouſands of Millions.	Thouſands of Millions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thouſands.	Tens of Thouſands.	Thouſands.	Hundreds.	Tens.	Units.
4	5	6,	9	8	7,	5	6	2,	3	4	1

In this table, the firſt figure to the right, taken ſingly, denotes 1; if two are taken, they make 41; three, make three hundred and forty-one; four, two thouſand, three hundred and forty-one; five, ſixty-two thouſand, three hundred and forty-one; ſix, five hundred and ſixty-two thouſand, three hundred and forty-one; ſeven, ſeven millions, five hundred and ſixty-two thouſand, three hundred and forty-one; eight, eighty-ſeven millions, five hundred, &c. &c. as before; nine, nine hundred and eighty-ſeven millions, five hundred, &c. &c. ten, ſix thouſand, nine hundred and eighty-ſeven millions, &c. &c. eleven, fifty-ſix thouſand, nine hundred and eighty-ſeven millions, &c. &c. twelve, four hundred and fifty-ſix thouſand, nine hundred and eighty-ſeven million, &c. &c. And after this manner any other numbers, let the figures be what they may, are to be read.

Thus, 678075302, ſignifies ſix hundred and ſeventy-eight millions, ſeventy-five thouſand, three hundred and two; alſo, 20367540213, ſignifies twenty thouſand, three hundred and ſixty-ſeven millions, five hundred and forty thouſand, two hundred and thirteen.

N. B. It will be uſeful, in reading large numbers, to point them off at every three figures, as every three are run off together in the reading. Thus, in the laſt example, the firſt three are taken together, the next three are read in like manner, only the word thouſands is added; the next three are diſtinguiſhed by the word millions following in the reading. If there were three more, they would ſtill be read the ſame way, only the word thouſands would again follow; after the next three, millions of millions, (by ſome termed billions) after the next three, thouſands again; after the next, millions of millions of millions, (or trillions) and ſo on; the word thouſand, and the repetition of millions of millions of millions of millions, &c. or quadrillions, quintillions, &c. according to the value, following each other alternately in the reading.

The following is a Synopſis of the Roman Notation, by Letters of the Alphabet.

1	is denoted by	I	50=L
2	by	II	100=C
3		III	500=D or IƆ
4	IIII or	IV	1000=M or CIƆ
5		V	2000=MM
6		VI	5000=IƆƆ or $\overline{\text{V}}$
7		VII	6000=$\overline{\text{VI}}$
8		VIII	10000=$\overline{\text{X}}$ or CCIƆƆ
9		IX	50000=IƆƆƆ
10		X	60000=$\overline{\text{LX}}$
11		XI	
12		XII	100000=$\overline{\text{C}}$ or CCCIƆƆƆ
13		XIII	500000=IƆƆƆƆ
14		XIV	1000000=$\overline{\text{M}}$ or CCCCIƆƆƆƆ
15		XV	2000000=$\overline{\text{MM}}$
16		XVI	5000000=IƆƆƆƆƆ or $\overline{\text{IƆƆ}}$
17		XVII	10000000=$\overline{\text{CCIƆƆ}}$
18		XVIII	
19		XIX	50000000=$\overline{\text{IƆƆƆ}}$
20		XX	&c. &c.

Remarks on this Notation.

1ſt. As often as any character is repeated, ſo many times its value is repeated.

2d. A character of inferior value, with reſpect to another character, does, when placed before the ſame, diminiſh its value by the value of ſuch inferior character; but, if placed after it, the value thereof is ſo much increaſed.

3d. Every Ɔ affixed to this character IƆ (500) increaſes its value ten-fold.

4th. Every time a C and Ɔ are placed at each end of this character, CIƆ (1000) its value is increaſed ten-fold.

5th. A Line over any character increaſes its value a thouſand-fold.

By a ſlight compare of the two Notations, it is obvious how much ſuperior the preſent mode of numbering is to the old Roman method; both as being more ſimple and eaſy, and infinitely better accommodated to Arithmetical Operations.

The Characters or Signs made Uſe of in this Syſtem.

1ſt. This character (+) placed between two numbers, denotes that they are to be added together.

2d. This ſign (—) put between two numbers, ſhews that the latter is to be ſubtracted from the former.

3d. When this mark (×) is put between two numbers, it ſignifies that they are to be multiplied together.

4th. This character (÷) being between two numbers, denotes that the former muſt be divided by the latter.

Note alſo, if two numbers be placed one above another, with a line between them, it ſignifies that the upper number is to be divided by the under one.

5th. A figure of 2 put over any number, denotes the ſquare thereof, a figure of 3, the cube thereof, a figure of 4, the biquadrate thereof, &c. Thus, 4^2, 4^3, 4^4, denote the ſquare, cube, and biquadrate of 4, reſpectively.

6th. This ſign (√) prefixed to any number, ſignifies that the ſquare root thereof is to be extracted; and if a 3, 4, 5, &c. be put over this character, it ſhews that the cube, biquadrate, ſur-ſolid, &c. root, is to be extracted.

7th. When two points (:) are placed between two numbers, and four points (∷) between the next two, it indicates that theſe numbers are proportional. Thus, 2 : 4 ∷ 6 : 12, muſt be read thus: As 2 is to 4 ſo is 6 to 12.

8th. A line or vinculum (————) drawn over the top of numbers, ſhews that they are to be taken as one compound quantity.

ARTICLE II.

ADDITION OF WHOLE NUMBERS.

DEFINITION.

Addition is the method of collecting certain given numbers into one, which ſhall be equivalent to the whole.

AXIOM. The whole is equal to all its parts taken together. Hence this

RULE. Place all the numbers one under another, in ſuch order that the units place of each may exhibit one diſtinct row, the tens place of each another diſtinct row, the hundreds place another, the thouſands another, &c. drawing a line underneath the whole. Then begin at the unit's place, and reckon up all the figures in that row, writing down the overplus, above entire tens, under the line, and bearing in mind ſo many to be carried and added to the next row, as there are tens in the firſt. Then the row of tens, being accordingly added up, together with what was carried, the overplus which remains above entire tens, muſt be put down below the line, under the ten's place; and one for each ten muſt be carried to the next row, and the proceſs continued in this manner through each column; obſerving to write under the laſt row, the whole ſum.

N. B. When there is no exceſs above the tens, write a cypher under the column.

EXAMPLES.

3278	78426	40325
4152	54315	1072
673	67820	128
4028	47853	54320
7068	69542	7809
3254	57869	3456
782	34578	876
4630	78456	327
2043	47807	48728
Sum 29908	Sum 536666	Sum 157041

Here, in the firſt example, having placed the ſeveral ſums, one below another, and drawn a line under them, as directed above, I begin with the unit's column, ſaying 3 and 2 are 5, and 4 make 9, and 8, 17; and 8, 25; and 3, 28; and 2, 30, and 8, 38. I ſet down the overplus 8, and carry 3 for the three tens to the next column, which, on caſting up, I find amounts to 50; wherefore, as there is no overplus above the tens, I ſet down 0, and carry 5 to the next row, which I add up in like manner, and find it amounts to 29; I therefore ſet down 9, and carry 2 to the laſt row, the amount of which I find to be 29; I place down 29 accordingly, and ſo the whole ſum is 29908. Obſerve the ſame method in the other examples.

N. B. Addition is proved by beginning at the top and caſting each row downwards.

ARTICLE III.

SUBTRACTION OF WHOLE NUMBERS.

DEFINITION.

Subtraction is the taking of one number from another, in order to find their difference.

RULE. Place the greater number uppermoſt, ſo that units may be under units, tens under tens, &c. and draw a line under them. Then begin at the unit's place, and take the lower figure from the upper, placing down the difference underneath them; and do ſo with the reſt of the figures. But if the lower figure in any inſtance is greater than the upper, 10 muſt be added to the upper figure, and, ſubtraction being made, 1 muſt be carried to the next lower figure, and the ſum muſt be ſubtracted from the figure which is above the ſame, placing down the remainder, and proceeding agreeably to theſe directions with each row.

EXAMPLES.

From	4286	From	478023	From	678092
Take	3242	Take	67842	Take	589764
Remainder	1044	Remaind.	410181	Remaind.	88328

Here, in the firſt example, the numbers being properly placed, and a line drawn as directed, I proceed thus: Take 2 from 6 and there reſts 4, which I put down: then I ſay, take 4 from 8, and there reſts 4; take 2 from 2 and there reſts 0: and take 3 from 4 and there remains 1; each of which remainders I write down under its proper figure, and the whole is 1044.

In the ſecond example, I ſay 2 from 3 and there reſts 1; 4 from 2 I cannot take, but borrowing 10 to put to it, it becomes 12, from which taking 4, the remainder is 8; then I carry 1 to 8, and ſo it becomes 9; and as 9 cannot be ſubtracted from 0, I again borrow 10, and the remainder is 1; then I carry 1 to 7, and ſo ſubtracting, the remainder is 0. Alſo, 6 from 7, and there reſts 1, and nothing from 4 leaves 4; therefore the whole remainder is 410181: and ſo for any other.

N. B. Subtraction is proved by adding the remainder and the under line, or number ſubtracted, together; for, if their ſum be equal to the upper line, the work is right; otherwiſe not.

ARTICLE IV.

MULTIPLICATION OF WHOLE NUMBERS.

DEFINITION.

Multiplication is a compendious method of performing a manifold addition of the ſame number. But before any thing can be done, the following table muſt be perfectly got by heart.

MULTIPLICATION TABLE.

Explanation of the TABLE.

To find the Product of two figures, look for one of the figures in the top row, and for the other in the ſide row; then, in the angle of meeting is their Product.

Thus the Product of 5 and 8 is 40, and of 6 and 9 is 54.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

General Rule for Multiplication.

Place the number (or number given to multiply by) under the multiplicand, (or the number to be multiplied) ſo that units may be under units, tens under tens, &c. and draw a line under them. Then begin with the unit's figure of the multiplier, (if it conſiſt of more than one) and by it multiply the unit's figure of the multiplicand. Set down the overplus above the tens, below the line, in the unit's place, and for each ten bear in mind 1 to be added to the next product. Then, by the ſame figure, multiply the next figure of the multiplicand, adding ſo many units as there were tens in the laſt product, and placing down the overplus as before. Proceed thus till each figure in the multiplicand has been multiplied by the firſt figure in the multiplier, writing down the product of the laſt entire. Then take the ſecond figure of the multiplier, and multiply thereby as with the firſt, placing the firſt figure of the product under the figure which you multiply with. Do ſo with each figure in the multiplier, ſo will the ſum of thoſe products be the Product required.

EXAMPLE I.

```
Multiply   468352
     By         6
          -------
Product   2810112
```

EXAMPLE II.

```
Multiply   6084358
     By         11
          --------
Product   66927938
```

EXAMPLE III.

```
Multiply     84308765
     By           243
          -----------
            252926295
           337235060
          168617530
          -----------
          20487029895
```

Here, in the firſt example, I multiply the firſt figure of the multiplicand by 6, ſaying 6 times 2 are 12; I ſet down the 2, and carry 1; then I proceed to the next figure, and ſay 6 times 5 are 30, and 1 that I carry, make 31; I ſet down 1, and carry 3, ſaying 6 times 3 are 18, and 3 make 21. I put down 1, and carry 2; proceeding to the next figure, whoſe product by 6 is 48, and 2 which are carried make 50; ſo I write down 0, and carry 5; then the product of the next figure is 36, and 5 which are carried, make 41; therefore, I place down 1 and carry 4; the laſt product is 24, and 4 which are carried make it 28, which I write down, and ſo the whole Product is 2810112.

In like manner the ſecond example is performed.

In the third example, I firſt multiply by 3, the unit's figure of the multiplier, ſetting down the whole Product 252926295, as above; then I multiply by 4, placing the firſt figure of the product directly under it, in the ten's place, and the reſt of the figures in the proper order as they follow each other. Laſtly, I multiply by 2, and place the firſt figure of the product under it in the third place, and the reſt in regular order as they come. Then the ſum of the products, caſt up in the order they ſtand, is 20487029895, which is the Product required.

Note. The ſecond example might have been done according to the manner of the third, by making two products, 1 being the multiplier each time.

EXAMPLE IV.

```
Multiply       42786307
     By          218403
          -------------
              128358921
          1711452280
           342290456
          42786307
         85572614
          -------------
Product  9344657807721
```

EXAMPLE V.

```
Multiply          68901478
     By            4567318
          ----------------
                 551211824
                68901478
              206704434
             482310346
            413408868
           344507390
          275605912
          ----------------
Product   314694960696004
```

COR. I. When either the multiplicand, multiplier, or both, have cyphers on the right hand, then multiply the ſignificant figures according to the former rule; and annex to the product as many cyphers as there are in the multiplicand and multiplier.

EXAMPLE. Let 8430876500 be multiplied by 243000.

Here, 84308765 multiplied by 243, the Product is 20487029895; to which annexing five cyphers (the number in both the multiplicand and multiplier) it becomes 2048702989500000, which is the Product required.

COR. II. Hence, if the multiplier be 10, 100, 1000, 10000, &c. the product is had by annexing as many cyphers to the multiplicand as there are in the multiplier. Thus the product of 246875 by 10 is 2468750; by 100, it is 24687500; by 1000, it is 246875000, &c.

COR. III. When the multiplier is a compoſite number, that is a number which conſiſts of complete factors, or in other words, is the product of ſome two or more numbers, then the multiplicand being multiplied by one of the factors, and that product by the other, and ſo on for each factor, the laſt product will be the product anſwering the whole; and by this method the trouble of adding two or more lines may frequently be ſaved.

EXAMPLE. Let 785364 be multiplied by 48.

Here the number 48 conſiſts of the factors 6 and 8. Whereſore I multiply 785364 by 8, and the product is 6282912, which multiplied by 6, gives 37697472, the anſwer ſought, and ſo the addition of two lines is ſaved.

N. B. It would have been the ſame if the firſt product had been made by 6, and the next by 8; for it is an indifferent thing in whatever order the factors are taken.

Alſo, in any numbers the multiplicand may be made the multiplier, and the multiplier the multiplicand, at pleaſure, according as it ſhall appear to be the moſt advantageous in the operation.

COR. IV. When the multiplier is any number above 10 and under 20, ſet the product made by the unit figure a place further to the right hand, and add thereto the multiplicand, or the multiplicand may be added by taking a figure at a time, as you proceed on in the operation after you have multiplied the firſt figure in the multiplicand.

EXAMP. Let 46302 be multiplied by 17. The operation is as below.

```
  Firſt Method.                Second Method.
46302                            46302
524114 Product by 7.                17
------                          ------
987134 Product.                 987134 Product.
```

Explanation of the Second Method.

Firſt, I multiply the unit's figure of the multiplicand by 7, and ſet down the overplus which is 4, and carry 1; then I multiply the next figure, or cypher, and take in the unit's figure of the multiplicand together with what was carried, and the whole is 3. Then I multiply the next figure which is 3, taking in the figure in the ten's place of the multiplicand; which in this inſtance, being only a cypher, does not augment the product. In like manner, I proceed to the next figure; the product thereby is 42, which, with 2 which was to be carried, and the figure in the hundreds place of the multiplicand, namely, 3 makes 47. I ſet down 7 and carry

4,

4, and thus proceed to the end, taking in a figure of the multiplicand each time. This, when it becomes familiar, is exceeding eaſy, and will ſave the writing of many needleſs figures.

N. B. In the ſame way when the multiplier is above 110, and leſs than 120, the product will be had by taking in the firſt figure of the multiplicand when you come to the ten's place, and the firſt and ſecond when you come to the hundred's place; afterwards the 2d and 3d, the 3d and 4th, and ſo on till the multiplication is compleated.

Cor. V. When the multiplier conſiſts of two figures and the unit's place is 1, multiply by the figure in the ten's place, and at each multiplication take in a figure of the multiplicand. The firſt figure ſo taken in muſt be that in the ten's place, the next that in the hundred's, &c. leaving out the unit's figure, but annexing the ſame to the product on the right, ſo that it may therein obtain the place of units.

Example. Multiply 634 by 21.

Here, in multiplying by 2, I take in 3 the firſt time, which makes the product 11, I ſet down 1 and carry 1, and the next time I take in the 6, which makes the product 13; I ſet down 3, and carry 1, and ſo the next product is 13, which I ſet down; and, by annexing the unit's figure to the number it becomes 13314, the product ſought.

634
21
13314

Cor. VI. When the multiplier is 100, 1000, 10000, &c. wanting any number conſiſting of two figures, of which either the firſt or ſecond figure is an unit, then multiply the multiplicand by the number ſo wanting; having previouſly annexed thereto, 2, 3, 4, &c. cyphers, as the caſe ſhall be, and the remainder will be the anſwer.

Thus let 54327 be multiplied by 988. Here the multiplier is 1000, wanting 12; therefore I multiply 54327, by 12, and the product is 6519324; which, ſubtracted from 54327000, leaves 53675076, the anſwer required.

Cor. VII. When in the multiplier, ſome two or more adjacent figures are equal to ſome multiple of another figure therein, the operation may be abbreviated by multiplying firſt by that other figure, and then that product by the figure which denotes the multiple, and adding the products together, having placed them ſo that the firſt figure of each row, or product, may ſtand under the firſt figure of thoſe in the multiplier, whoſe product, by the multiplicand, ſuch row denotes.

Example I.

Multiply 408765
By 3612
4905180
14715540
Product 1476459180

Example II.

Multiply 4675231
By 324981
42077079
378693711
1514774844
1519362245611

Explanation.

In the firſt example, I begin with multiplying by 12, and then I multiply that product by 3; becauſe, three times 12 are equal to the next two figures 36. I place the products down as above, and their ſum is the whole product required.

In the ſecond example, the firſt row of figures obtained, is the product by 9; the ſecond is taken equal to 9 times the firſt row; becauſe, 9 times 9, are equal to the firſt two figures (81), and the third row is taken equal to 4 times the ſecond row; becauſe, 4 times 81, are equal to the three laſt figures (324).

Their ſum, according to the due order in which they are placed, is 1519362245611, the product required.

In both theſe examples, the operations are performed with half the trouble and half the figures, which are required by the common method.

Schol. It will frequently happen that great advantages may be derived from the joint application of theſe ſeveral methods.

Thus. If the multiplier is 12816; the product for the firſt two figures, viz. 16, may be had in one line by Cor. IV. and the product for the laſt three will be had by multiplying that product by 8; becauſe 8 times 16, are equal to 128. And the product, by the whole, will be equal to the ſum of theſe two when placed in due order. This mode of contraction is not treated of by any author that I have read; nor, indeed, do I know of any perſon that has ever hit upon it, but myſelf.

Its uſe is very great, for it will ſeldom happen in the courſe of buſineſs but ſome advantage from it will accrue, either by rendering the operations ſhorter or more eaſy, or both; wherefore, I am happy in having the opportunity of communicating in the New Royal Encyclopædia, ſo uſeful an improvement in Arithmetical Calculations. A variety of foms of proceeding in different caſes might have been enumerated, but our limits confine me to paſs on to other matters; I am, however, perſuaded that what has been ſhewn, will prove a ſufficient leſſon to an ingenious mind.

ARTICLE V.

DIVISION OF WHOLE NUMBERS.

Definition.

As multiplication teacheth how to find the amount of any number when repeated a given number of times, ſo Diviſion, by having both the number and amount given, teacheth to diſcover how often ſuch number had been repeated in order to give that amount; or, by having, inſtead of the number, the number of times it was repeated, given; the number itſelf, (though, before unknown) is by this art found out.

Briefly, it is the art of finding ſuch a part of the dividend as the diviſor expreſſes; or, of diſcovering how often one number is contained in another.

General Rule. Set down the number to be divided (called the dividend) and the number by which the diviſion is to be made (named the diviſor) on the left hand thereof, but ſeparated from it by a crooked line. Alſo make another crooked line on the right hand, beyond which the figures ariſing by the diviſion (named the quotient) are to be placed.

Then take a part of the dividend, including as many figures to the left hand, as there are figures in the diviſor; or, one more, if the number expreſſed by them, when ſo taken, is leſs than the diviſor; and find how often the diviſor is contained in, or can be taken out of ſuch part of the dividend, (which generally may be diſcovered on a compare of the firſt, or two firſt figures of each) and place the figure which denotes the number of times in the quotient; obſerving to multiply the diviſor thereby, to ſubtract the product from the part of the dividend aforeſaid, and to note down the remainder.

Then annex to the remainder the next following figure in the dividend, and find how often the diviſor is contained in this number, (uſually called the dividual) placing the figure, which expreſſes the number of times in the quotient, and multiplying and ſubtracting as before.

Annex the next figure of the dividend to the remainder, and proceed again as above, continuing to do ſo, till all the figures of the dividend are in this manner brought into the operation.

N. B. When after a figure of the dividend has been annexed to a remainder, the number is leſs than the diviſor, a cypher muſt be placed in the quotient, and another figure of the dividend muſt be annexed; and the ſame muſt be repeated again, if the dividual is ſtill leſs than the diviſor.

Note alſo, That if after ſubtraction is made, the remainder is greater than the diviſor, the quotient figure has been taken too little, and muſt be ſo increaſed as to cauſe the remainder to be leſs than the diviſor.

Example I.

Divide 42674 by 26.
Divr. Divid. Quot.
26) 4264 (164
26
166
156
104
104
. . .

Example II.

Divide 378965 by 481.
Divr. Divid. Quot.
481) 378965 (787
3367
4226
3848
3785
3367
418 Remains.

Here in the firſt example, having placed the dividend and diviſor, as directed, I take the firſt two figures of the dividend, namely, 46, and enquire how often 26 is contained therein, and find it to be but once; I therefore place 1 in the quotient, and ſubtract 26 from 42, and the remainder is 16; to which I annex the next figure of the dividend, namely, 6; and ſo the dividual is 166. I now enquire how often 26 is contained in 166, and find it is contained ſix times; I place 6 in the quotient, and multiply the diviſor by 6, ſubtracting the product from 166; the remainder is 10, to which I annex the other figure of the dividend, namely, 4, and the dividual is conſeqnently 104. Again, I enquire how often the diviſor is contained in 104, and I find it is contained four times therein. I place 4 in the quotient, and multiply the diviſor thereby; the product is 104, therefore there is no remainder, and the whole quotient is 164.

The ſecond example is wrought in like manner, only in it there is a remainder after the diviſion is finiſhed of 418, which ſhews that the quotient is 787, and 418 parts out of 481 of another unit, viz. if 1 be divided into 481 parts, then the exact quotient is 787, and 418 of ſuch parts. Such parts are called fractions, and are expreſſed by placing the remainder over the diviſor, with a line between them, thus $\frac{418}{481}$. The upper number is named the numerator of the fraction, becauſe it expreſſes the number of the parts; and the lower number is called the denominator, becauſe, by it is underſtood of what denomination ſuch parts are. The whole quotient, therefore, will ſtand thus 787 $\frac{418}{481}$. But of fractions, and their operations, I ſhall treat hereafter.

Schol. When the diviſor is very large, and it appears that the quotient will conſiſt of a great many figures, it is adviſeable to multiply the diviſor by all the nine digits ſeverally, and place the products in a table, before one begins the operation, for by that means the quotient figure, as well as the product of it, and the diviſor, will always be had by inſpection, and ſo the buſineſs will conſiſt merely in ſubtracting.

Example. Divide 487654327861 by 246874.

Table.

246874	1
493748	2
740622	3
987496	4
1234370	5
1481244	6
1728118	7
1974992	8
2221866	9

```
Diviſor.    Dividend.     Quotient.
 246874 )487654327861 (1165186
         246874
         ------
         407803
         246874
         -------
         1609292
         1481244
         -------
          1280487
          1234370
          -------
            461178
            246874
            -------
            2143046
            1974992
            -------
             1680541
             1481244
             -------
              199297 Remainder.
```

Cor. I. When the diviſor does not exceed 12, it is unneceſſary to ſet down all the ſeveral products and ſubtract as has been taught, becauſe the proceſs at each figure may very well be comprehended in the mind without that trouble, and ſo as nothing in ſuch caſe is requiſite but to put down the quotient figures, it will make the work appear more conciſe and methodical to write them down under the dividend as they ariſe, a line of ſeparation having firſt been drawn.

Example I.

Divide 478654 by 6.

```
Diviſor.  Dividend.
     6 ) 478654
         ------
Quotient  79775 4/6
```

Example II.

Divide 68743254 by 11.

```
Diviſor.  Dividend.
    11 ) 68743254
         --------
Quotient  6249386 8/11
```

Here, in the firſt example, I aſk how oft 6 in 47, the anſwer is 7 times, for 7 times 6 is 42, and conſequently there remains 5, which is expreſſive of ſo many tens, and which carried to the next figure (8) of the dividend, they make 58; then I ſay, how oft 6 in 58? the anſwer is 9 times, and 4 remains, which carried to the next figure, they make 46; the ſixes in 46 are 7, and 4 remains; then the ſixes in 45 are 7, and 3 remains; and the ſixes in 34 are 5, and 4 remains, which I place over the 6 in manner of a fraction, and ſo the quotient is 79775$\frac{4}{6}$.

The other example is done after the ſame manner.

Cor. II. If the diviſor have cyphers towards the right hand, cut off ſo many of the right hand places of the dividend as there are ſuch cyphers in the diviſor; then, rejecting the cyphers in the diviſor, proceed to work as before; and, when the operation is finiſhed, annex the figures cut off to the remainder.

Thus, let the dividend be 46784, and the diviſor 300. I cut off two figures; viz. 84, from the dividend, and divide the reſt 467 by 3; the quotient is 155, and 2 remains; to which remainder I annex 85, the figures cut off, and it becomes 285, and ſo the quotient is 155$\frac{285}{300}$. The ſame muſt be obſerved for any other ſuch diviſor.

Cor. III. When the diviſor is 10, 100, 1000, 10000, &c. cut off ſo many figures to the right hand as the diviſor contains cyphers; then thoſe to the left will be the quotient, and the right hand figures will be the remainder.

Thus, let the dividend be 687543287, and the diviſor 1000; then three figures being cut off, the quotient is 687543, and the remainder 287; or the full quotient is 687543$\frac{287}{1000}$.

Cor. IV. When the diviſor is a compoſite number, that is, a number which is the product of two or more ſmall numbers, then divide by one of ſuch ſmall numbers, and that quotient by another, and ſo on till a diviſion has been made by each of them, and the laſt quotient will be the anſwer.

N. B. If there are remainders in the operation, multiply the laſt remainder by the laſt diviſor but one, taking in the remainder belonging to ſuch diviſor, (if any) then multiply that ſum by the laſt diviſor but two, and take in the remainder belonging to it, proceeding thus till you have multiplied by the firſt diviſor, and taken in the firſt remainder, (if any) and the reſult will be the remainder, anſwerable to the whole diviſor.

Example. Divide 47876 by 48.

Here firſt divide by 8, and the quotient is 5984, with a remainder of 4; then I divide this quotient by 6, and the next quotient is 997, with a remainder of 2. I multiply this laſt remainder by 8, taking in the firſt remainder, and the reſult is 20. So the true anſwer is 997$\frac{20}{48}$.

Schol. The beſt way of proving Diviſion is to multiply the quotient by the diviſor, taking in the remainder; and if the reſult be the ſame with the dividend, the work is right, otherwiſe not.

Alſo, the beſt way of proving Multiplication is by Diviſion; for if the product, when divided by the multiplier, give the multiplicand, the operation is true, otherwiſe it is not ſo.

The old method of proving Multiplication and Diviſion, by caſting out the nines, is not worth attending to, for it will often happen that the operation according to it will appear to be right, when the ſame is notwithſtanding wrong.

ARTICLE VI.

REDUCTION OF MONEY, WEIGHTS, MEASURES, &c.

Definition.

Reduction, properly ſpeaking, is not a Rule in Arithmetic, but is rather the application of Multiplication and Diviſion, in reducing money, weights, meaſures, &c. of any denomination to another. It includes three caſes.

Case I. If numbers of a greater denomination are to be reduced to their equivalents of a leſs, multiply continually by the number of the next inferior denomination which is equivalent to one of the greater, till you arrive at the required denomination, adding to each product, by the way, thoſe of the ſame denomination with itſelf, if ſuch there be, and the laſt product will be the anſwer. This is called Reduction Deſcending.

Case II. If numbers of a leſs denomination are to be reduced to their equivalents of a greater, divide continually by ſuch number as makes one of the next greater denomination, till you arrive at the required denomination, and the laſt quotient, with the ſeveral remainders, (if any) will be the anſwer. This is named Reduction Aſcending.

Case III. When a number of any propoſed denomination cannot be reduced to that required by Multiplication or Diviſion alone, both Rules are to be uſed promiſcuouſly; ſo that by one it may be reduced to ſuch a denomination as may by the other be reduced to the required denomination.

Note. When in Reduction Aſcending you have remainders, each will be of the ſame denomination with its reſpective dividend.

N. B. In this buſineſs, as well as in many of the following articles, it will be requiſite to have recourſe to Tables of Coin, Weights, Meaſures, &c. Such Tables will be given under their proper heads, namely, Coin, Weights, Meaſures, &c. and therefore it will be ſuperfluous to enumerate them here.

Example I.

Of Money. Descending.

In 32l. 14s. 6$\frac{1}{4}$d. how many farthings?

Operation.

```
        32   14   6¼
        20
       ---
       654 (adding 14)
        12
      ----
      7854 (adding 6)
         4
     -----
Anſw. 31419 (adding 3)
```

Example II.

Of Money. Ascending.

In 31419 farthings, how many pounds?

Operation.

```
 4 ) 31419
     -----
12 ) 7854 + ¼
     ---------
2|0 ) 65|4 + 6d.
      ---------
       32 + 14s.
     -------------
     32l. 14s. 6¼d.
```

Example III.

In 4674 crowns, how many guineas?

Operation.

```
  4674 crowns
     5 ſhillings in 1 crown
 -----
3)23370 ſhillings in all.
  -----
 7)7790
   ----
   1112 remainder 6.
Anſ. 1112 guineas and 18 ſhill.
```

Example IV.

In 1112 guineas and 18 ſhillings, how many crowns?

Operation.

```
Guineas. ſhillings.
  1112   18
    21
  ----
  1120 (taking in 8)
 2225  (taking in 1)
 -----
5)23370 number of ſhillings.
Anſ. 4674 crowns.
```

Example V.

In 3 cwt. 2 qrs. 14 lb. 10 oz. avoirdupoiſe, how many ounces?

Operation.

```
Cwt. qrs. lb. oz.
  3   2   14  10
  4
 --
 14
  28
 ---
 116
  29
 ---
 406
  16
 ----
 2436
 407
 ----
 6506 Anſwer.
```

Example VI.

In 420 gallons of beer, how many pints?

Operation.

```
 Gallons.
   420
     4
  ----
  1680 quarts.
     2
  ----
Anſw. 3360 pints.
```

EXAMPLE VII.

In 24 weeks how many minutes ?

24 weeks.
7
168 days.
24
672
336
4032 hours.
60
Anſw. 241920 minutes.

EXAMPLE VIII.

In 420 ells Engliſh, how many ells Flemiſh ?

420 ells Engliſh.
5
3) 2100 quarters.
Anſw. 700 ells Flemiſh.

EXAMPLE IX.

If 3 barley-corns make an inch, how many barley-corns will reach round the globe of the earth, ſuppoſing the circumference to be 360 degrees, and each degree to contain 70 Engliſh miles?

360 degrees.
70
25200 miles.
1760
1512000
428400
44352000 yards.
3
133056000 feet.
12
1596672000 inches.
3
Anſ. 4790016000 barley-corns.

ARTICLE VII.

ADDITION OF NUMBERS OF DIFFERENT DENOMINATIONS.

RULE. Place all numbers of the ſame denomination, directly under each other, obſerving to place the columns in ſuch order that the higheſt denomination may ſtand firſt towards the left hand, and the next inferior denomination next towards the right hand; and ſo on, that the loweſt denomination may obtain the farthermoſt place to the right hand, and draw a line under them. Then begin at the leaſt denomination; and add up all the figures in that row as in addition of whole numbers, and find by reduction how many of the next ſuperior denomination the ſum contains; carry the ſame to the next row, but writing down the overplus (if any) under the leaſt denomination, or the row which has been added.

Then add up the next row together with what was carried; finding, as before, how many of the next ſuperior denomination are contained in the ſum, in order to be carried to the next row, and writing down the overplus. Proceed in this manner till you come at the higheſt denomination, which muſt be added up and wrote down in all reſpects as in addition of whole numbers.

EXAMPLE I.

l.	s.	d.
241	14	6
123	10	4½
47	13	10¼
63	18	11
114	9	7½
57	16	0½
649	3	3¼

EXAMPLE II.

Troy Weight.

lb.	oz.	dwt.	grs.
47	11	15	14
14	9	13	15
71	10	10	10
67	10	15	17
81	9	10	18
12	10	4	0
297	2	10	2

EXAMPLE III.

Land Meaſure.

Acr.	Roods	Perch.
3	3	37
72	1	4
21	2	16
76	1	0
9	0	3
183	0	20

EXAMPLE IV.

Dry Meaſure.

Buſh.	Pecks	Gal.	Pts.
7	3	1	7
19	1	0	6
8	2	1	2
6	1	1	4
2	3	0	5
46	0	0	0

EXAMPLE V.

Cloth Meaſure.

Eng. Ells	Qr.	Nails
70	4	3
61	3	2
16	2	1
10	1	0
3	0	2
162	2	0

Here, in the firſt example, I begin and caſt up the column of farthings, and the ſum is 7, or 1 penny and 3 farthings; I ſet down ¾, and carry 1 to the row of pence; the amount of which I find to be 39, or 3 ſhillings and 3 pence. I ſet down the 3 pence, and carry 3 to the row of ſhillings, which I add up and find it amounts to 83, or 4 pounds 3 ſhillings. I put down 3 ſhillings, and carry 4 to the pounds, which I add up as in common addition. The whole ſum is 649l. 3s. 3¼d.

The reſt of the examples are equally eaſy, due regard being had to the different denominations, and how many of an inferior kind make one of the next ſuperior.

N. B. In order to facilitate the addition of money, ſome writers give what they call a Pence Table, in manner following.

PENCE TABLE.

d.		s.	d.	d.		s.	d.
20	is	1	8	130	is	10	10
30	—	2	6	140	—	11	8
40	—	3	4	150	—	12	6
50	—	4	2	160	—	13	4
60	—	5	0	170	—	14	2
70	—	5	10	180	—	15	0
80	—	6	8	190	—	15	10
90	—	7	6	200	—	16	8
100	—	8	4	210	—	17	6
110	—	9	2	220	—	18	4
120	—	10	0	230	—	19	2
				240	£	1	0 0

ARTICLE VIII.

SUBTRACTION OF MIXT NUMBERS, OR NUMBERS OF DIFFERENT DENOMINATIONS.

RULE. Place the leſs number under the greater, and in ſuch order as directed in addition; drawing a line under them. Then, beginning at the leaſt denomination, take the under numbers from the upper, and ſet down their reſpective remainders under them. But in caſe the under number of any denomination is greater than the upper, borrow one of the next ſuperior denomination, viz. add as many to the upper number as make 1, in the next higher denomination, and ſubtract as before, carrying 1 to the under line of the next ſuperior denomination, for that which was borrowed.

Note, the higheſt denomination muſt be ſubtracted as integers.

EXAMPLE I.

Money.

	l.	s.	d.
From	27	10	6½
Take	18	12	7¼
Rem.	8	17	11¼

EXAMPLE II.

Avoirdupoiſe Weight.

	Tons	cwt.	qr.	lb.	oz.	dr.
From	27	12	1	15	13	14
Take	18	16	2	13	15	15
Rem.	8	15	3	1	13	15

As our intention is to be brief, where much explanation is not required, I ſhall not enumerate further examples. Thoſe who underſtand one properly, will do any other with the ſame eaſe; and a due attention to the rule, together with what has been taught before, is amply ſufficient for the underſtanding of theſe examples.

ARTICLE IX.

TO MULTIPLY MIXT NUMBERS, OR NUMBER OF DIFFERENT DENOMINATIONS.

RULE. Place the multiplier under the number of the leaſt denomination, and having multiplied it, reduce the product to the next inferior denomination, ſetting down the overplus, and carrying the quotient to be added in the multiplying of the next row; proceed thus through each denomination.

N. B. When the multiplier is a compoſite number, multiply by the factors, as in multiplication of whole numbers.

Note alſo, if the number is above 12, and not compoſite, find the product for the neareſt compoſite number; then find the product for the exceſs, or defect, of the given number, and ſubtract it from, or add it to, the former product, (according as the caſe ſhall require) and the difference or ſum will be the anſwer ſought.

EXAMPLE I.

What is the value of 9 cwt. of ſugar, at

l. s. d.
4 17 11¾ per cwt.
9
£. 44 1 9¾ Anſwer.

EXAMPLE II.

What is the value of 12lb. of tea, at

s. d.
7 8½ per lb.
12
£. 4 12 6

EXAMPLE III.

What comes 100lb. of raiſins to, at 7½ per lb.

10
6 3
10
£. 3 2 6 Anſwer.

EXAMPLE IV.

What is the value of 37 dozen of knives, at

l. s. d.
2 5 7¾ per doz.
6
£. 13 13 10½
6
Val. of 36 doz. 82 3 3
Val. of 1 doz. 2 5 7¾
Anſwer £. 84 8 10¾

SCHOL. There are methods of obtaining the product in theſe caſes, let the multiplier be what it may, or however great; but in general, the trouble will be conſiderable, and the anſwer will be far more readily had by the RULE OF PRACTICE.

ARTICLE

ARTICLE X.
TO DIVIDE NUMBERS OF DIFFERENT DENOMINATIONS.

Rule. Divide each denomination beginning with the higheſt, as in diviſion of whole numbers; only obſerving, that when there is a remainder in any denomination, ſuch remainder muſt be reduced to the next inferior denomination, and added to the number of that denomination before the diviſion thereof takes place.

N. B. When the diviſor is a compoſite number, divide by the factors one after another, and the laſt quotient will be the anſwer.

Example I.

If 7lb. of ſugar coſt 5s. $1\frac{1}{2}$d. what is that per lb?

7) 5 $1\frac{1}{2}$
0 $8\frac{1}{2}$ Anſwer.

Example II.

Divide 44l. 1s. $9\frac{1}{4}$d. into 9 equal parts.

l. s. d.
9) 44 1 $9\frac{1}{4}$
£. 4 17 $11\frac{1}{4}$ = the value of each part.

Example III.

If 6l. 16s. 8d. be divided equally among 80 perſons, what is each man's ſhare?

l. s. d.
10) 6 16 8
8) 0 13 8
£. 0 1 $8\frac{1}{2}$ Anſwer.

Example IV.

Divide 27l. 3s. $4\frac{1}{2}$d. by 81.

l. s. d.
9) 27 3 $4\frac{1}{2}$
9) 3 0 $4\frac{1}{2}$
£. 0 6 $8\frac{1}{2}$ Anſwer.

Alike eaſy is the diviſion of Weights, Meaſures, &c.

ARTICLE XI.
VULGAR FRACTIONS.
Definitions.

1ſt. Fractions are expreſſions for any aſſignable parts of an integer or unit, and are repreſented by two terms, or numbers, placed one above another with a line between them; the upper term is called the Numerator, and the lower the Denominator, as was alſo noticed in Art. V. Likewiſe, the Denominator ſhews into how many parts the integer is divided, and the Numerator declares how many of ſuch parts are intended by the Fraction.

2d. A Proper Fraction is that where the Numerator is *leſs* than the Denominator, as $\frac{1}{4}$.

3d. An Improper Fraction is that wherein the Denominator is *leſs* than, or *equal* to, the Numerator; as $\frac{4}{3}$, or $\frac{3}{3}$.

4th. A Single Fraction is that which conſiſts but of *one* Numerator, and *one* Denominator.

5th. A Compound Fraction, or Fraction of a Fraction, is that whoſe parts are vulgar fractions connected with the word of, as $\frac{1}{2}$ of $\frac{2}{3}$, of $\frac{3}{4}$.

6th. A Mixt Number, is a Whole Number, with a Fraction annexed, as $15\frac{2}{3}$.

7th. The Reciprocal of a Fraction, is when the Numerator is changed into the Denominator, and the Denominator is made the Numerator. Thus $\frac{3}{2}$ is the reciprocal of $\frac{2}{3}$.

Hence, the reciprocal of a Proper Fraction, is an Improper Fraction, and *vice verſa*.

Lemma I. If the Numerator and Denominator of any Fraction be each multiplied, or divided by the ſame given number, the fraction, thus multiplied, or divided, retains its former value; thus, if the Numerator and Denominator of the fraction $\frac{1}{2}$, be multiplied by 2, it becomes $\frac{2}{4}$, which is equivalent to the former.

For, if any thing be divided into 2 parts, and one of them be taken, it is the ſame thing as if it were divided into 4 parts and two of them were taken; the value in each caſe being one half; and the ſame in diviſion, for if the Numerator and Denominator of the fraction $\frac{2}{4}$ be divided by 2, the fraction becomes $\frac{1}{2}$, which is equal to the former.

Lemma II. In any fraction, if the Numerator be augmented, or the Denominator, diminiſhed, its value in either caſe is encreaſed; but if the Numerator be made leſs, or the Denomitor, more, then its value is diminiſhed. Thus, ſuppoſe the fraction to be $\frac{3}{5}$, if the Numerator be augmented to 4, it is evident its value is augmented alſo; for, it is clear, that 4 parts out of 5, muſt be greater than 3 parts out of 5; or, if the Denominator be made 4, it is evident that the value is thereby increaſed; for 3 parts out of 4, are more than 3 parts out of 5; ſeeing, that when any number or quantity is divided only into 4 parts, each part muſt contain more than if the ſame were divided into 5 parts. By a ſimilarity of reaſoning, if the numerator is taken at 2, or the denominator at 6, its value is diminiſhed.

Heuce, alſo, if the Numerator of a fraction be multiplied by any given whole number, or the Denominator thereof divided thereby, the value of the fraction will be multiplied ſo many times as the given number expreſſes. Thus, if the Numerator of the fraction $\frac{1}{1}$, be multiplied by 3, it becomes $\frac{3}{1}$; or 3, which is equal to three times the former; or, if the Denominator of the fraction $\frac{3}{3}$, which, by the preceding Lemma, is equivalent to $\frac{1}{1}$, by divided by 3, it becomes $\frac{3}{1}$, as before; and ſo, in either caſe, its value is multiplied.

Alſo, by the like reaſoning, if the Numerator of any fraction be divided, or its Denominator multiplied by any given number, the value thereof will be diminiſhed ſo many times; or, which is the ſame thing, the value of the fraction will be thereby divided by ſuch number.

Note alſo, the Numerator of any fraction is expreſſive of a dividend, whereof the Denominator is the diviſor.

REDUCTION OF VULGAR FRACTIONS.

Prob. I. To reduce a whole number to the form of a fraction.

Rule. Place an unit (or 1) under it for a denominator.

Examp. Reduce 6, to the form of a fraction.

Here I place 1 under it, and it becomes $\frac{6}{1}$, the form required.

Schol. If it is required, that it ſhould have any aſſigned number for its Denominator, then multiply the Numerator and Denominator, of the form found as above, by ſuch number, and it will be the fraction required; for, by the preceding Lemma, it retains its ſame value. Thus, in the preceding Example, if it were required that its Denominator ſhould be 5, the fraction would be $\frac{30}{5}$.

Problem II. To reduce a fraction to its leaſt terms.

Rule. Divide the Terms of the given fraction by any number, which will divide them without a remainder, and the quotients (by the Lemma) will be the Terms of a new fraction, equivalent to the former; alſo thoſe terms, if they will divide by any number, muſt be divided, and ſo on, till a fraction is had; the terms of which cannot be divided by any given number, except unity, or 1, and then the fraction will be in its loweſt terms.

Examp. Let $\frac{10}{12}$ be propoſed. Here, by dividing both the terms by 2, we have $\frac{5}{6}$, which cannot be reduced lower, and ſo the fraction is in its leaſt terms.

Again, let $\frac{42}{72}$ be propoſed; then, by dividing by 2, we have $\frac{21}{36}$, and this being divided by 3, gives $\frac{7}{12}$, which is the fraction in its loweſt terms.

Cor. I. If the terms of any fraction conſiſt of numbers multiplied into one another, and expreſſed by the ſign of multiplication ($\times$) between them; then, if one number only in each term be divided by any given number, its value will remain the ſame, and it will be reduced into lower terms.

In like manner, if one number only in each term be multiplied, its value will be the ſame. And univerſally, if the ſame quantity of numbers in each term, thus connected, be multiplied, or divided, by any given number, the products, or quotients, will exhibit a fraction equivalent to the former.

Thus: let the fraction $\frac{3\times5\times4}{6\times10\times2}$ be propoſed. It is equivalent to $\frac{1\times5\times4}{2\times10\times2}=\frac{1\times1\times4}{2\times2\times2}=\frac{1\times1\times2}{1\times2\times2}=\frac{1\times1\times1}{1\times1\times2}=\frac{1}{2}$ in its leaſt terms.

Cor. II. It the terms of a fraction conſiſt of numbers connected by the ſigns of addition, (+) or of ſubtraction, (—) or both, then the numbers muſt either be reduced into one by means of addition and ſubtraction, in order to be reduced lower, or elſe every number in each term muſt be alike divided.

Example.

Let $\frac{4+6-2}{10+8-4}$ be propoſed. This is equal to $\frac{8}{14}=\frac{4}{7}$, the fraction in its leaſt terms; or the ſame is $=\frac{2+3-1}{5+4-2}=\frac{4}{7}$, as before.

Schol. In reducing fractions to their leaſt terms by the foregoing method, there will ſometimes be a great difficulty in finding ſuch a number as will divide both its terms; and then the method in the following Problem, of finding the greateſt common meaſure, is to be practiſed.

Problem III. To find the greateſt common meaſure of two or more numbers.

Rule. If there be two numbers only, divide the greater by the leſs, and the diviſor by the remainder, continuing to repeat the ſame till nothing remains; then will the laſt diviſor be the greateſt common meaſure required.

If there are three or more numbers, find the greateſt common meaſure for two of them; and then find the common meaſure of that common meaſure, and one of the other numbers; and ſo on through all the numbers; ſo will the greateſt common meaſure, laſt found, be the anſwer.

N. B. If 1 proves to be the common meaſure, the given numbers are prime to each other.

Example.

What is the greateſt common meaſure of $\frac{412}{516}$, or of 412 and 516?

Operation.

412) 516 (1
412
104) 412 (3
312
100) 104 (1
100
4) 100 (25
100
...

Here the diviſor, 4, is the greateſt common meaſure, and the fraction brought into its leaſt terms is $\frac{103}{129}$.

Problem IV. To find the leaſt number which can be divided by two or more given numbers without a remainder.

Rule. If the required number is only to be divided by two numbers, divide either number by the greateſt common meaſure, and multiply the quotient by the other number, and the product will be the anſwer.

If it is to be divided by three or more numbers, find the leaſt number which can be divided by two of them, and then find the leaſt number which will divide by that and another of the numbers, and ſo on through all the numbers; ſo will the number laſt found be the required anſwer.

Example.

What is the leaſt number which can be divided by 15 and 25?

Here the greateſt common meaſure is 5, and $25 \div 5 = 5$, and $15 \times 5 = 75$, the number ſought; or $15 \div 5 = 3$; and $25 \times 3 = 75$, as before.

Prob. V. To reduce a mixed number to an improper fraction.

Rule. Multiply the whole number by the denominator of the fraction, and to the product add the numerator; ſo will the ſum be the numerator of the required fraction; the denominator is the denominator of the given fraction.

Example. Reduce $5\frac{3}{4}$ to an improper fraction.

Here $5 \times 4 = 20$; and $\frac{20+3}{4} = \frac{23}{4}$, the fraction required.

N. B. This caſe properly belongs to addition of fractions, for it is the ſame thing as reducing the whole number to a fraction, whoſe denominator is 4 (as by Schol. of Prob. I.) and then adding the two fractions together, as directed in Article XI.

Problem VI. To reduce an improper fraction to its equivalent whole or mixed number:

Rule. Divide the numerator by the denominator, and the quotient will be the whole or mixed number required.

Example. Reduce $\frac{23}{4}$ to its equivalent whole or mixed number.

Here $23 \div 4 = 5\frac{3}{4}$, the anſwer.

Schol. As the numerator of any fraction is expreſſive of a dividend, and its denominator is the diviſor of ſuch dividend, the reaſon of the above proceſs is ſelf-evident.

Problem VII. To reduce a compound fraction to a ſingle fraction equivalent thereto.

Rule. Multiply together all the numerators of the given fractions: do the ſame with the denominators; then will the product of the former be the numerator, and of the latter the denominator of the fraction required.

Example. Let $\frac{2}{3}$ of $\frac{3}{4}$ be reduced to ſingle fraction.

Here $\frac{2\times3}{3\times4} =$ (in its leaſt terms) $\frac{1}{2}$, the fraction required.

Note. If any part of the compound fraction be a whole or mixed number, it muſt be reduced to a fraction by one of the former Problems, before this Rule is applied.

Schol. The reaſon of this rule is manifeſt; thus, in the above inſtance, the fraction $\frac{3}{4}$ is $3 \div 4$; and $\frac{2}{3}$ of $\frac{3}{4} = \frac{2}{3}$ of $3 \div 4$: but $\frac{2}{3}$ of 3 is 3 times greater than $\frac{2}{3}$ of 1 (or $\frac{2}{3}$) and, therefore, by the ſecond of the preceding Lemmas, $\frac{2\times3}{3} = \frac{2}{3}$ of 3; alſo $\frac{2\times3}{3} \div 4 = \frac{2}{3}$ of $\frac{3}{4}$, $=$ by the ſaid Lemma $\frac{2\times3}{3\times4} = \frac{1}{2}$, as before.

The rule may be proved in like manner for three or more fractions thus compounded, by taking the firſt two, and then the third, and ſo on.

Problem VIII. To reduce any fraction to another equivalent one, which ſhall have any aſſigned number for its denominator.

Rule. Multiply the numerator of the fraction by the aſſigned number; divide the product by the denominator, and the quotient will be the numerator of the fraction required, under which write the aſſigned number.

Example. Reduce $\frac{2}{3}$ to an equivocal fraction, which ſhall have 12 for its denominator.

Here $\frac{2\times12}{3} = 8$, the required numerator, and therefore the fraction is $\frac{8}{12}$.

Schol. The truth of this rule is manifeſt; for it is evident, that the numerator and denominator, by ſuch proceſs, will become equally multiplied or divided; and therefore the fraction ſo produced is (by Lemma 1) equivalent to the given fraction. Thus, in the above inſtance, if both terms of the fraction be multiplied by 4, it will give the required fraction.

N. B. When the numerator of the required fraction does not come out in whole numbers, the caſe is impoſſible.

Problem IX. To reduce fractions of different denominators to equivalent fractions having a common denominator.

Rule. Multiply all the denominators together, and it will be a common denominator for each fraction; to which denominator find the numerator of each fraction by the preceding Problem.

Example. Reduce $\frac{3}{4}$ and $\frac{5}{6}$ to a common denominator.

Here $4 \times 6 = 24$, the common denominator, then $\frac{3\times24}{4} = 3\times6 = 18$, the numerator for the firſt fraction; and $\frac{5\times24}{6} = 5\times4 = 20$, the numerator for the ſecond fraction; and therefore the required fractions are $\frac{18}{24}$ and $\frac{20}{24}$.

Schol. It is to be obſerved, that the above method, though it finds a common denominator, yet it does not find the leaſt common denominator, except when the denominators of the given fractions are prime to each other.

The leaſt common denominator is always the leaſt number, which will divide by each of the given denominators without a remainder, and is found by Problem IV; and the numerators anſwerable thereto will be found, as above, by Problem VIII.

In the laſt example, the leaſt number which can be divided by 4 and 6 is 12, and the numerators from thence for each fraction, are 9 and 10 reſpectively; and therefore the fractions, with the leaſt common denominator, are $\frac{9}{12}$ and $\frac{10}{12}$.

Problem X. To find the value of a fraction in the known parts of the integer.

Rule. Multiply the numerator by ſuch a number of units of the next leſs denomination as is equal to an unit (or 1) of that name or denomination which the fraction is of, dividing the product by the denominator, and the quotient ſhews the value ſought in ſuch inferior denomination.

If there be a remainder after the diviſion, multiply it by the number, which in the next inferior denomination conſtitute an unit, in the laſt or preceding denomination, and divide by the denominator as before, and the quotient will be the value of the remainder in ſuch inferior denomination. Proceed in this manner (if there are remainders after the diviſion) to the loweſt denomination, and the ſeveral quotients connected in due order will be the value of the whole given fraction.

Example I. What is the value of $\frac{3}{8}$ of a pound ſterling?

Here $\frac{3\times20s}{8} = 7s.$ with a remainder of 4; and $\frac{4\times12d}{8} = 6d.$ Wherefore the required value is 7s. 6d.

Example II. What is the value of $\frac{5}{6}$ of a cwt. avoirdupoiſe?

Here $\frac{5\times4\,qrs.}{6} = 3\,qrs.$ with a remainder of 2; and $\frac{2\times28\,lb.}{6} = 9lb.$ with a remainder of 2; and $\frac{2\times16\,oz.}{6} = 5\,oz.$ and a remainder of 2. and $\frac{2\times16\,drs.}{6} = 5\,drs.$ with a remainder of 2, (or $\frac{2}{6}$, or $\frac{1}{3}$.) And therefore the whole value is 3*qrs.* 9*lb.* 5*oz.* $5\frac{1}{3}$*drs.*

Example III. What is the value of $\frac{5}{8}$ of an acre?

Here $\frac{5\times4r.}{8} = \frac{5}{2} = 2r.$ with a remainder of 1. and $\frac{1\times40p.}{2} = 20p.$ And therefore the anſwer is 2 roods and 20 perches.

Problem XI. To reduce a fraction of one denomination to that of another.

Rule. If it be from a leſs denomination to a greater, multiply the denominator by all the numbers in each denomination, (from that given to that required) which make an unit in the next ſuperior denomination; but, if it be from a greater denomination to a leſs, multiply the numerator by all ſuch numbers of each denomination; and the product, in either caſe, will be the anſwer.

Example I. Let there be given $\frac{3}{5}$ of a penny, to find what fraction of a pound it is equivalent to.

Here $\frac{3}{5\times12\times20} = \frac{1}{5\times4\times20} = \frac{1}{400}$, the fraction ſought, in its leaſt terms.

Example II. Let there be given $\frac{3}{5}$ of a pound, to find what fraction of a penny is equivalent thereto.

Here $\frac{3\times20\times12}{5} = \frac{720}{5}$ of a penny, the anſwer $=$ 144 pence.

Example III. Reduce 12*s.* 6*d.* to the fraction of a farthing.

Here 12*s.* 6*d.* $=$ 150 pence $= \frac{150}{1}$ and $\frac{150\times4}{1} = \frac{600}{1}$, the fraction required.

Example IV. Reduce 7s. 6d. to the fraction of a pound.

Here 7s. 6d. $=$ 90 pence $= \frac{90}{1}$; and $\frac{90}{1\times12\times20} = \frac{9}{1\times12\times2} = \frac{3}{1\times4\times2} = \frac{3}{8}$, the fraction required.

Schol. Where broken numbers are given to be reduced to the fraction of any aſſigned integer, as in the two laſt examples, they muſt always be reduced to the loweſt denomination mentioned, and then turned into a fraction of that denomination (by writing 1 for its denominator, as taught in Problem I.) before the above Rule can be applied.

ADDITION AND SUBTRACTION OF VULGAR FRACTIONS.

Rule. Reduce compound fractions to ſingle ones, mixed numbers to improper fractions, fractions of different integers to thoſe of the ſame, and all of them to a common denominator.

This preparation being made, add together or ſubtract their numerators, as if they were whole numbers, and the ſum or difference will be the numerator fraction ſought; under which write the common denominator; then reduce the fraction to its leaſt terms, if it will admit of being brought lower.

Example I. Add together $\frac{1}{3}$ of a pound, $\frac{1}{2}$ of a ſhilling, and $\frac{1}{4}$ of a penny.

Here $\frac{1}{4}$ of a penny $= \frac{3}{4\times12\times20}$ of a pound $= \frac{1}{4\times4\times20} = \frac{1}{320}$; and $\frac{1}{2}$ of a ſhilling $= \frac{1}{2\times20} = \frac{1}{40}$ of a pound. So the given fractions are $\frac{1}{3}$, $\frac{1}{40}$, and $\frac{1}{320}$ of a pound. Which reduced to the leaſt common denominator become $\frac{320}{960}$, $\frac{24}{960}$, and $\frac{3}{960}$, reſpectively. Then $320+24+3=347$, the numerator ſought; and therefore the ſum of the given fractions is $\frac{347}{960}$ of a pound ſterling; which fraction is in its leaſt terms.

Example II. Subtract $\frac{1}{8}$ of a ſhilling from $\frac{1}{3}$ of $\frac{2}{5}$ of a pound.

Here $\frac{1}{8}$ of a ſhilling $= \frac{3}{8\times20} = \frac{3}{160}$ of a pound; and $\frac{1}{3}$ of $\frac{2}{5}$ $= \frac{1\times2}{3\times5} = \frac{2}{15}$ of a pound. Alſo $\frac{2}{15}$ and $\frac{3}{160}$ reduced to the leaſt common denominator, are $\frac{64}{480}$ and $\frac{9}{480}$ reſpectively. Their difference is $\frac{55}{480} = \frac{11}{96}$ of a pound, the anſwer.

MULTIPLICATION AND DIVISION OF FRACTIONS.

Rule. Reduce compound fractions to ſimple ones, and mixed numbers to improper fractions. Then, in multiplication, multiply the numerators together for a new numerator, and the denominators together for a new denominator. And, in diviſion, having, inſtead of the diviſor, ſubſtituted its reciprocal, proceed as in multiplication.

Example I. What is the product of $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{2}{5}$, multiplied together?

Anſwer. $\frac{1\times2\times2}{2\times3\times5} = \frac{2}{3\times5} = \frac{2}{15}$.

Example II. What is the product of $\frac{2}{5}$ of $\frac{1}{4}$ of 7, muliplied by $\frac{3}{5}$ of 6?

Here $\frac{2}{5}$ of $\frac{1}{4}$ of $7 = \frac{2\times3\times7}{5\times4\times1}$; and $\frac{3}{5}$ of $6 = \frac{3\times6}{5\times1}$. This multiplied into the former, we have the anſwer $= \frac{3\times6\times2\times3\times7}{5\times5\times4} = \frac{3\times6\times3\times7}{5\times5\times2} = \frac{3\times3\times3\times7}{5\times5} = \frac{189}{25} = 7\frac{14}{25}$.

Example III. Let $\frac{4}{7}$ be divided by $\frac{2}{3}$.

Here the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$; and $\frac{4}{7}\times\frac{3}{2} = \frac{3\times4}{7\times2} = \frac{3\times2}{7} = \frac{6}{7}$, the anſwer.

Example IV. Divide $9\frac{1}{6}$ by $\frac{1}{2}$ of 7.

Here $9\frac{1}{6} = \frac{55}{6}$, and $\frac{1}{2}$ of $7 = \frac{7}{2}$; its reciprocal is $\frac{2}{7}$; and $\frac{55}{6}\times\frac{2}{7} = \frac{55\times2}{6\times7} = \frac{55}{3\times7} = \frac{55}{21} = 2\frac{13}{21}$, the anſwer.

Schol. The reaſon of the foregoing Rule will be underſtood from what follows.

Thus: let the firſt example be reſumed; then, to multiply the two firſt numbers together, $\frac{1}{2}$ and $\frac{2}{3}$, it is evident that $\frac{2}{3}$ is $=2\div3$, or the third part of 2; and therefore the product by 2 will be three times as great as that by $\frac{2}{3}$. Now, by Lemma II. the product by 2 is $\frac{1\times2}{2}$; but this, being three times as much as it ought, muſt be divided by 3; and, by the ſaid Lemma, a fraction is divided by any whole number, by multiplying the denominator; and therefore, $\frac{1\times2}{2\times3}$ is the product of $\frac{1}{2}$ by $\frac{2}{3}$; alſo, this product multiplied by $\frac{2}{5}$ is, for the ſame reaſon, $= \frac{1\times2}{2\times3}\times2$, and $\div5$; $= \frac{1\times2\times2}{2\times3\times5}$, which is agreeable to the Rule. Again, in diviſion, Example III. the diviſor, $\frac{2}{3}$, is = the third part of 2; and therefore, if $\frac{4}{7}$ be divided by 2, the diviſor, being = three times the proper diviſor, the quotient, of courſe, will be proportionably too little.

But $\frac{4}{7}\div2 = \frac{4}{7\times2}$; and this being multiplied by 3, gives $\frac{3\times4}{7\times2}$, as before, which proves the Rules true.

I have been the more copious on fractions, becauſe a due comprehenſion thereof is one main pillar in Arithmetic.

ARTICLE XII.

DECIMAL FRACTIONS.

Definitions.

1ſt. A decimal fraction is one which has an unit (or 1) for its denominator with cyphers annexed. Thus $\frac{1}{10}$, $\frac{2}{100}$, $\frac{3}{1000}$, &c. are decimal fractions.

d. A decimal fraction is expreſſed without the denominator, by writing only the numerator, and prefixing a point on the left hand of it; and the number of places in the numerator is always equal to the number of cyphers in the denominator. Thus .3 ſignifies $\frac{3}{10}$, .03 ſignifies $\frac{3}{100}$; $.37 = \frac{37}{100}$; $.004 = \frac{4}{1000}$; &c. conſequently, if the numerator has not ſo many places as the denominator has cyphers, the void places muſt be filled up with the cyphers towards the left hand.

3d. Cyphers on the right hand of a decimal do neither increaſe nor diminiſh its value. Thus, .3, .30, and .300, are equal to each other, becauſe $\frac{3}{10}$, $\frac{30}{100}$, $\frac{300}{1000}$, (which are their proper repreſentatives) are, as it is plain from vulgar fractions, equal to one another. But cyphers placed to the left hand, decreaſe the value of the fraction in a ten-fold ratio. Thus of the following; .3, .03, .003, &c. each one is in value but $\frac{1}{10}$ of the preceding one, as is evident from their repreſentatives in vulgar fractions; viz. $\frac{3}{10}$, $\frac{3}{100}$, $\frac{3}{1000}$, &c.

Schol. The reaſon of writing decimals thus is evident, for ſince they are equal to fractions, of like numerators with denominators, that are conſtantly 1 and cyphers annexed; and ſince the denominator of a fraction is a diviſor to the numerator, and to divide by 1, with cyphers annexed, is only to cut off ſo many figures as there are cyphers, the value of the fraction is fitly expreſſed by placing a point before the numerator. Thus: ſuppoſe the fraction $\frac{25}{100}$; now, ſince to divide by 100 is no more than to cut off two figures, therefore, when a point is put before .25, they will ſtand as figures cut off, or parts of 100.

Again: ſuppoſe the improper fraction $\frac{785}{100}$; it is plain they are $=7\frac{85}{100}$. But, according to the decimal notation, they muſt be expreſſed 7.85. And this notation, in many caſes, gives decimals a great advantage over vulgar fractions: for, as the ſeveral decimal parts are, as has been obſerved, in a ten-fold ratio, and the whole numbers alſo increaſe or decreaſe, in the ſame ratio, it follows that they may be promiſcuouſly brought into operation with each other, provided due care be uſed, and, at the concluſion, a proper number of figures be pointed off, anſwerable to the decimals that have been in uſe.

In what follows, I ſhall only lay down the Rules, with an example or two to each, leaving my reader to prove the truth of them by vulgar fractions.

REDUCTION OF DECIMALS.

Problem I. To reduce a Vulgar Fraction to a Decimal.

Rule. Annex as many cyphers to the numerator, as you would have decimal places, and divide by the denominator.

N. B. This is the ſame as finding the numerator of a fraction whoſe denominator is 1, with a given number of cyphers annexed. See Reduction of Vulgar Fractions. Prob. VIII.

Examp. I. Reduce $\frac{3}{8}$ to a decimal.

Here, If to 3 I annex 6 cyphers, as being deſirous, for the ſake of accuracy, of having ſo many decimals, then the quotient by 8 is .375000. But, as I find it comes without a remainder in three places of figures, I reject the three cyphers, as uſeleſs, for by definition 3, they are of no value.

Examp. II. Reduce $\frac{275}{3842}$ to a decimal. Anſwer .071577.

Schol. When it is requiſite that there ſhould be a great many places of decimals, and after a few figures are got, it is obſerved, that the remainder is either ſome multiple or aliquot part of the numerator of the given fraction; then multiply, or divide the figures already found (according as the caſe ſhall be) by the number, denoting ſuch multiple, &c. and the reſult will be the next following figures of the quotient.

Example. Let the fraction be $\frac{4}{17}$. Then, by proceeding as before, it will be found $=.235294\frac{2}{17}$, and the remainder 2, being $=\frac{1}{2}$ the numerator (4), I divide the ſaid quotient by 2, and the reſult is $117647\frac{1}{17}$; wherefore, I annex this to the former, and it becomes $.235294117647\frac{1}{17}$ true to 12 places of decimals. Again, I ſee that the remainder 1 is equal to $\frac{1}{4}$ of the numerator, and therefore by dividing the laſt quotient by 4, there will be 12 more places true, viz. $.058823529411\frac{13}{17}$, and this annexed to the former, gives $.235294117647058823529411\frac{13}{17}$. Alſo, I obſerve, that after the ſixteenth figure the decimal repeats the ſame figures again, and ſo it may be continued further at pleaſure, *ad infinitum.*

Problem II. To reduce the decimal of one denomination to the decimal of another.

Rule. This is performed in all reſpects as in common reduction, where one denomination is given to be reduced to another; obſerving, that there muſt be juſt as many places of decimals in the anſwer, as there are in the given decimal; and, therefore, when there are more places of figures in the anſwer than there are decimals in the given number, the exceſs to the left hand will be whole numbers; but if there are fewer places therein, the defect muſt be ſupplied by prefixing cyphers.

N. B. It will ſometimes be requiſite to annex cyphers to the given decimal, and then the number of decimal places muſt be taken accordingly.

Examp. I. Reduce .0235 of a pound ſterling, to the decimal of a penny. Here $.0235 \times 20 \times 12 = 52400$; and as the given number conſiſts of 4 places of decimals only, therefore, the anſwer is 5.2400, where 5 is a whole number, denoting ſo many pence, and the reſt .24 are decimal parts of a penny.

Examp. II. Reduce .2785 of a ſhilling to the decimal of a pound Here $.2785 \div 20$, (or which by definition 3 is the ſame $.278500 \div 20 =$) 13975; but the decimal places in the given number, with the cyphers annexed, are ſix, and therefore one cypher muſt be prefixed to this number; and ſo the anſwer is .013975 of a pound.

Corol. I. Hence the value of any decimal, in the ſeveral known parts of the integer, will be had by the ſame method; only obſerving, at each multiplication, to ſet off the whole numbers in each denomination, and continue the operation with the decimal parts only. Thus, if it is required to find the value of .3785 of a pound ſterling, in ſhillings, pence, &c.

Here $.3785 \times 20 = 7.5700$ (the 7. being ſhillings); then $.57 \times 12 = 6.84$, (the 6. being pence) and $.84 \times 4 = 3.36$, (the 3. being farthings) and ſo the value is 7s. $6\frac{1}{4}$d. and .36 decimal parts of a farthing.

Again, In 342.5 pence, how many pounds?

Here 342. pence = 1l. 8s. 6d. and .5 of a penny = $\frac{1}{2}$, and therefore the required value is 1l. 8s. $6\frac{1}{2}$d.

Corol. II. Any integer number of an inferior denomination, is brought to the decimal of a ſuperior denomination, by reducing it firſt to the vulgar fraction of ſuch ſuperior denomination, and then finding its equivalent decimal by **Problem I.** or, a ſufficient number of cyphers being annexed thereto for decimal places; it may often be more conveniently reduced to the decimal of ſuch ſuperior denomination, by dividing, as directed in this Problem; obſerving, to make as many decimal places in the anſwer, as there were cyphers annexed in the operation, by prefixing as many cyphers as are neceſſary.

Example. Reduce 9d. to the decimal of a pound. Here $9 \div 12$, or, which is the ſame, $9.00 \div 12 = .75$; and $.75 \div 20$; or, $.7500 \div 20, = .0375$, the decimal required.

Corol. III. Hence, if the given number conſiſts of integers in divers denominations, to be reduced to the decimal of ſome ſuperior denomination; reduce the loweſt denomination to the next ſuperior, and prefix thereto the given integers of that denomination. Alſo reduce that number to the decimal of the next ſuperior denomination, prefixing the integers, if any, as before, and ſo on to the end. The laſt reſult is the anſwer.

Example. Reduce 5s. $3\frac{1}{4}$d. to the decimal of a pound. Here 1 farthing, reduced to the decimal of a penny, is .25, to which I prefix 3, and it becomes 3.25; and this reduced to the decimal of a ſhilling is .2708333, &c. and prefixing 5, it is 5.2708333, which reduced to the decimal of a pound is .263541666, &c. the anſwer.

N. B. The ſeveral denominations of Weights, Meaſures, &c. are managed in like manner; due regard being had to the number of integers which in one denomination is equivalent to an unit in the next ſuperior denomination, as was ſhewn both in reduction of whole numbers and vulgar fractions.

Schol. The value of any decimal of a pound ſterling, may be had by inſpection, thus: Double the firſt figure (or that in the place of tenths) for ſhillings, and if the ſecond figure be 5, or more, reckon another ſhilling; then call the figures in the ſecond and third places, after the 5 is deducted, ſo many farthings, abating 1 when they are above 12, and 2, when above 37; and the reſult will be the anſwer.

Example. What is the value of .375 of a pound?

Here the double of 3 is 6, but the next figure being above 5, I make it 7, which are ſhillings. Then the reſidue (when 5 is taken from 7) is 25; which, being above 12, I reckon only 24, for farthings, which make 6d. and ſo the value required is 7s. 6d.

ADDITION AND SUBTRACTION OF DECIMALS.

Rule. Reduce the decimals to one and the ſame denomination, if they are not ſo already. Then place the numbers ſo, that the units (if any) may ſtand under units; and the tenth's place of the decimals, under the tenths, &c. and add or ſubtract them as in whole numbers, placing each figure directly under its proper column, ſo that it may obtain the ſame place in the rank of decimals, &c. as the figures in ſuch column obtain.

ADDITION.

Examples.	Examples.
23.27514	4.7652
.15614	26.
5.432678	.374
.0023456	35.406
Total 28.8663036	7.00352
	Total 73.54872

SUBTRACTION.

From	7.8543	From	76.543
Take	4.02765	Take	.37856
Rem.	3.82665	Rem.	76.16444

MULTIPLICATION AND DIVISION OF DECIMALS.

Rule. Multiply and divide them as in whole numbers; obſerving in Mulplication, that the product muſt contain as many places of Decimals, as there are in both the multiplicand and multiplier; and in Diviſion that the number of ſuch places, in the quotient, together with thoſe in the diviſor, muſt be equal to the number of decimal places in the dividend.

Hence, if the dividend be a whole number, or contain but few places of decimals, cyphers muſt be annexed thereto, till the number of decimal places therein exceed the number of ſuch places in the diviſor, by as many as there are decimal places required in the quotient.

Example I.		Example II.	
Mult.	4.276	Mult.	.57324
By	3.5	By	.0936
	21380		515916
	12828		2063664
Product	14.9660	Prod.	.053655264

Example III.		Example IV.	
Div.	4.732604	Div.	427848.
By	.4	By	.06
	.4) 4.732604		.06)427848.00
Quot.	11.83151	Quot.	7130800.

Example V. Divide .22742025 by 5.326.

Operation.

5.326).22742025(.04270
21304
14380
10652
37282
37282
5

Here, in the ſecond example, the product contains only 8 figures, though, according to the rule, there ſhould be 9 decimal places; wherefore I prefix a cypher to make up a deficiency, placing a point before it, to ſhew that the figures are decimals.

In the fourth example, the dividend being a whole number, and the diviſor having two decimal places, I annex two cyphers (as decimals) to the dividend; and then, according to the Rule, all the figures in the quotient are whole numbers; but if there had been a remainder after the diviſion, and it had been required to have a certain number of decimals in the quotient, then as many cyphers more muſt have been annexed as would have been equal to the required number of decimals.

In the laſt example it appears, that, without annexing cyphers there ſhould be five places of decimals in the quotient; and therefore I find it requiſite to prefix a cypher. There being a remainder of 5, more places of decimals may be had by annexing cyphers.

Thus, by annexing 6 cyphers, the quotient will be .04270000938. But, if the quotient is continued no farther than .04270, the cypher on the right hand may be rejected; for in that caſe, by Definition III. it does not augment the value.

Cor. I. If any decimal number is to be multiplied by 10, 100, 1000, &c. the product will be had by only removing the decimal point ſo many places towards the right hand, as there are cyphers annexed to the unit; and, on the contrary, if the diviſor of any decimal number is 10, 100, 1000, &c. the quotient will be had by removing the decimal point the like number of places towards the left hand. Thus; $.2754 \times 100 = 27.53$; and $387.54 \div 100 = 3.8754$.

Cor. II. When, in multiplication, there are many decimal parts in the multiplicand and multiplier, and but a few decimals are required in the product, the operation may be ſhortened, as follows:

Write the unit's place of the multiplier under that figure in the multiplicand, whoſe place you would retain in the product, diſpoſing the reſt of the figures in the contrary order to that which they are properly placed in; then begin always at that figure in the multiplicand which ſtands over the figure which you multiply with, and ſet down the products, ſo that their right hand figures may ſtand in a line under one another.

Note. The firſt figure in every line muſt be increaſed with what would ariſe (by carrying 1, from 5 to 15; 2 from 15 to 25; 3 from 25 to 35, &c.) from the product of the preceding figures which are left out of the operation.

Example I.	Example II.
Multiply 79.80625 by 7.854, and let four places of decimals be retained in the Product.	Multiply 535.5625 by .6375, and let three decimals be retained.
Operation.	Operation.
79.80625	535.5625
458.7	5736.0
5586438	321338
638450	16067
39903	3749
3192	268
Product 626.7983	Product 341.422

N. B. In the ſecond example, there being no unit's figure in the multiplier, therefore, to render the operation the more plain and eaſy to be comprehended, according to the Rule, I have put a cypher in the place of units.

Cor. III. By a ſimilar procedure, the operations in diviſion may be ſhortened. The method is thus: conſider, according to the foregoing Rule, how many decimal places there ought to be in the dividend, in order to give the deſired number of decimals in the quotient; alſo, conſider how many figures the quotient (with ſuch number of decimals) will contain, which is done by obſerving how many figures of the dividend will be uſed (according to the common method) to give the firſt quotient figure; then each of the remaining figures of the dividend will give a figure more. Take as many of the left hand figures of the diviſor into the operation, as there are to be figures in the quotient, and as many figures of the dividend as will give the firſt quotient figure; and at each diviſion leave out another figure on the right hand of the diviſor, always making the laſt remainder the dividend.

Example. Let 63092.878 be divided by 76.84375, and let there be three places of decimals in the quotient.

Operation.

Diviſor. Dividend.
76.84375)63092.87|8(821.054
6147500
161787
153688
8099
7684
415
384
31
31
..

Here, in this example, there being five places of decimals in the diviſor, there ought, (according to the common method) to be eight places of decimals in the dividend, in order to give three decimal figures in the quotient; and therefore, to the dividend there ſhould be five cyphers annexed. Alſo, it is evident, that to give the firſt quotient figure (by the whole diviſor) will take all the given figures of the dividend; and as the five cyphers will give five more figures, it is plain that there will be ſix figures in the quotient. Therefore I take only ſix figures of the diviſor, with as many of the dividend as will give the firſt quotient figure.

In each diviſion I leave out another figure of the diviſor, but augment its product by each quotient figure, as was taught in multiplication.

RULE OF PRACTICE.

Definition.

Practice is a compendious way of caſting up the value of any articles, whether by Weight or Meaſure, the price of the integer being given.

It is in general formed by taking ſuch aliquot parts of the given quantity, as the price is of a pound, ſhilling, &c.

The following are the moſt uſual methods.

1ſt. When the price is leſs than a penny, divide by the aliquot parts of a penny, and then by 12 and by 20, and you will have the value required.

2d. When the price is an aliquot part of a ſhilling, divide by ſuch aliquot part, and the quotient will be the anſwer in ſhillings; which, if above 20, muſt be reduced into pounds.

3d. When the price is pence and farthings, and not an aliquot part of a ſhilling, divide the given number by ſome aliquot part of a ſhilling; and then conſider what part of the ſaid aliquot part the reſt is, and divide the quotient thereby; and the laſt quotient, together with the former, will be the anſwer in ſhillings, which muſt be reduced into pounds as before; or the price may frequently be ſo divided, that each part will be ſome aliquot part of a ſhilling, and then a proper aliquot part of the given number muſt be taken for each, and their ſum collected as above.

4th. When the price is an even number of ſhillings, without pence and farthings, multiply the given number by the half thereof; doubling the firſt right hand figure of the product for ſhillings, and thoſe to the left are pounds.

5th. When the price is any odd number of ſhillings, except 5, either multiply thereby and divide by 20, or find the value of the greateſt even number, as above; to which add $\frac{1}{20}$ of the given number, for the odd ſhilling.

6th. When the price is an aliquot part of a pound, as 10s. 6s. 8d. 5s. 4s. &c. divide the given quantity by ſuch aliquot part, and the quotient will be the anſwer in pounds.

7th. When the price is ſhillings, pence, &c. it muſt be ſo divided, that one or more of the foregoing rules may be applied, as ſhall appear moſt convenient; and when it can be done, aliquot parts of parts may be taken.

8th. When the given number is a whole number, with parts annexed, find the value of the whole number by the preceding methods; to which add a part of the price anſwerable to the given parts.

9th. When the given quantity, whoſe value is ſought, is of ſeveral denominations; and the price is of an integer of the higheſt denomination, multiply the price by the number of the higheſt denomination, or find the value thereof by ſome of the foregoing methods; then take the ſame parts of the price for thoſe of the lower denominations, as they are of an unit of the higheſt denomination, and the ſum of all will be the anſwer.

10th. When the given quantity is of ſeveral denominations, and the price is that of an unit of ſome lower denomination, the higher denominations muſt be reduced to ſuch lower denomination; and then the laſt, or ſome preceding method, muſt be uſed.

TABLE OF ALIQUOT PARTS.

Parts of a Pound.

s.	d.		
10	0	is	$\frac{1}{2}$
6	8	—	$\frac{1}{3}$
5	0	—	$\frac{1}{4}$
4	0	—	$\frac{1}{5}$
3	4	—	$\frac{1}{6}$
2	6	—	$\frac{1}{8}$
2	0	—	$\frac{1}{10}$
1	8	—	$\frac{1}{12}$
0	8	—	$\frac{1}{30}$
0	6	—	$\frac{1}{40}$
0	4	—	$\frac{1}{60}$
0	3	—	$\frac{1}{80}$
0	2	—	$\frac{1}{120}$

Parts of a Shilling.

d.		
6	is	$\frac{1}{2}$
4	—	$\frac{1}{3}$
3	—	$\frac{1}{4}$
2	—	$\frac{1}{6}$
1½	—	$\frac{1}{8}$
1	—	$\frac{1}{12}$

Parts of a Cwt.

lb.		
56	is	$\frac{1}{2}$
28	—	$\frac{1}{4}$
14	—	$\frac{1}{8}$
16	—	$\frac{1}{7}$
8	—	$\frac{1}{14}$
7	—	$\frac{1}{16}$

I. What is the value of 8274lb. at ¼ per lb?

d. | d. | 8274
½ is | ½ | 4137
¼ is | ¼ | 2068 ½
$\frac{1}{12}$ | 6205 ½
$\frac{1}{20}$ | 51|7 1½
Anſw. £. 25 7 1½

Or thus:
3d is the $\frac{1}{80}$ of a £. 8|0 | 827|4
¾d is the ¼ of 3d ¼ | 103. 8 6
Anſw. £. 25 17 1½

Here in dividing by 80, there is a remainder of 34, which are ſo many three pences, and make 8s. 6d.

II. What is the value of 7284lb. at 3d. each?

3d. is ¼ | 7284
20 | 182|1
Anſw. £. 91 1
Or thus 8|0 | 728|4
Anſw. £. 91 1

Here 4 remains in the diviſion by 80, which are 4 three pences.

III. What is the value of 4443 at 7¾d each?

4d is — ⅓ | 4443
3d is — ¼ | 1481
¾ is ¼ of 3d ¼ | 1110 9
| 277 8¼
2|0 | 286|9 5¼
£. 143 9 5¼ An.

Or thus
6d is $\frac{1}{40}$ of a l. 4|0 | 444|3
1½d is ¼ of 6d. ¼ | 111 1 6
¼ is ⅙ of 1½d. ⅙ | 27 15 4½
| 4 12 6¾
Anſw. £. 143 9 5¼

IV. Given 4325 at 6s. each?

4325
3
£. 1297 10 Anſw.

See method the 4th.

V. Given 2756 pieces at 7s. each.

2756
7
2|0 | 1929|2
£ 964 12s An.

Or thus
2756
3
826 16
137 16
£. 964 12s An.

VI. ⅙ | 576 pieces at 3s. 4d. each
96 £ Anſwer.

VII. What comes 9876 to at 7s. 1½d. each?

7
⅛ | 69132
| 1234 6
1½d is —
2|0 | 7036|0 6
Anſw. £. 3518 6 6

VIII. What is the value of 5678¼ lb. at 4d per lb.

4d is $\frac{1}{60}$ of a £. 6|0 | 567|8
£. 94 12 8
The value of ½ lb. is 2
¼ lb. is 1
Anſwer £. 94 12 11

IX. What is the value of 3 cwt. 22¼lb. at 13s. and 5¼d. per cwt.

s. d.
13 5¼
3
£. 2 0 5¼
14lb is — ½ | 1 8¼ nearly
7 is ½ of 14lb ½ | 10 ditto
1 is ⅐ of 7 ⅐ | 1½ ditto
½ is ½ of 1 ½ | ¾ ditto
¼ is ½ of ½ ½ | ¼ ditto
£. 2 3 2 Anſw.

X. What is the value of 3 tons, 4 cwt. 1 qr. at 2l. 5s. per cwt?

Tons cwt. qr.
3 4 1
20
Given wt. 64 cwt. and 1 qr.
2
£. 128 val. of 64 cwt at 2l
5s is ⅛ | 16 val. of do. at 5s
1qr. is ¼ | 11 3 val. of 1qr of cwt
£. 144 11 3 Anſwer.

OF TARE AND TRETT, &c.

Definitions.

1ſt. **Tare** is an allowance to the buyer of any commodity for the weight of the box, caſk, &c. containing the ſame.

2d. **Trett** is an allowance of 4lb. in every 104lb. on account of waſte, duſt, &c.

3d. **Cloff** is an allowance of 2lb. upon every 3cwt. to make the weight hold out when retailed.

4th. **Gross Weight** is the whole weight both of package and goods before any of the aforeſaid allowances are deducted.

5th. **Suttle Weight** is when part of the allowances are deducted from the groſs.

6th. **Neat Weight** is that which remains after all the allowances are deducted.

The Rules for making theſe allowances are reſolved into the five following caſes.

I. When Tare only is allowed, and the ſame is ſo much in the whole, Subtract it from the groſs, and the remainder will be the Neat Weight.

II. When the Caſe is as before, but the Tare is at ſo much per box, caſk, &c. multiply the number of boxes, caſks, &c. by the Tare of one of them, Subtract the product from the groſs, and the remainder will be the Neat Weight.

III. When the Caſe is as before, but the Tare is at ſo much per cent. Divide the groſs weight by the aliquot parts of a cwt. as in the Rule of Practice; ſubtract the quotient (or the ſum or difference of the quotients, as the caſe ſhall be) from the groſs, and the remainder will be the Neat Weight.

IV. When both Tare and Trett are allowed, Divide the Suttle Weight (or that weight which remains after the Tare is deducted) by 26; ſubtract the quotient from the ſubtle, and the remainder is the Neat.

V. When Tare, Trett, and Cloff are allowed, Deduct the Tare and Trett as above directed, and divide the Suttle by 168; then ſubtract the quotient from the Suttle, and the remainder will be the Neat Weight.

EXAMPLES.

I. Let the Groſs be 28 cwt. 2 qrs. 18 lb. and the Tare 1 cwt. 1 qr. 21 lb. 8 oz. required the Neat Weight?

Here, 1 cwt. 1 qr. 21 lb. 8 oz. ſubtracted from the Groſs, leaves 27 cwt. 0 qr. 24 lb. 8 oz. the Neat Weight required.

II. What is the Neat Weight of 7 hogſheads of tobacco, each weighing 5 cwt. 2 qrs. 21 lb. Groſs, and the Tare 98 lb. per hogſhead?

Here, 5 cwt. 2 qrs. 21 lb. multiplied by 7, gives 39 cwt. 3 qrs. 7 lb. the whole Groſs; and 98 lb. or 3 qrs. 14 lb. multiplied by 7, gives 6 cwt. 0 qr. 14 lb. the whole Tare, which ſubtracted from the Groſs, leaves 33 cwt. 2 qrs. 21 lb. the Neat Weight required.

III. Let the Groſs be 16 cwt. 2 qrs. 14 lb. and the Tare 16 lb. per cwt. what is the Neat Weight?

Here, 16 lb. is $\frac{1}{7}$ of a cwt. Wherefore, divide the Groſs by 7, and the quotient, 2 cwt. 1 qr. 14 lb. is the Tare, which ſubtracted from the Groſs, leaves 14 cwt. 1 qr. the Neat Weight.

IV. Suppoſe the Groſs Weight to be 154 cwt. 2 qrs. 8 lb. and the Tare 10 lb. per cwt. what is the Neat Weight, allowing alſo for Trett?

OPERATION.

Cwt. 2 qrs. is $\frac{1}{2}$ | 10 lb.

16 lb. is $\frac{1}{7}$ | 154 8 lb. is $\frac{1}{7}$ of 2 qrs. $\frac{1}{7}$ | 5 oz.

4 is $\frac{1}{4}$ of 16 $\frac{1}{4}$ | 22 qrs. 7$\frac{1}{2}$ nearly

5 2 Tare of 2 qrs. 8 lb. 5 7$\frac{1}{2}$

16 2 = tare of 154 cwt.

5 lb. 7$\frac{1}{2}$d tare 2 qrs. 8 lb.

16 2 5 7$\frac{1}{2}$ whole tare.

	Cwt.	qrs.	lb.	oz.	
Groſs	154	2	8	0	
Tare	16	2	5	7$\frac{1}{2}$	
26)	138	0	2	8$\frac{1}{2}$	Suttle
	5	1	6	9	nearly = Trett
Anſw.	132	2	23	15$\frac{1}{2}$	Neat Weight

V. What is the Neat Weight of two hogſheads of tobacco, each weighing 5 cwt. 3 qrs. 20 lb. Groſs, the Tare being 7 lb. per cwt. and the Trett and Cloff as uſual?

OPERATION.

	Cwt.	qrs.	lb.	
	15	3	20	
			2	
	31	3	12	groſs.
7 lb. is $\frac{1}{16}$	1	3	26$\frac{1}{4}$	tare.
26)	29	3	13$\frac{3}{4}$	
	1	0	16$\frac{1}{4}$	nearly, trett.
168)	28	2	25$\frac{1}{2}$	ſuttle.
	0	0	19	cloff.
Anſw.	28	2	6$\frac{1}{2}$	Neat Weight.

N. B. In ſome commodities 2 lb. in 100 lb. is allowed for Cloff, in which caſe, inſtead of dividing the Suttle by 168, it muſt be divided by 50 only, and the quotient will be the Cloff to be ſubtracted as before.

Note alſo, that in calculating oil, if the Neat Weight be reduced into half pounds, and divided by 15, the quotient will be the neat Gallons, becauſe 7$\frac{1}{2}$ lb. are allowed to the gallon.

SINGLE RULE OF THREE.

DEFINITIONS.

1ſt. This Rule takes its name from having always, in the queſtions to which it relates, three terms given to find a fourth, which ſhall have the ſame proportion to one of the given terms as ſubſiſts between the other two; it is therefore ſometimes called the Rule of Proportion; and, becauſe of its excellence and uſe, it is alſo named the Golden Rule.

2d. Before the operation is begun, the given terms muſt be arranged in one line, with two points between the 1ſt and 2d, and four points between the 3d and 4th. Thus, 2 : 4 : : 6; and the reading of them is after this manner; viz. as 2 is to 4, ſo is 6 to the fourth number or anſwer. When the fourth term is found (or given) it is frequently ſet after the third term, with two points between them.

3d. To arrange the terms properly, is called ſtating the queſtion; to perform which, obſerve that the term, whereon the demand of the queſtion reſts, is to be made the ſecond term; it is generally preceded by the interrogative of the queſtion; viz. the words, I demand? How much? How many? How long? What will? &c.

The firſt term is always of the ſame kind, or nature, as the ſecond; and the third is of the ſame kind, or nature, as the fourth term or anſwer.

4th. When the 4th term or anſwer bears ſuch proportion to the 3d as the 2d does to the 1ſt, the queſtion is called Direct; which is the caſe when there is the ſame affection between the 3d and 4th, as there is between the 1ſt and ſecond; viz. when the 2d term is either greater or leſs than the firſt; and it is neceſſary that the 4th be in like manner either greater or leſs than the 3d.

5th. When the 4th term bears ſuch proportion to the 3d as the 1ſt does to the 2d, the queſtion is ſaid to be Inverſe; the affection between the 3d and 4th being, under ſuch circumſtance, of a contrary nature to the affection between the 1ſt and 2d. This happens when the 2d term is either greater or leſs than the firſt; and it is neceſſary, that the fourth be in the former caſe leſs, and in the latter greater than the 3d.

Having by theſe inſtructions ſtated the queſtion, and diſcovered from its nature whether the ſame be direct or inverſe, then to perform the operation, obſerve the following rules.

I. Reduce the 1ſt and 2d terms to one and the ſame denomination, if they are not ſo already; and the 3d term to the loweſt denomination, if it be a number of ſeveral denominations.

II. If the queſtion be direct, multiply the 2d and 3d terms together, and divide the product by the firſt, and the quotient will be the anſwer in the ſame denomination with the 3d term, after its reduction, if any was made.

III. If the queſtion be inverſe, multiply the 1ſt and 3d terms together, and divide the product by the 2d, and the quotient will be the anſwer, as before.

N. B. Sometimes when the 3d term is of ſeveral denominations, it will be unneceſſary to reduce it to the loweſt, viz. when the 1ſt and 2d terms are ſuch, that the Multiplication and Diviſion may be eaſily performed without it.

Note alſo, when the given terms are fractions, the reciprocal of the firſt and ſecond term, according as the queſtion is Direct or Inverſe, may be taken in lieu of ſuch term, and then the anſwer will be had by multiplying all the terms together.

EXAMPLE I. If 5 oxen coſt 55 l. 10 s. what will 21 oxen coſt at that rate?

	oxen.		oxen.		l.	s.		
As	5	:	21	: :	55	10	(:	the Anſwer)
						20		
						1110	ſhillings.	
						21		
					5)	23310	product of 2d and 3d terms.	
					2|0)	466|2	anſwer in ſhillings.	
						£233	2s. anſwer in pounds.	

EXPLANATION. The demand of the queſtion in the above example, is the value of 21 oxen? therefore, by Definition 3d, 21 oxen muſt be the ſecond term; then as (by the ſaid Definition) the firſt term muſt be of the ſame kind or nature with the ſecond, it is plain that 5 oxen muſt be the firſt term; and the other number, namely 55 l. 10 s. which is of the ſame nature with the anſwer, muſt be the third term; wherefore I write them down in order as above, and the proper reading thereof in that order is, as 5 is to 21, ſo is 55 l. 10 s. (the price of 5) to the anſwer (or the price of 21.) Then, to determine whether the queſtion be Direct or Inverſe, I obſerve, that the ſecond term is greater than the firſt, and the anſwer muſt be greater than the third, in the ſame proportion; and therefore (by Definition 4th) the queſtion is Direct.

Then, according to Rule I. I reduce the third term into ſhillings; alſo I multiply the ſame by the ſecond term, and divide the product by the firſt, and the quotient is the anſwer in ſhillings, according to Rule III. which, being divided by 20, gives the anſwer in pounds.

SCHOLIUM I. In order to abbreviate the operations, it will be convenient to connect the two terms, which are to be multiplied together with the ſign of multiplication between them, and to write the diviſor under them in manner of a fraction, which will be a fractional expreſſion for the anſwer, to be reduced into its loweſt terms by Prob. II. of Fractions.

SCHOL. II. Sometimes alſo the operation may be ſhortened thus: obſerve how often that term which is the diviſor is contained in one of the other terms (noting the Remainder) and multiply the remaining term by the quotient, and take parts for the remainder, to be added to the product.

SCHOL. III. When the diviſor is a compoſite number, and one of the other terms is leſs than the diviſor, but no aliquot part thereof, obſerve what aliquot part of the diviſor comes neareſt to the ſaid leſs term; divide the remaining term by the number denoting the aliquot part, and it will give the value, anſwering to the number expreſſed by the ſaid aliquot part of the diviſor. Then take aliquot parts of this value for the exceſs or defect, and ſubtract or add the ſame, as the caſe ſhall be, and it will give the anſwer.

Contractions of this kind will often prove extremely uſeful, though they have not, I believe, been noticed by any other author. Thus the preceding Example may, by Scholium I. (after the reduction) be written, $\frac{1110\times 21}{5}$ = anſwer in ſhillings, and $\frac{1110\times 21}{5\times 20}$, or $\frac{1110\times 21}{100}$ = anſwer in pounds $= 11.10\times 21 =$ 233.1 l. or 233l. 2s.

Or, by following the ſecond Scholium, I obſerve that 5 is contained 4 times in 21, but that there is a remainder of 1. Therefore I multiply 55l. 10s. by 4, and it gives 222l. to which I add the fifth part of 55l. 10s. viz. 11l. 2s. (becauſe 1 is the fifth part of 5) and the ſum is 233l. 2s. as before.

Note. In following this method, when the remainder is large, it will be better to take the quote 1 more, and ſo deduct, inſtead of adding, a proportionable ſhare, anſwerable to the parts in exceſs.

Thus, in the foregoing example, if the ſecond term had been 24, then the neareſt quote, by the firſt term, would have been 5, but producing an exceſs of 1. Therefore, in that caſe, I ſhould have multiplied the 55l. 10s. by 5, and deducted a fifth part from the product, in order to obtain the anſwer.

Example II. Suppoſe a ſhip ſails 24 leagues in 12 hours, (or half a natural day) how many leagues will ſhe ſail in a week, at the ſame rate?

Hours. Week. Leag.

Here the ſtating will be thus: As 12 : 1 : : 24 (: the anſwer.) But as in 1 week there are 14 half days, therefore, when the firſt and ſecond terms are reduced to the ſame denomination, the proportion will be, As 1 : 14 : : 48 : Anſwer.

And $\frac{14\times 24}{1} = 336$ leagues, the diſtance ſought.

Example III. If 9 yards of cambric coſt 5l. 12s. what will 72 yards coſt at that rate?

Yds. yds.
As 9 : 72 : : 5l. 12s. (Anſwer.)

Therefore the anſwer $= \frac{5\text{l. }12\text{s.}\times 72}{9} = 5\text{l. }12\text{s.}\times 8 = 44\text{l. }16\text{s.}$

Example IV. If 8 men can finiſh a piece of work in 15 days, what number of men will be requiſite to perform the ſame in 24 days?

Days. Days. Men.
As 15 : 24 : : 8 : Anſwer.

Here the proportion is Inverſe, becauſe the ſecond term is greater than the firſt; and the anſwer muſt be leſs than the third; for it is not neceſſary to have ſo many men to do a piece of work, if 24 days be allowed, as would be employed, provided 15 days only were allowed.

Therefore, $\frac{8\times 15}{24} = \frac{15}{3} = 5$, the number of men required.

Example V. If 56 yards of ſhalloon, of 3-quarters wide, are neceſſary for the linings of 10 ſuits of cloaths, how many yards of ſhalloon, of 5-quarters wide, would it take to line them?

Qrs. Qrs. Yards.
As 3 : 5 : : 56 : (Anſwer.)

Here the queſtion is alſo Inverſe; and therefore, $\frac{3\times 56}{5} = 56 \times .6 = 33.6$ yards $= 33\frac{3}{5}$ yards = the Anſwer: or $\frac{3\times 56}{5} = 3 \times 11\frac{1}{5} = 33\frac{3}{5}$, as before.

Example VI. If $\frac{3}{16}$ of a ſhip coſt 274l. 12s. 6d. what will $\frac{5}{32}$ thereof be worth?

As $\frac{3}{16}$: $\frac{5}{32}$: : 274l. 12s. 6d. : Anſwer.

Therefore, $\frac{16}{3} \times \frac{5}{32} \times$ 274l. 12s. 6d. = Anſwer; viz. $\frac{16\times 5}{3\times 32}$ (or $\frac{5}{2\times 3} = \frac{5}{6}$) $\times$ 274l. 12s. 6d. $= \frac{274\text{l. }12\text{s. }6\text{d.}\times 5}{6}$ $= 45\text{l. }15\text{s. }5\text{d.}\times 5 = 228\text{l. }17\text{s. }1\text{d.}$ the Anſwer.

Or, the two fractions reduced to the leaſt common denominator are $\frac{6}{32}$ and $\frac{5}{32}$; and rejecting the denominators, as common to both multiplier and diviſor, the proportion will ſtand thus. As 6 : 5 : : 274l. 12s. 6d. : (Anſwer.) And 274l. 12s. 6d. $\times$ 5 = 1373l. 2s. 6d. which, divided by 6, gives 228l. 17s. 1d. the ſame as before.

Example VII. If 60 gallons of water, in 35 minutes time, be conveyed through a pipe into a ciſtern which holds 200 gallons, and if, by a cock in the ciſtern, there runs out 45 gallons in the ſame time, how long will the ciſtern be in filling, provided the cocks keep running at the above rates?

Here it is evident, that, at the end of 35 minutes, there will be 15 gallons in the ciſtern, and that it will keep filling at the ſame rate.

Gal. Gal. Min.
Hence, As 15 : 200 : : 35 : (Anſwer.)

Therefore, $\frac{200\times 35}{15} = \frac{200\times 7}{3} = \frac{1400}{3} = 466\frac{2}{3}$ minutes, or 7 hours, 46 minutes, and 40 ſeconds, the Anſwer.

Example VIII. If 54 oxen coſt 411l. 1s. 6d. what is the price of 20 oxen at that rate?

Oxen. Oxen.
As 54 : 20 : : 411l. 1s. 6d. : (the Anſwer.)

OPERATION.

$$\begin{array}{r|rrr} 3\,) & 411 & 1 & 6 \\ \hline 9\,) & 137 & 0 & 6 \\ & 15 & 4 & 6 \\ \hline £ & 152 & 5 & 0 \end{array} \text{ Anſwer.}$$

Here I divide the price by 3, and it gives the price of 18, becauſe 18 is the $\frac{1}{3}$ part of 54. Then, to obtain the price of the remaining 2, I divide this by 9, becauſe 2 is the $\frac{1}{9}$ part of 18. The ſum of theſe is 152l. 5s. the Anſwer ſought.

Other queſtions might be given to illuſtrate this Rule, but a due attention to what has been delivered, will afford ſufficient inſtruction for every caſe, and in a more conciſe and methodical method than has been given by other writers.

DOUBLE RULE OF THREE.

The Double Rule of Three, by ſome called the Rule of Five, is when five terms are given to find a ſixth.

The beſt method of ſolving queſtions of this kind, is to make two ſtatings in the ſingle rule; but to ſuſpend the operation till it is diſcovered from the nature of the queſtion, which terms will be multipliers, and which diviſors.

Then the three terms which are multipliers, may be connected by ſigns of multiplication between them, and the two terms which are diviſors may be connected in like manner, and written under the other with a line between them, in form of a fraction, to be reduced to its leaſt terms, as has been ſhewn in the ſingle rule. And in general all the contractions, which have been introduced there, may be occaſionally uſed here.

Example I. If the carriage of 100lb. weight for 30 miles coſt 2 ſhillings, what will the carriage of 500lb. coſt for 200 miles?

As 100lb. : 500lb. : : 2s. : (1ſt Anſwer.)
As 30m. : 200m. : : 1ſt Anſwer : (Anſwer required.)

Then $\frac{500\times 2\times 200}{100\times 30} = \frac{50\times 2\times 2}{3} = \frac{200}{3} = 66\text{s. }\frac{2}{3} = 3\text{l. }6\text{s. }8\text{d.}$ = the Anſwer.

Explanation. Here I ſay by the ſingle rule as 100lb. is to 500lb. ſo is 2s. the value of the carriage of 100lb. for 30 miles, to the value of 500lb. for 30 miles.

Then, as 30 miles is to 200 miles, ſo is the firſt anſwer (or the value of 500lb. for 30 miles) to the value of 500lb. for 200 miles.

The firſt anſwer by the ſingle rule $= \frac{500\times 2}{100}$; and the ſecond Anſwer therefore $= \frac{500\times 2}{100} \times 200 \div 30 = \frac{500\times 2\times 200}{100\times 30}$ as above.

Or, ſince from the nature of the queſtion, both the ſtatings are direct; therefore the firſt terms of each are diviſors, and the reſt multipliers; and hence the procedure is evident.

This mode is vaſtly ſuperior to that of working out the firſt ſtating by itſelf, not only becauſe there will be frequently a remainder in the firſt operation, which, if neglected in the ſecond, will ſometimes produce a material error in the required anſwer, or, if retained, will make the work very troubleſome and tedious, but, becauſe conſiderable advantages will often occur in this way, which cannot poſſibly happen in the other.

Example II. If 68 men can build a wall in 27 days, when the day is 9 hours long? in how many days will 54 men build the ſame when the day is 17 hours long?

Men Men Days
As 68 : 54 : : 27 : (1ſt Anſwer.)
Hours Hours
9 : : 17 : : 1ſt Anſwer (to true Anſwer.)

Then $\frac{68\times 27\times 9}{54\times 17} = \frac{4\times 9}{2} = 2\times 9 = 18$ days, the Anſwer.

Here both the ſtatings are inverſe; for, in the firſt ſtating, it is evident, that 54 men muſt require a longer time for the doing of a piece of work than is neceſſary, in caſe 68 men are employed; and therefore the fourth term, or anſwer, muſt be greater than the third, and of courſe will not have the ſame affection to it, as the ſecond has to the firſt.

In the ſecond example it is plain, that when the day is 17 hours long, a piece of work will be done in fewer days, than when the day is only 9 hours long; and therefore the fourth term, or the required anſwer, muſt be leſs than the third term; or the time that 54 men can do a piece of work in, when the day is 9 hours long, ſuppoſed to be obtained by the firſt ſtating.

Wherefore, this ſtating is alſo inverſe; and therefore 54 and 17, are the diviſors, and the reſt multipliers.

This queſtion is called a queſtion of the Double Rule of Three inverſe. Sometimes one ſtating will be direct, and the other inverſe, and ſuch queſtions are alſo deemed inverſe; wherefore, ſince there is ſuch a difference in queſtions of this kind, this mode of ſolution which diſcovers at once what ſtatings are direct, and which are inverſe, muſt be infinitely preferable to that ambiguous way (uſed by many authors) of placing all the five terms in one line, after a certain order; and then giving rules for operation, according as the queſtion is conceived to belong to the direct or inverſe rule; without conſidering whether an inverſe queſtion involves two indirect ſtatings, or only one.

Example III. If 24 ſtudients ſpend 64 pounds in 16 months, what ſum of money will ſerve 9 ſtudients 8 months?

ſtu. ſtu. l.
As 24 : 9 :: 64 : (1ſt Anſwer.)
m. m.
As 16 : 8 :: 1ſt Anſwer : (required Anſwer.)

Then $\frac{9\times64\times8}{24\times16}=\frac{9\times4}{3}3\times4=12$l. the Anſwer.

Schol. Sometimes queſtions will occur wherein 3 or more ſtatings are neceſſary, but the ſame method may be applied to all.

Example IV. If the carriage of 150 feet of wood, that weighs three ſtone per foot, comes to 3l. for 40 miles, how much will the carriage of 54 feet of free ſtone, that weighs eight ſtone per foot come to for 25 miles?

Feet feet l.
As 150 : 54 :: 3 : (1ſt Anſwer.)
Stone ſtone
As 3 :: 8 : 1ſt Anſwer. : (2d Anſwer.)
Miles miles
As 40 : 25 :: 2d Anſwer. : (required Anſwer.)

Then $\frac{54\times3\times8\times25}{150\times3\times40}=\frac{54}{6\times5}=\frac{9}{5}=1\frac{4}{5}$l. $=$ 1l. 16s. the Anſwer ſought.

Here all the ſtatings are direct, as is evident on inſpection, and therefore 150, 3, and 40, are the diviſors, and the reſt multipliers.

Schol. Sometimes the given numbers will be ſuch as cannot be reduced at once to an anſwer, by this method of placing them in a fractional manner; but it will, nevertheleſs, be convenient to expreſs them ſo at firſt, as they will be a guide to the future operation, and in moſt caſes ſome advantages may be derived from it.

N. B. It is in this, as in the ſingle rule, commonly neceſſary to reduce the 1ſt and 2d terms of each ſtating to one and the ſame denomination; and the third term (unleſs the reſt of the numbers are ſuch, that the operation may be performed without that trouble) muſt be reduced to the loweſt denomination mentioned in it.

ARTICLE XII.

INVOLUTION AND EVOLUTION.

Definitions.

I. If a number be multiplied certain times into itſelf, the reſult is called a power of that number.

When a number is multiplied into itſelf once, the reſult is called the 2d Power; when twice, the 3d Power; thrice, the 4th Power; and ſo on; the number itſelf being always deemed the 1ſt Power, though uſually named the Root.

The 2d Power is alſo called the Square, the 3d, the Cube, the 4th, the Biquadrate, the 5th, the Sur-ſolid, the 6th, the Square Cube, &c. of any number.

Corol. Hence, if it be required to find any Power of a given number, it is done by multiplying the ſame as often into itſelf as is denoted by the number of the Power, leſs 1.

Thus, the 3d Power of $16=16\times16\times16=4096$; the 4th Power thereof $=16\times16\times16\times16=65536$; and ſo for any Power of any other number.

Definition II. The raiſing of a given number to any required Power, is called Involution; but if a certain Power of any number be given, and it be required to determine the 1ſt Power thereof, or the number or root from which the ſame was raiſed, then the art of performing this buſineſs is called Evolution, or the Extraction of Roots; and on this I ſhall ſolely inſiſt through the following part of this Article.

Note. The Root of the 2d Power is called the Square Root; of the 3d Power, the Cube Root; of the 4th Power, the Biquadrate Root, &c.

TABLE OF POWERS.

1ſt Power or Root.	2d Pow or ſquare	3d Pow. or Cube	4th Pow. or Biqua.	5th Pow. or Sur-ſolid.	6th Pow. or ſquare Cube.	7th Pow. or 2d Sur ſolid.	8th Pow. or ſquare Cube.	9th Pow. or Cube Cube.
1	1	1	1	1	1	1	1	1
2	4	8	16	32	64	128	256	512
3	9	27	81	243	729	2187	6561	19683
4	16	64	256	1024	4096	16384	65536	262144
5	25	125	625	3125	15625	78125	390625	1953125
6	36	216	1296	7776	46656	279936	1679616	10077696
7	49	343	2401	16807	117649	823543	5764801	40353607
8	64	512	4096	32768	262144	2097152	16777216	134217728
9	81	729	6561	59049	531441	4782969	43046721	387420489

To Extract the Square Root.

Rule I. Diſtinguiſh the given number into periods of two figures each, by putting a point over the place of units, another over the place of hundreds, another over the place of tens of thouſands, &c. Alſo, if there are decimals, by placing a point alſo over the hundredths plaae, another over the ten thouſandths place, &c. annexing a cypher, if requiſite, to make the periods complete. Then there will be as many figures in the Root as there are periods; and the periods of decimals denote the number of decimals in the Root.

II. Find by the Table a ſquare number, either equal to, or the next leſs than the firſt period to the left hand, and put the root of it to the right hand of the given number, in manner of a quotient, and it will be the firſt figure of the root required.

III. Subtract the ſquare number, found as above, from the firſt period, and to the remainder bring down the next period for a reſolvend or dividend; and, on the left thereof, write the double of the quotient figure for a diviſor; and ſee how oft it is contained in the reſolvend (excluding the laſt figure).

IV. Annex the anſwer to the quotient figure, and alſo to the diviſor, multiplying the ſame, thus augmented, by this laſt quotient figure, and ſubtracting the product from the whole reſolvend.

V. Then to the remainder bring down the next period, for a new reſolvend; double the whole quotient for a diviſor, annexing thereto the next figure of the root, and thus proceed unto the end; obſerving, that if at any time the product of the laſt quotient figure, and the augmented diviſor, be greater than the reſolvend, a leſs figure muſt be taken in lieu thereof, and placed in the quotient.

Note. If after all the figures in the dividend have been brought into the operation, there ſhould ſtill be a remainder, and it is required that the anſwer ſhould be had to a greater degree of accuracy, then annex a pair of cyphers to the remainder, and proceed to find another figure, (which will be a decimal) do the ſame to the next remainder, and ſo on, till there are as many decimal figures in the root as is requiſite.

Note, alſo, That when half the deſired number of figures are had in the root, the reſt may be found by dividing by the double of the root (according to the ſhort method of leaving out a figure in the diviſor each time) without being at the trouble of obtaining new diviſors, or annexing to the remainders any more periods of figures. And it is further obſervable, that inſtead of doubling the root each time for a diviſor, the laſt quotient figure may all along be added to the former diviſor.

Example I.

What is the ſquare root of 327286.9681?

Operation.

```
                         Root.
    327286.9681 ( 572.09
    25
 107)772
   7 749
 ----------
 1142)2386
    2 2284
 ----------
114409) 1029681
        1029681
        -------
        .......
```

Example II.

What is the ſquare root of 10?

Operation.

```
 10.000000(3.16227
  9
61)100
 1  61
------
626)3900
  6 3756
--------
 632)14400
      1264
      ----
       176
       127
       ---
        49
        44
        --
         5
```

Here, in the firſt example, I point off the given number into pairs, both ways from the unit figure (6). Then I find that the greateſt ſquare number under 32 is 25, which I place under 32, and the root 5 in the quotient, doubling the ſame for a diviſor. Then bring the next period (27) down for a dividend, and perceive that the next quotient figure will be 7, which I therefore annex to the root, and to the diviſor, placing the product of the whole diviſor by 7 under the dividend, ſubtracting it therefrom, and bringing down the next period. Then I add the laſt quotient figure to the former diviſor, (or, which is the ſame, double the whole quotient) and it becomes 114. I obſerve that the next figure in the root will be 2, which I annex to the diviſor, and to the quotient; and thus I proceed to the end, and find the root 572.09.

The ſecond example is wrought in like manner, only there, after three figures are had, I divide by the double of the quote; and, as I do not include the laſt root figure, I cut off one figure from the laſt period brought down, and ſo, with very little trouble, I obtain three more figures. If, in the laſt diviſor, I had included the quotient figure, I ſhould then have got four figures more in the root.

Schol. The ſquare root of a vulgar fraction is found by extracting the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator. Thus the ſquare root of $\frac{4}{9}=\frac{2}{3}$. The truth of this is evident, for $\frac{2}{3}$ ſquared $=\frac{2}{3}\times\frac{2}{3}=\frac{4}{9}$; or, if it is deſired that either the numerator or denominator of the root ſhall be the ſame as that of the given fraction, then multiply the numerator and denominator together, and extract the ſquare root of the product, which will be the reſpective denominator or numerator of the required root.

Thus, in the former example, if it is required that the numerator of the root ſhould be the ſame as that of the given fraction, namely, 4.

Then, $4 \times 9 = 36$, the ſquare root of which is 6; and $\frac{4}{6}$ is the fraction required: or, if it is required to have the ſame denominator, then $\frac{6}{9}$ is the root required. The truth of this proceeding is evident; for $\frac{4}{6}$, and $\frac{6}{9}$, are each $= \frac{2}{3}$ the former root; or, it may be proved thus; $\frac{4\times4}{9\times4} = \frac{4}{9}$; and therefore the ſquare root of $\frac{4\times4}{9\times4}$ is of courſe $=$ ſquare root of $\frac{4}{9}$.

Alſo, $\frac{4\times9}{9\times9} = \frac{4}{9}$; and therefore the ſquare root of $\frac{4\times9}{9\times9} =$ ſquare root of $\frac{4}{9}$.

In the former caſe, the ſquare root of the numerator is equal to the given numerator, and in the latter, the ſquare root of the denominator is equal to the given denominator.

This method, therefore, will ſave the extraction of one of the terms of the given fraction. However, in general it will be better to reduce the given fraction to a decimal, and then extract its root.

TO EXTRACT THE CUBE ROOT OF A GIVEN NUMBER.

Rule I. Point off the given number into periods of 3 figures each, placing a point over the unit's figure, and one upon every 3d figure, both to the right and left thereof, if there are decimal figures in the given number.

II. Find the greateſt cube contained in the firſt period, and ſubtract it therefrom, placing the root in the quotient, and annexing the next period to the remainder for a Reſolvend.

III. Divide the ſaid reſolvend (excepting the two laſt figures of the period annexed) by three times the ſquare of the quotient figure, which will generally give the next figure of the root, though ſometimes, in this firſt inſtance, it will prove too big.

IV. Having placed the figure in the quotient, multiply the ſame by thrice the firſt figure of the root, and write the product under the diviſor before uſed; in ſuch order, that the ten's place thereof may ſtand under the unit's place of the other; alſo ſquare the laſt figure, and place this under the product, ſo that the ten's place (if any) may ſtand under the unit's place of the product; ſo will the ſum of the three rows in the order they ſtand, be a more correct diviſor.

V. Divide the whole of the above reſolvend by this diviſor, and to the remainder bring down the next period.

VI. Divide this (leaving out the two laſt figures as before) by 3 times the ſquare of the root, already found, and place the figure in the quotient, adding to ſuch diviſor, the product of thrice the laſt mentioned root, by this figure, together with the ſquare of the ſaid figure; but placed in the ſame order as is deſcribed above, for finding the laſt correct diviſor; then the ſum will be another correct diviſor.

VII. Divide the laſt reſolvend by this diviſor, and to the remainder bring down the next period, proceeding to find another figure of the root, and a correct diviſor as before, and ſo on to the end; when, if there be ſtill a remainder, and more exactneſs be required, annex to the remainder three cyphers, and repeat it till as many decimal figures are obtained as is requiſite.

Example. What is the cube root of 67507.82424?

Operation.

```
                                   Root
                    67507.824240 (40.717
                    64
      3 × 4² = 48)  3507 Reſolvend

    3 × 40² =    4800 \
   7×3×40  =      840  )3507824 Reſolvend
       7²  =       49  )3419143
     Diviſor    48889 /

   3 × 407² = 496947  \
 1 × 3 × 407 =   1221   )  88681240 Reſolvend
      1 × 1 =       1   )  49706911
     Diviſor 49706911 /

   3 × 4071² = 49719123  \   38974329000 Reſolvend
7 × 3 × 4071² =    85491  )  34809370813
        7² =          49  )   4164958187 Remainder.
     Diviſor  4972767259 /
```

Here by annexing more cyphers, and continuing the operation, the anſwer may be had to any degree of accuracy. But when a few figures are got, as many more may be had true in the root without changing the diviſor; and there need not to be more figures taken in the diviſor, than there are figures already in the root, and a figure may be cut off each time as has been before taught, which renders the work exceeding ſhort.

Thus, in the above example, having the laſt reſolvend 38974329000, the diviſor 4972767259, and 40.71 the root, there may be cut off from the diviſor and dividend, ſix figures each, and four more figures will be had correct in the root, with very little trouble; as follow,

```
  Diviſor   Reſolvend
4972|767259)38974|329000(7817
  ...       34809|
            4165
            3978
              87
            . 50
              37
              35
               2
```

The 4 figures obtained as above, being annexed to 40.71, make the root 40.717817, true to 8 figures, and the laſt 4 being obtained with great facility.

N. B. If the firſt 4 figures of thrice the ſquare of the root had been uſed for the diviſor, it would have been ſufficient; at leaſt, it would give three more places correct, and not have differed from the truth above 1 in the fourth figure.

A general Method of extracting the Roots of all Powers.

Rule I. Prepare the given number for extraction, by pointing it off from the unit's place into periods; each of which muſt contain as many figures as is denoted by the number, expreſſing the name of the power.

II. Find the firſt figure of the root by trial, take the difference between the power thereof, from the given number, and to the remainder bring down the firſt figure belonging to the next period for a dividend.

III. Involve the root to the next inferior power to that which is given, and multiply it by the number, denoting the given power for a diviſor.

IV. Find how many times the diviſor may be had in the dividend, and the quotient will be another figure to be added, or ſubtracted to the root, according as the former was leſs or greater than the truth.

V. Involve the whole root to the given power; take the difference between it and the given number, and annex thereto the firſt figure of the next period for a new dividend; finding a diviſor as before, and proceeding thus till the operation is finiſhed.

N. B. When a few figures are had in the root, the next diviſor will give near as many more, without the trouble of renewing the operation.

Example. What is the biquadrate root of 19987173376?

Operation.

```
                          .  .  .
                     19987173376      / 4 . . Root too great
                4⁴=256........       (  —2 .  leſs, quote
                Diff. 5612826624     (   38 .Root ſtill too great
Diviſor=4×4³=256)561 Divid.(2.quo    (  —3. 93 leſs, quote.
                          .  .  .     \ 376.07 Root.
                     19987173376 Given number
               38⁴=2085136....
                Diff. 864186624
Diviſ.=4×38³=219|968)864|186 dividend (3.93 quote.
                     660
                     204
                     198
                       6
                       6
                       .
```

Here the aſſumed root being more than juſt, the quotient figure (2) is to be ſubtracted. Alſo I find by involution that 380 is too great, and therefore the next quotient figures are alſo to be ſubtracted.

I venture to take 3 figures the next operation, which being ſubtracted from the former, leaves 376.07 for the root; therefore I doubt not but 376. is either the true root or very near it; and on involving the ſame I find it to be the root required. So by only two ſhort operations, the root of the fourth power is had true to four figures, erring only in the fifth.

N. B. The biquadrate root may be found by firſt extracting the ſquare root, and then the ſquare root of that root; the ſquare cube root, may be found by extracting the ſquare, and then the cube root; the root of the 8th power may be reſolved in 3 ſquare roots; that of the 9th power into two cubes, &c.

Note alſo, Any root of a vulgar fraction is had by extracting the root of both numerator and denominator. But it is better to throw it into a decimal, and then extract it.

A General Method whereby the Roots of all Powers may be readily Approximated.

Rule. Find the neareſt root of the firſt period (whether the ſame be greater than the truth or leſs) and multiply the power thereof by the number denoting the name of the next higher power; alſo multiply the given number by the number denoting the name of the next inferior power, and add theſe two products together. Then as this ſum is to the difference between the given number and the power of the ſaid root (cyphers being annexed to fill up the vacant periods) ſo is twice the root to the correction, which muſt be added to the root if the root was leſs than juſt, but ſubtracted if greater.

N. B. In all odd powers, as the next greater and next leſs are denoted by even numbers, the given number and the power of the root may be multiplied by only half thoſe numbers, or, which is the ſame, the power of the root muſt be multiplied by the greater half of the number denoting the name of the power; and the given number by the leſs half thereof; and then inſtead of twice the root, the root only muſt be taken for the 3d term.

The firſt term of the proportion for the cube root will therefore be twice the cube of the aſſumed root, added to the given number; for the furſolid root, it will be thrice the 5th power of the aſſumed root, more twice the given number; for the root of the 7th power, it will be four times the 7th power of the ſuppoſed root added to thrice the given number, and ſo on.

Example. Let it be required as before, to extract the cube root of 67507.82424. Here 4 is the neareſt root of the firſt period, which, as the root muſt conſiſt of 2 figures of whole numbers, muſt be called 40, and the operation will ſtand thus:

```
The given number       67507.82424 Given numb. 67507.82424
Thrice the neareſt cube 128000     Suppoſed cube 64000.
                 (Sum) 195507.82424   Difference 3507.82424
  As 195507.82424 : 3507.82424 :: 40 : (Correction)
                               40
    1955|07.82&c.)140312.96960(.7177 nearly
                  13685
                    346
                    195
                     151        1ſt Root   40.
                     137        Correction +7177
                      14        Anſwer     40.7177
                      14
```

Note, Here the anſwer at the firſt operation errs only 1 in the ſixth figure, and if the operation be repeated, it will give the Anſwer true to 17 or 18 places. Note alſo, the firſt operation will in any caſe give 3 or 4 true figures, and the next operation will treble the number.

The Inveſtigation of the foregoing Rule.

Let the number denoting the power to be extracted be n, and the given number a; or which is the ſame, let the $\frac{1}{n}^{\text{th}}$ root of a be required. Alſo put $x=$ the true root, and let r be a ſuppoſed root taken near to x (the nearer the better); v, being the exceſs or defect, ſo will $r\pm v=x$. Then $\overline{r\pm v}^{\,n}=a$; and by the binomial theorem $\overline{r\pm v}^{\,n}=r^n\pm nr^{n-1}v+n.\frac{n-1}{2}.r^{n-2}v^2\pm$ &c. which terms for an approximation are ſufficient. Then $\overline{\pm nr^{n-1}+n.\frac{n-1}{2}r^{n-2}v}\times v=a-r^n$, and

$\frac{a-r^n}{\pm nr^{n-1}+n.\frac{n-1}{2}.r^{n-2}v}=v$; but $\frac{a-r^n}{\pm nr^{n-1}}$ is alſo an approximate of v; therefore $v=$

$$\frac{a-r_n}{\pm nr^{n-1}+n.\frac{n-1}{2}r^{n-2}\times\frac{a-r^n}{\pm nr^{n-1}}}=\frac{\pm anr^{n-1}\mp nr^{2n-1}}{+n^2r^{2n-2}+n.\frac{n-1}{2}.r^{n-2}\times\overline{a-r_n}}=$$

$$\frac{\pm ar\mp r^{n+1}}{nr^n+\frac{n-1}{2}\times\overline{a-r^n}}=\frac{\pm ar\mp r^{n+1}}{\frac{n+1}{2}r^n+\frac{n-1}{2}.a}=\frac{\pm 2ar\mp 2r^{n+1}}{\overline{n+1}.r^n+\overline{n-1}.a}$$

$$\frac{\pm a\mp r^n}{\overline{n+1}.r^n+\overline{n-1}.a}\times 2r=\frac{a\backsim r^n}{\overline{n+1}.r^n+\overline{n-1}.a}\times 2r;$$ which resolved into a proportion we have, As $\overline{n+1}.r^n+\overline{n-1}.a : a\backsim r^n :: 2r : v$, the correction to be added to or ſubtracted from r, according as r is taken leſs or greater than x, which proportion in odd powers may be reduced, as has been before ſhewn.

If a Theorem is wanted, that ſhall give x at once, then $r\pm\frac{\pm 2ar\mp 2r^{n+1}}{\overline{n+1}.r^n+\overline{n-1}.a}=x=$ (in either caſe)

$$\frac{\overline{n-1}.r^{n+1}+\overline{n+1}.ar}{\overline{n+1}.r^n+\overline{n-1}.a}=\frac{\overline{n+1}.a+\overline{n-1}\,r^n}{\overline{n+1}\,r^n+\overline{n-1}\,a}\times r,$$ and hence as

$\overline{n+1}\,r^n+\overline{n-1}.a : \overline{n+1}.a+\overline{n-1}\,r^n :: r : x.$

In words thus, aſſume a number, near to the root, whether greater or leſs than the ſame; then to the number denoting the power to be extracted, add 1, and multiply the ſum by the power of the aſſumed root; alſo from the number, denoting the ſaid power, ſubtract 1; and multiply the difference by the given number; and add the two products together, for the firſt term of the proportion.

Likewiſe; multiply the former ſum by the given number, and likewiſe the aforeſaid difference by the power of the aſſumed root, and add theſe two products together, for the ſecond term in the proportion.

Then the 3d term will be the aſſumed root, and the 4th term or anſwer will be a nearer value of the root, containing thrice the number of figures that were true in the root before.

In odd powers, the proportion may be reduced by dividing the firſt and 2d terms by 2; and ſo, in the cube root, the firſt term will be twice the cube of the ſuppoſed root, added to the given number; and the 2d, twice the given number added to the cube of the ſuppoſed root: in extracting the root of the fifth power, the firſt term will be 3 times the 5th power of the ſuppoſed root, added to twice the given number; and the ſecond term, three times the given number, more twice the fifth power of the aſſumed root.

In the root of the 7th power, the firſt term will be 4 times the 7th power of the aſſumed root, more 3 times the given number, and the ſecond term, 4 times the given number added to 3 times the 7th power of the ſuppoſed root, and ſo on.

A rule for the cube root, agreeing with this latter method, has been given by ſome authors; but I know of none who have inveſtigated one general proportion, for approximating the roots of all powers.

Mr. Burrow, late mathematical maſter at the Tower, and author of the Gentleman and Ladies Diaries, &c. to whom I was formerly aſſiſtant, made ſome attempts; but the method that he took, though a gentleman of excellent abilities, was not well adapted to the purpoſe; for after all that he did in this buſineſs, the matter was ſtill left to be gueſſed at; and, in many caſes, it would require fifty times the trouble to aſcertain a fit proportion for extracting the roots of a particular power, that I have been at in inveſtigating and giving two general Proportions for extracting the Roots of all Powers.

The firſt of theſe methods will be found to have the preference in point of expedition; as by the latter method a longer diviſion (by $\frac{1}{2}$ part) muſt be uſed, than is neceſſary in the former.

Another New Method for extracting the Cube Root.

Rule. Find the neareſt root of the firſt period, whether greater or leſs than the truth, and thereto annex cyphers to ſupply the vacancy of the remaining figures to be had in the root. Divide the difference between four times the number to be extracted, and this root (ſo ordered) by thrice the ſaid root. Then the ſquare root of the quotient, added to the aſſumed root, will be equal to twice the required root; or ſuch root may be taken for a new operation, if more accuracy is wanted.

N. B. This method will nearly treble the number of true figures in the root, at each operation.

Example. What is the cube root of 7892485271?

```
                         7892485271|2000 = neareſt root
                                  4|
                        31569941084 = 4 times given number
                         8000000000 = cube of neareſt root
Thrice neareſt root=6000)23569941|084 = difference
                          . . . . .  |
                          3928323.514|1982 = ſquare root
                          1          |2000 = aſſumed root
                 29      |292      2 (3982 = ſum
                  9      |261          1991 = cube root req.
                 388     | 3183
                  .      | 3104
                             79
                             78
                              1
```

ARTICLE XIII.

BARTER.

Definition.

Barter is the exchanging of one commodity for another in trade, ſo as neither party may ſuſtain loſs thereby.

Rule I. Find the value of that commodity, whoſe quantity is given, and find alſo what quantity of the other, at its propoſed rate, will amount to the ſame money: then ſo much of the latter commodity muſt be given for the former.

Rule II. When one commodity is advanced above the ready money price, find the advanced price of the other in the ſame proportion; and then proceed as above.

Example I. How much ſugar at 8d. per lb. muſt be given for 16 ctw. of tobacco at 5 l. per cwt.?

Here 16 cwt. of tobacco at 5 l. per cwt. comes to 80l. then ſay, As 8d. : 80 l. (or 19200 pence) :: 1 : (Anſwer.)

Therefore $\frac{19200}{8}=2400$ lb. of tobacco, or 21 cwt. 1 qr. 20 lb. the Anſwer.

Example II. A and B barter with each other. A hath 200 yards of cloth at 6s. 8d. per yard, ready money, but in barter he will have 8s. per yard. B has hops at 1l. 14s. per cwt. ready money. How many cwt. of hops muſt B give A for his cloth, ſo that his gain in the barter may be equal to A's?

As 6s. 8d. (or 80 pence) : 1l. 14s. (408 pence) :: 8 s. : (price of hops in barter.)

Then $\frac{408\times 8}{80}=40.8$s. the price which B's hops muſt be charged at per cwt. in barter. Alſo A's 200 yards of cloth at 8s. comes to 80 l.

An

And as 40.8s. : 80l. (or 1600s.) : : 1 cwt. : (the Anſwer.)

Therefore $\frac{1600}{40.8} = \frac{200}{5.1} =$ 39 cwt. 0. qr. 24 $\frac{8}{51}$ lb. the Anſwer required.

Quest. III. Two merchants, A and B, barter with each other. A has 460 yards of broad cloth, worth 9s. 2d. per yard, but in barter he will have 11s. per yard. B has coffee at 2s. per lb. for which he charges 2s. 6d. How much coffee muſt A receive for his cloth, and what does he gain or loſe by the bargain?

Here A's cloth, at 11s. per yard, comes to 5060 ſhillings.

And as 2s. 6d. (or 2.5) : 5060 : : 1lb. : to the quantity of coffee, which A muſt receive.

Therefore $\frac{5060}{2.5} = \frac{1012}{.5} =$ 2024 lb. = the pounds of coffee, which B muſt give A for his cloth.

Now, to find the gain or loſs of either party in this tranſaction.

As 9s. 2d. (or 110d.) : 2s. (or 24d.) : : 11s. : the value that B's coffee ought to be charged at per lb. ſo as neither to gain nor loſe, = 2.4s. And therefore, as 2.4s. : 5060s. : : 1lb. : the quantity of coffee which B ought to give A for his cloth, $= \frac{5060}{2.4} = \frac{1265}{.6} = 2108\frac{1}{3}$ lb. But B only gives A 2024 lb. and therefore he ſaves $84\frac{1}{3}$ lb. which at 2s. per lb. the prime coſt of the coffee, comes to 8l. 8s. 8d. the gain of B by this bargain. And ſo much alſo A loſt.

ART. XIV. FELLOWSHIP.

Definitions.

I. Fellowſhip is a general rule by which merchants, tradeſmen, &c. in company determine each perſon's particular ſhare of the gain or loſs in proportion to his ſhare in the joint ſtock.

II. Fellowſhip is either double or ſingle.

III. Single Fellowſhip is when each perſon's ſtock is employed during one and the ſame given time.

IV. Double Fellowſhip is when the different ſtocks are employed for unequal portions of time.

THE RULE FOR SINGLE FELLOWSHIP.

As the whole ſtock is to the whole gain or loſs, ſo is each man's particular ſtock to his particular ſhare of the gain or loſs.

Question I. A and B have gained by trading 160l. A put into ſtock 300l. and B 500l. what is each perſon's ſhare of the gain?

Here the whole ſtock is 800l. And as 800l. : 160l. : : 300l. : to the ſhare of A $= \frac{160 \times 300}{800} = \frac{2 \times 300}{10} = \frac{2 \times 30}{1} =$ 60. Alſo, as 800l. : 160l. : : 500l. : to the ſhare of B $= \frac{160 \times 500}{800} = \frac{2 \times 500}{10} = \frac{2 \times 50}{1} =$ 100l.

Moreover 60l. the gain of A, added to 100l. the gain of B, makes 160l. the whole gain, which ſhews that the work is right.

Schol. I. After the gain or loſs of one perſon is found, the reſt may be found without uſing the whole gain or loſs, and the whole ſtock, by ſaying, as that perſon's ſtock is to his gain, or loſs, ſo is any other perſon's ſtock to his gain, or loſs, and it will frequently happen that, by this method, the different Anſwers will be obtained in a ſhorter way than by adhering ſtrictly to the foregoing Rule, eſpecially if one be mindful to embrace every contraction that may preſent itſelf in the operations, as deſcribed in the Rule of Three.

Schol. II. When it does not appear that the method pointed out in the laſt Scholium will be attended with any advantage; then when there are many joint ſtocks to ſettle, or caſes of bankruptcy, &c. it will be a good way to find the gain or loſs upon 1l. which is done by dividing the whole gain by the whole ſtock. Then multiply the quotient by each man's particular ſtock, and it will give his particular ſhare of the gain or loſs.

This method will ſave a repetition of diviſions; and the multiplications may alſo be ſhortened by beginning with the ſmalleſt ſhare firſt; for then the next may be wrought by multiplying the ſaid quotient by the difference between that and the former ſtock, and adding the product to the former; and the next, by multiplying by the difference between that ſtock and the preceding, and adding the product in like manner to the preceding ſhare, and ſo on; always going forward to the next greater ſtock.

Thus, in the laſt example, the gain of 1l. ſtock $= \frac{160}{800} =$ 2l. And $300 \times .2 = 60$l. = gain of A. Alſo, 200 (or $500 - 300$) $\times .2 = 40$l. and $60 + 40 = 100$l. = gain of B.

Question II. Four perſons in partnerſhip, A, B, C, and D, put into ſtock 360l. 480l. 700l. and 860l. reſpectively, for a certain time, at the end of which they have gained 3960l. what is each perſon's ſhare of the gain?

$$\begin{array}{ll}
\text{£.} & \\
360 = & \text{A's ſtock.} \\
480 = & \text{B's.} \\
700 = & \text{C's.} \\
\underline{860} = & \text{D's.} \\
2400 = & \text{Whole ſtock.}
\end{array}
\qquad
\begin{array}{lrcrcrcrl}
 & & & \text{£.} & & \text{£.} & & \text{£.} & \text{£. Share.} \\
\text{Then, As} & 2400 & : & 3960 & :: & 360 & : & 594 & = \text{A's} \\
\text{As} & 3 & : & 4 & :: & 594 & : & 792 & = \text{B's} \\
\text{As} & 24 & : & 35 & :: & 792 & : & 1155 & = \text{C's} \\
\text{As} & 35 & : & 43 & :: & 1155 & : & \underline{1419} & = \text{D's} \\
 & & & & & \text{Whole gain} & & 3960 & \text{Proof.}
\end{array}$$

Example III. Four men, A, B, C, and D, bought a caſk of ale for 20 ſhillings, and agreed that each man's part of the purchaſe ſhould be as $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$, reſpectively; what muſt each pay?

Here the fractions, reduced to the leaſt common denominator, are $\frac{20}{60}$, $\frac{15}{60}$, $\frac{12}{60}$, and $\frac{10}{60}$; and, conſequently, the ſhares will be as 20, 15, 12, and 10, reſpectively.

Then $20 + 15 + 12 + 10 = 57$.

$$\begin{array}{llcccccl}
 & & & & & \text{s. d. f.} & & \text{s. d. f.} \\
\text{And, As} & 57 & : & 20 & :: & 20\ 0\ 0 & : \text{to the ſhare of A} = & 7\ 0\ 0\frac{48}{57} \\
\text{As} & 4 & : & 3 & :: & 7\ 0\ 0\frac{48}{57}: & \text{ſhare of B} = & 5\ 3\ 0\frac{36}{57} \\
\text{As} & 5 & : & 4 & :: & 5\ 3\ 0\frac{36}{57}: & \text{ſhare of C} = & 4\ 2\ \frac{1}{2}\frac{6}{57} \\
\text{As} & 2 & : & 1 & :: & 7\ 0\ 0\frac{48}{57}: & \text{ſhare of D} = & \underline{3\ 6\ 0\frac{24}{57}} \\
 & & & & & & = & 20\ \text{Proof.}
\end{array}$$

Example IV. Five men trade together, and compoſe a ſtock of 823l. 15s. A put in 96l. 10s. B, 108l. 5s. C, 162l. 6s. D, 196l. 6s. and E, 260l. 8s. and their whole gain is 98l. 17s. What is each man's part thereof?

Here the whole gain, 98.75l. being divided by the whole ſtock, gives .12l. for the gain of 1l. which therefore will be a common multiplier. Then,

$$\begin{array}{l}
\text{l.} \\
96.5 \\
108.25 \\
162.3 \\
196.3 \\
\underline{260.4} \\
823.75
\end{array}
\left.\vphantom{\begin{array}{l}1\\1\\1\\1\\1\end{array}}\right\} \times .12 =
\left\{\begin{array}{lcrrrlcl}
\text{l.} & & \text{l.} & \text{s.} & \text{d.} & & & \\
11.58 & = & 11 & 11 & 7 & .8 & = & \text{A's ſhare.} \\
12.99 & = & 12 & 19 & 9\frac{1}{2} & .4 & = & \text{B's.} \\
19.476 & = & 19 & 9 & 6 & .96 & = & \text{C's} \\
23.556 & = & 23 & 11 & 1\frac{1}{4} & .76 & = & \text{D's} \\
31.248 & = & \underline{31} & \underline{4} & \underline{11\frac{1}{2}} & .08 & = & \text{E's.} \\
 & \text{£} & 98 & 17 & 0 & \text{Proof.} & &
\end{array}\right.$$

Schol. III. If the whole ſtock, and each man's gain or loſs be given to find the particular ſtock of each, then ſay, as the whole gain is to the whole ſtock, ſo is each man's gain to his ſtock.

THE RULE FOR DOUBLE FELLOWSHIP.

Multiply each man's ſtock by the time of its being in trade, and add the ſeveral products into one ſum; then ſay, as that ſum is to the whole gain or loſs, ſo is the product of each man's ſtock and time, to his part of the gain or loſs.

Example I. Three merchants, A, B, and C, enter into partnerſhip: A put in 60l. for 4 months: B, 50l. for 3 months: C, 30l. for 2 months: and the whole of the gain is 60l. What is each man's part thereof?

$$\left.\begin{array}{r}
\text{l.} \\
60 \times 4 = 240 \\
50 \times 3 = 150 \\
30 \times 2 = \underline{\ 60} \\
\text{£}\ 450
\end{array}\right\} \text{Then, as}
\left\{\begin{array}{rcrcrcrcl}
 & & \text{l.} & & & & \text{l.} & & \\
450 & : & 60 & :: & 240 & : & 32 & = & \text{A's ſhare.} \\
450 & : & 60 & :: & 150 & : & 20 & = & \text{B's} \\
450 & : & 60 & :: & 60 & : & \underline{8} & = & \text{C's.} \\
 & & & & & \text{£} & 60 & & \text{Proofs.}
\end{array}\right.$$

Schol. I. When there are many in partnerſhip, it will expedite the work to divide the whole gain or loſs by the ſum of the products of each man's ſtock and time, and multiply the reſpective quotients by each of ſuch products, and the reſults will be the ſeveral anſwers required. And this way alſo may be frequently rendered ſhorter, by beginning with the leaſt product, and proceeding according to the differences as ſtated in Schol. II. of Single Fellowſhip: or, having calculated one man's ſhare, you may ſay, as the product of his ſtock and time is to the product of any other man's ſtock and time, ſo is the gain more or loſs of the former partner to the gain or loſs of the latter.

Schol. II. When the whole ſtock, the time of each man's continuing in partnerſhip, and the gain or loſs of each is given, to find the proper ſtock of each, it may be done thus.

Divide each man's gain by the time, and add the ſeveral quotients into one ſum. Then ſay, as the ſum of the quotients is to the whole ſtock, ſo is each quotient to the correſponding ſtock; or find by Problem IV. of Fractions, the leaſt number that is diviſible by each man's time, and let the ſame be ſeverally divided by each ſuch time accordingly. Alſo multiply each of the reſpective quotients by the correſponding gain or loſs, and add all the products into one ſum, noting diſtinctly to what perſon each relates; then ſay, as the whole gain or loſs is to the ſaid ſum, ſo is each product to the correſpondent ſtock, or to the ſtock of ſuch partner as the product in operation had a reference to.

N. B. This latter method will be preferable, when there is a remainder in dividing any of the gains by its time.

Example II. Three perſons, A, B, and C, hire a piece of land for 6l. 10s. To which ſum A contributed 11l. 5s. B, 20l. and C, 29l. 5s. Now they propoſe to ſtock the ſame with oxen, and that A's oxen ſhall be at paſture for $4\frac{1}{2}$ months; B's, for 5 months; and C's, for $6\frac{1}{2}$ months. The number of oxen to be fed is 22. How many muſt each man put to graſs?

Here the times are 9 half months, 10 half months, and 13 half months, reſpectively; and the leaſt number which is diviſible by each of them $= 9 \times 10 \times 13$. And therefore the multiplier in the caſe of A, is $\frac{9 \times 10 \times 13}{9} = 10 \times 13 = 130$; in that of B is $\frac{9 \times 10 \times 13}{10} = 9 \times 13 = 117$; and in that of C, is $\frac{9 \times 10 \times 13}{13} =$ 90. Then

$$\left.\begin{array}{r}
11.25 \times 130 = 1462.5 \\
20 \times 117 = 2340. \\
29.25 \times \ 90 = \underline{2632.5} \\
6435
\end{array}\right\} \begin{array}{c}\text{And,}\\ \text{as}\end{array}
\left\{\begin{array}{rcrcrcrl}
 & & & & & & & \text{Oxen} \\
6435 & : & 22 & :: & 1462.5 & : & 5 & = \text{A's} \\
6435 & : & 22 & :: & 2340 & : & 8 & = \text{B's} \\
6435 & : & 22 & :: & 2632.5 & : & \underline{9} & = \text{C's} \\
 & & & & & & 22 & \text{Proof.}
\end{array}\right.$$

ART. XV. ALLIGATION, &c.

Definitions.

I. Alligation teacheth how to mix ſimples of different qualities, ſtrengths, values, or rates, ſo that the compoſition may be of ſome intermediate quality, ſtrength, or value.

II. Alligation is of four kinds, viz. Medial, Alternate, Partial, and Total.

III. Alligation Medial, is the method of finding the rate of the compound, from having the rates and quantities of the ſeveral ſimples given.

IV. Alligation Alternate teaches, by knowing the rate of the compound, and the rates of the ſimples of which it is compoſed, to find the proportional quantities of each ſort, to form ſuch a mixture.

V. Alligation Partial is when the rates of the ſimples, the rate of the compound, and the quantity of one (or more) of the ſimples to be mixed, are given to find the ſeveral quantities of the reſt of the ſimples.

VI. Alligation Total is when the rates of the ſimples, the rate of the compound, and the quantity of the compound are given, to find the reſpective quantities of the ſimples uſed in making that quantity of the compound.

THE RULE FOR ALLIGATION MEDIAL.

Multiply each quantity by its rate; and divide the ſum of the products, by the ſum of the quantities, (or whole compoſition) and the quotient will be the rate of the compound required.

Example. A Vintner would mix together 80 gallons of malaga, at 8s per gallon; 50 gallons of ſherry, as 5s 6d per gallon; 32 gallons of canary, at 7s per gallon; and 29 gallons of white wine, at 4s 6d per gallon: how muſt the mixture be ſold?

Here, 8s. × 80 = 640
5.5 × 50 = 275
7. × 32 = 224
4.5 × 29 = 130.5
191 1269.5

191) 1269.5 (6s
1146
123.5
12
191) 1482. (7
1337
145
4
191) 580 (3
573
7

Anſwer, 6s. $7\frac{3}{4}$d. and $\frac{7}{191}$ of a farthing.

Schol. When in the given quantities there are fractional parts, it will be convenient before you commence the operation, to reduce them all to fractions, having the leaſt common denominator.

Then the denominators, being common, may be rejected, and the operation carried on with the numerators, as though they were given whole numbers.

THE RULE FOR ALLIGATION.

Alternate.

I. Set down the rates of the ſimples in a column under each other; and write down the rate of the compound oppoſite the middle of the column, and on the left thereof.

II. Connect, or link with a crooked or curve line, the rate of each ſimple, which is leſs than that of the compound, with one or any number of thoſe that are greater; and link each greater rate with one, or any number of the leſs.

III. Write down the difference between the rate of the compound, and that of each ſimple, oppoſite the rate to which it is linked.

IV. Then if only one difference is found oppoſite any rate, it will be the quantity belonging to that rate; but, if there be ſeveral, their ſum will be the rate.

N. B. Queſtions of this kind admit of innumerable anſwers, and are of the ſame nature with thoſe under the head *Indeterminate Problems*, in the Syſtem of Algebra.

Therefore to obtain more anſwers than the above rule will give, take, inſtead of the differences belonging to any couple of rates, any multiple thereof, whatever.

Do this with as many couple of rates, as you pleaſe; through which there will be had a new ſet of differential numbers, exhibiting freſh anſwers. And thus by repeating the operation with different multiples, any number of anſwers may be derived; for the variety is infinite, or in general; (though it may ſeem a paradox) infinitely infinite, or an infinity of infinity.

Example. How much ſherry at 2s. 3d. canary at 2s. 9d. and port at 1s. 2d. per quart, muſt be taken to form a compound of the value of 1s. 6d. per quart?

Pence
18d. | 33 | 4 | | 4 = quantity of canary
| 27 | 4 | | 4 = ditto ſherry
| 14 | 9 15 | 24 = ditto port

Hence, to make the mixture, there may be taken 4 quarts of canary, 4 quarts of ſherry, and 24 of port, or any quantities in thoſe proportions; or, if the differences of either, or both the couples be multiplied by any aſſigned number, other proportions will be had that will ſatisfy the enquiry, even (by repetitions) to a number greater than any aſſignable one.

Thus, if the differences 4 and 15, belonging to 33 and 14, be doubled, then the proportions will become 8, 4, and 39, reſpectively; if trebled, they will be 12, 4, 54; and ſo on, the proportions ever varying as a different multiple is applied.

Again, if the differences 4 and 9, belonging to 27 and 14, be doubled, and not the other, then the proportions will be 4, 8, and 33, reſpectively; if trebled, they will be 4, 12 and 42, and ſo on for any other multiple.

Therefore, it is evident, that this Example admits of an infinitely infinite variety of proportions.

THE RULE FOR ALLIGATION.

Partial.

Find the proportions as for Alligation alternate; then ſay, as the difference or proportionate number, belonging to the ſimple or ingredient, whoſe quantity is given, is to the difference or proportionate number, belonging to any other ſimple, &c. ſo is the quantity of the former ſimple, &c. to the quantity of the latter.

And thus the quantities of each ſimple may be found ſo as to form the propoſed compound, when the quantity of one of the ſimples is given.

If the quantities of two or more ſimples are given, and it is required to determine the quantities of ſeveral others ſo as to form a given compound, then by Alligation medial find the quality, rate, or value of a mixture compoſed of the ſimple, whoſe quantities are given, and ſubſtitute the whole of the ſame, inſtead of the ſaid given quantity; and ſo they will be reduced, as it were, to one ingredient, whoſe quantity and rate, or value, &c. is given; and therefore, the unknown quantities will be found by the preceding rule.

Question. What quantity of gold of 15, of 17, and of 22 carats fine, muſt be mixed with 6 oz. of carats fine, ſo that the compoſition may be of 20 carats fine?

20 | 15 | 2 | 2
| 17 | 2 | 2
| 22 | 5,3,2 | 10
| 18 | 2 | 2

Then as 2 : 6 : : 2 : 6 oz. of 15 carats fine
2 : 6 : : 2 : 6 do. of 17 ditto
2 : 6 : : 10 : 30 do. of 22 ditto

Hence, there muſt be 6 oz. of 15 carats fine, 6 oz. of 17 carats fine, and 30 oz. of 22 carats fine.

N. B. If the quantities of two had been given, as for inſtance, if not only the 6 oz. of 18 carats fine had been given, but alſo the 6 oz. of 15 carats fine, then by the firſt rule they are reduced to 12 oz. of $16\frac{1}{2}$ carats fine.

When the queſtion is reduced to this, viz. to find how many ounces of 17 carats fine, and 22 carats fine, muſt be mixed with 12 oz. of $16\frac{1}{2}$ carats fine, ſo that the compoſition may be of 40 carats fine; and the anſwer is 12 oz. of 17 carats fine, and 39 of 22 carats fine; which numbers, though different from the former, do equally anſwer the conditions of the queſtion; for if, inſtead of the differences belonging to the couplet 17 and 22, the double thereof had been taken in the former caſe (which, according to the rule, would have been equally right) then the numbers in the firſt anſwer would have been the ſame as in this; or, if in the latter caſe, the ſame differences had been multiplied by $\frac{1}{2}$, or which is equivalent, if the half thereof had been taken, inſtead of working with the whole, then the numbers in this anſwer would have been the ſame as in the former.

But note, if after the ſeveral ingredients are reduced to one as above, that the rate or value thereof, together with the ſeveral rates or values of the reſt of the compounds, be all either above or below the propoſed rate or value of the whole compound, then the caſe is impoſſible.

This method of proceeding, when the quantities of two or more ſimples are given, I have not ſeen exemplified elſewhere.

THE RULE FOR ALLIGATION TOTAL.

When the ſum of all the quantities to be mixed is given, add up all the differences, or proportionate numbers together; then ſay, by the Rule of Three, as that ſum is to the whole given quantity, ſo is each particular difference or proportionate number to its reſpective quantity.

Question. A goldſmith has gold of different ſorts, viz. of 24, 23, 22, and 21 carats fine, reſpectively, as alſo a quantity of alloy, from which he wants to make a maſs of 200 oz. that ſhall be 20 carats fine; how much of each ſort muſt he take?

20 | 24 | 20 | 20
| 23 | 20 | 20
| 22 | 20 | 20
| 21 | 20 | 20
| 0 | 4,3,2,1 | 10
| | | 90

Then, as 90 : 200 : : 20 : $44\frac{4}{9}$ oz. which is the quantity that the goldſmith muſt take of 24, 23, 22, and 21 carats fine reſpectively.

Alſo as 90 : 200 : : 10 : $22\frac{2}{9}$ oz. the quantity of alloy.

N. B. Alloy is reckoned at 0 carats fine.

Schol. If not only the whole quantity, but alſo the quantity of ſome particular ingredient is given; then find the rate, quality, or value of the compound, as though that particular ingredient was not included; which is done thus,

Multiply the quantity of the whole compound by its propoſed quality, rate, or value, &c. Alſo multiply the given quantity by its rate or value, &c. and ſubtract the latter product from the former. Then divide the remainder by the difference between the whole weight and the given weight, and the quotient will be the value, rate, &c. of the compound, provided the quantity and quality of the given ingredient were deducted therefrom. Therefore

fore make the quantity of the compound equal to the difference between the whole quantity and the given quantity, and its quality or rate, &c. equal to the Anſwer brought out as above, and proceed with the remaining ingredients to find their reſpective quantities, according to the foregoing Rule.

Thus, in the laſt Example, if the quantity of 24 carats fine had been given $= 44\frac{4}{9}$ oz. and it had been required to determine the quantities of the reſt; then $200\times20 = 4000$, and $24\times44\frac{4}{9} = 1066\frac{2}{3}$; and $4000 - 1066\frac{2}{3} = 2933\frac{1}{3}$. Alſo $200 - 44\frac{4}{9} = 155\frac{5}{9}$; and $2933\frac{1}{3} \div 155\frac{5}{9} = 18\frac{6}{7}$ carats; the fineneſs of the maſs, provided the $44\frac{4}{9}$ oz. of 24 carats were not included.

Therefore the queſtion is now reduced to this, viz. to find what quantities of 23, 22, and 21, carats fine, and of alloy muſt be mixed together to form a maſs of $155\frac{5}{9}$ oz. weight that ſhall be of the fineneſs of $18\frac{6}{7}$ carats; and the operation will ſtand as under;

$$18\tfrac{6}{7}\left|\begin{array}{l}23\\22\\21\\0\end{array}\right.\;\begin{array}{l}18\frac{6}{7}\\18\frac{6}{7}\\18\frac{6}{7}\\4\frac{1}{7},3\frac{1}{7},2\frac{1}{7}\end{array}\;\left|\begin{array}{r}18\frac{6}{7}\\18\frac{6}{7}\\18\frac{6}{7}\\ \underline{9\frac{2}{7}}\\66\end{array}\right.$$

Then as $66 : 155\frac{5}{9} :: 18\frac{6}{7} : 44\frac{4}{9}$, the quantity of 23,22 and 21 carats fine reſpectively.

And as $66 : 155\frac{5}{9} :: 9\frac{2}{7} : 22\frac{2}{9}$ the quantity of alloy; the ſame as before.

And thus may any other ſimilar caſe be ſolved; alſo if the whole quantity, and likewiſe the quantity of two or more of the ingredients be given, the anſwer will be obtained in the ſame manner, only the ſeveral ingredients that are given, muſt firſt of all be reduced to one ingredient, as directed in the rule for Alligation partial.

N. B. This caſe I have not ſeen handled in Allegation by any author before.

ART. XVI. EXCHANGE.

Definitions.

I. Exchange is the bartering of money, and conſiſts in finding what quantity of money of one place is equal to a ſpecified ſum of another, according to a given courſe of exchange.

II. The Courſe of Exchange is ſuch a variable ſum of the money of one place, as is propoſed to be given for a certain conſtant ſum of that of another.

III. The Par of Exchange is the intrinſic equality between two pieces or ſums of money, one of which is the conſtant piece or ſum to which the courſe is compared.

IV. The Ageo is the difference of the value of current money and bank money; for the bank money in Foreign countries is finer than the current money.

The operations are all managed by the Rule of Three, Practice, &c.

THE EXCHANGE, WITH IRELAND, AMERICA, AND THE WEST-INDIES.

In thoſe places the accounts are kept in pounds, ſhillings and pence, as in England. The courſe of exchange with Ireland, is from 5 to 12 per cent. in favour of England; according to the ballance of trade; and the par is reckoned at 108l. 6s. 8d. Iriſh, per 100l. ſterling.

In the Weſt Indies, 5l. ſterling is accounted worth 7l. currency.

Example I. Dublin remits to London 690l. Iriſh, how much ſterling muſt Ireland be credited, the courſe of exchange being 8 per cent?

Here, As 108l. : 690l. :: 100l. : $\frac{690\times100}{108} = \frac{69000}{2\times54} = \frac{34500}{54} = \frac{34500}{6\times9} = \frac{5750}{9} =$ 638l. 17s. $9\frac{1}{4}$d. and $\frac{1}{3}$ of a farthing, the Anſwer.

Example II. London remits to Ireland 787l. 15s. ſterling, how much Iriſh muſt London be credited, exchange at $10\frac{1}{2}$ per cent?

Here, As 100l. : 787l. 75 :: 110l. 5 : $\frac{110.5\times787.75}{100} =$ 870.46375l. = 870l. 9s. $3\frac{1}{4}$d. and $\frac{2}{10}$ of a farthing, the Anſwer.

N. B. Through an *odd miſtake*, Mr. Bonnycaſtle, in his Arithmetic has brought out the anſwer to this queſtion, 791l. 13s. $3\frac{1}{4}$d. and $\frac{2}{10}$ parts, which is 78l. 16s. too little.

Example III. Virginia is indebted to London 550l. ſterling: how much currency will London be credited at Virginia, when the exchange is $33\frac{1}{3}$ per cent?

Here, As 100l. : 550 :: $133\frac{1}{3}$: $\frac{550\times133\frac{1}{3}}{100} = 733.33\frac{1}{3}$l. = 733l. 6s. 8d. the Anſwer.

THE EXCHANGE WITH HOLLAND, FLANDERS, AND GERMANY.

Accounts in theſe places are ſometimes kept in pounds, ſhillings and pence, but frequently in gilders, ſtivers and pennings.

The money of Holland and Flanders is called Flemiſh, and they exchange by the pound ſterling. The exchange is from 33s 6d. to 36s. Flemiſh per pound ſterling. The agio is from 3 to 6 per cent for current.

Note. Eight pennings make 1 grote or penny; 2 grotes, 1 ſtiver; 6 ſtivers, 1 ſchilling; 20 ſtivers, 1 florin or guilder; $2\frac{1}{2}$ florins, 1 rix dollar; and 6 florins, 1 pound Flemiſh.

To turn current Money in Banco.

Rule. Add the agio to 100, then ſay as that ſum is to any given ſum current, ſo is 100 to the value of the ſaid ſum current in banco.

To turn Banco Money in Current.

Rule. As 100 is to any given ſum banco, ſo is 100 with the ageo, added to it, to its value current.

N. B. The exchange is ſuppoſed to be in bank money, and therefore current money muſt be always reduced to banco, before the exchange is made.

To change Sterling Money into Flemiſh.

Rule. As 1l. ſterling, is to the ſum ſterling given, ſo is the given rate to the Flemiſh ſought.

To change Flemiſh Money into Sterling.

As the given rate is to the given ſum Flemiſh, ſo is 1l. ſterling to the ſterling required.

N. B. Theſe caſes may frequently be commodiouſly wrought by the rules of practice.

Example. Suppoſe there be due at Rotterdam 63:6 guilders, 1 ſtiver and 15 pennings current money, and the ageo be $4\frac{7}{8}$ per cent: how much ſterling money does it come to, the exchange being at 33s. $5\frac{1}{2}$d. Flemiſh per pound ſterling?

Firſt reduce the current money into banco, thus. As $104\frac{7}{8}$ cur. : 631 guild. 1 ſtiv. 15 pen. cur. :: 100 bank : 6022 guild. 10 ſtive. banco.

Now reduce the banco into Flemiſh, thus: 6022 guild. : 10 ſtiv. Flemiſh is equal to 1003l. 15s. Flemiſh, which is found by dividing by 6, becauſe 6 florins or guilders is 1l. Flemiſh. Then as 33s. : $5\frac{1}{2}$d. :: 1003l. 15s. :: 1l. : 600l. ſterling, the Anſwer; and the like for other queſtions of this nature.

THE EXCHANGE WITH FRANCE.

The French accounts are kept in livres, ſols, and deniers, exchange being made by the French crown, the par of which is 4s. 6d. ſterling.

Note I. Twelve deniers make 1 ſol or ſou; 20 ſols, 1 livre, and 3 livres, 1 crown or ecu. Alſo 10 livres make a piſtole, and 24 livres, 1 louis d'or, or guinea.

Note II. The livres are imaginary money, but the crowns, ſols, and deniers are real.

Note III. The term tournois is only a note of diſtinction of the French money, as ſterling is of the Engliſh.

Note IV. In the French exchange, you muſt diſtinguiſh between exchange money and book money. The exchange money is called money d'or, and is expreſſed in crowns, ſols, and deniers d'or. The book money is called tournois, and is expreſſed in livres, ſols, and deniers tournois. Alſo crowns, ſols, and deniers d'or, being multiplied by 3, throughout, give livres, ſols, and deniers tournois, or book money; and, on the contrary, book money, being divided by 3, gives the exchange money.

Note V. The exchange is from 30d. to 32d. per crown or ecu.

Example. How many livres, &c. tournois, will 360 l. ſterling amount to, the exchange being at 30d. per crown, or ecu?

Here, as 30d. : 360l. (or 86400 pence) :: 1 ecu : $\frac{84400}{30} =$ 2880 crowns, or ecu's, which, multiplied by 3, gives 8640 livres tournois.

THE EXCHANGE WITH SPAIN.

In Spain they keep their accounts in piaſtres, rials, and maravedies, reckoning 34 maravedies to a rial, and 8 rials to a piaſtre, *peſo*, or piece of eight, old money, by which they exchange, the par being 4s. 6d. The piaſtre is imaginary, but the rials and maravedies are real. Alſo London exchanges with Spain in pieces of eight, new money, of 10 rials.

Note, likewiſe, 5 piaſtres is a Spaniſh piſtole, and 2 piſtoles is a doubloon.

Example. How many piaſtres ſhall I receive in Spain for 510 l. ſterling, the exchange being at 50d. per piaſtre?

Here, as 50d. : 510 l. (or 122400 pence) :: 1 piaſtre : $\frac{122400}{50} = \frac{244800}{100} = 2448$, the Anſwer.

N. B. In Genoa, and Leghorn, they keep their accounts in ſols and deniers, as in France, but exchange by the piaſtre, as in Spain. At Venice alſo, accounts are by ſome kept in the ſame manner, and by others, in ducats and groſs, reckoning 24 groſs to a ducat.

Examples of exchange with other countries might be given, but as they are all founded on the ſame principles of computation, it would be ſuperfluous to enumerate them.

ART. XVII. INTEREST.

Definitions.

I. Intereſt is the premium or reward allowed for the loan or uſe of any ſum of money for any appointed time.

II. The Principal is the money lent or put out to intereſt.

III. The Rate of Intereſt is the Intereſt of 100l. for a year, but frequently the Intereſt of 1 l. for a year is termed the Rate of Intereſt.

IV. The Amount of a ſum of money at the expiration of a given time, conſiſts of the Principal, together with its Intereſt for that time.

V. Alſo, Intereſt is either Simple or Compound.

VI. Simple Intereſt is that which is charged only upon the principal from the time of its being put out to Intereſt, or of its becoming due, if an arrear.

VII. Compound Intereſt, or Intereſt upon Intereſt, is that which is continually derived from both Principal and Intereſt, ſo that the Intereſt itſelf, as it ariſeth, is ſuppoſed to be perpetually gaining Intereſt, as well as the Principal.

I ſhall treat of them both diſtinctly; and firſt,

OF SIMPLE INTEREST.

All the queſtions of Simple Intereſt are reſolved by the Rule of Three; but, as under that Rule I have given no Examples of Intereſt, judging it more methodical to handle the ſubject by itſelf, I ſhall add a few by way of precedent and exerciſe.

Example I. What is the Intereſt of 550 l. for a year, at 5 l. per cent.

As 100 l. : 550 l. :: 5 l. : (Anſwer.)

Then $\frac{550\times5}{100}=5.5\times5=27.5\text{ l.}=27\text{ l. }10\text{s.}$ the Anſwer.

N. B. In caſes like this, where the Intereſt is at 5 per cent. may be had by dividing the given ſum by 20; for 5 is a conſtant multiplier, and 100 is a conſtant diviſor, and $\frac{5}{100}$ is $=\frac{1}{20}$.

In the above Example, the 20th part of 550 l. is 27 l. 10 s. as before.

Example II. What is the Intereſt of 575 l. 12 s. 6 d. for 3 years, at 5 per cent. per annum, Simple Intereſt?

This is done by the Double Rule of Three, as follows:

As 100 l. : 575 l. 12 s. 6 d. :: 5 l. : (1ſt Anſwer.)

As 1 year : 3 years :: 1ſt Anſwer : (Anſwer required.)

Then $\frac{575\text{ l. }12\text{ s. }6\text{ d.}\times5\times3}{1\times100}=\frac{575\text{ l. }12\text{ s. }6\text{ d.}\times3}{20}=\frac{1726\text{ l. }17\text{ s. }6\text{ d.}}{20}=86\text{ l. }6\text{ s. }10\tfrac{1}{2}\text{d.}$ the Anſwer required.

Here, when the Intereſt is at 5 per cent and the time is any number of complete years, the Anſwer is had by multiplying the principal by the time, and dividing the product by 20.

Example III. What is the Intereſt of 894 l. 10 s. 9 d. for 120 days, at 4 per cent. per annum, Simple Intereſt?

By the Double Rule of Three, as below.

As 100 l. : 894 l. 10 s. 9 d. :: 4 l. : (1ſt Anſwer.)

And, As 365 days : 120 days :: 1ſt Anſwer : (Anſwer required.)

Then $\frac{894\text{ l. }10\text{ s. }9\text{ d.}\times4\times120}{100\times365}=\frac{3578\text{ l. }3\text{ s.}\times12}{10\times365}=\frac{42937\text{ l. }16\text{ s.}}{10\times365}=\frac{4293\text{ l. }15\text{ s. }7\frac{1}{5}\text{d.}}{365}=$ (by dividing by 5) $=\frac{858\text{ l. }15\text{ s. }1\frac{11}{25}}{73}$ = (by diviſion as below) 11 l. 15 s. 3¼d. the Anſwer.

Or ſhorter, thus.

$$\begin{array}{r|rrr}
 & \pounds. & \text{s.} & \text{d.}\\
\frac{1}{10} & 858 & 15 & 1\frac{1}{2}\\
\frac{1}{10} & 85 & 17 & 6\\
\frac{1}{3} & 8 & 11 & 9\\
\frac{1}{10} & 2 & 17 & 3\\
\frac{1}{10} & 0 & 5 & 8\frac{1}{4}\ \text{nearly}\\
 & 0 & 0 & 6\frac{1}{4}\\
\hline
 & \pounds\ 11 & 15 & 3\frac{1}{2}\\
 & \text{Subtract} & & \frac{1}{4}\\
\hline
 & \pounds\ 11 & 15 & 3\frac{1}{4}\ \text{Anſwer.}
\end{array}$$

Or, Decimally, thus,

$$\begin{array}{r}
858.75\\
\hline
\frac{1}{3})\ 8.5875\\
2.8625\\
.2862\\
286\\
\hline
11.7648\\
\text{leſs}\quad 11\\
\hline
\pounds\ 11.7637\ \text{Anſwer.}\\
=\pounds\ 11\ \ 15\ \ 3\frac{1}{4}
\end{array}$$

£. Operation.

$$\begin{array}{l}
73\ )\ 858\ \ 15\ \ 1\tfrac{1}{2}\ \text{nearly.}\ (11\\
\quad\ \ \underline{73}\\
\quad\ \ 128\\
\quad\ \ \underline{73}\\
\quad\ \ 55\\
\quad\ \ \underline{\ 20}\\
73\ )\ 1115\ (15\\
\quad\ \ \underline{73}\\
\quad\ \ 385\\
\quad\ \ \underline{365}\\
\quad\ \ \ 20\\
\quad\ \ \underline{\ 12}\\
73\ )\ 241\ (3\\
\quad\ \ \underline{219}\\
\quad\ \ \ 22\\
\quad\ \ \underline{\ \ 4}\\
73\ )\ 90\ (1\\
\quad\ \ \underline{73}\\
\quad\ \ 17
\end{array}$$

Anſwer 11 l. 15 s. 3¼d.

The ſhort method of dividing by 73, is thus;

Divide the given ſum by 100 (or which is the ſame by 10 and 10).

Then take the $\frac{1}{3}$ part of the quotient, and the $\frac{1}{10}$ part of that part, and alſo the $\frac{1}{10}$ part of this latter part. Add the four quotients together, and the ſum will be the Anſwer nearly.

And to correct the ſame for every 500l. in the Anſwer thus obtained, ſubtract 1 ſhilling, and ſo on in proportion for any greater or leſs ſum, viz. for 250l. ſubtract 6d. for 125l. abate 3d. and for each of the intermediate ten pounds, as well as for thoſe below, deduct a farthing; obſerving, to take the neareſt number of tens, whether the ſame ſhall exceed, or fall ſhort of the ſaid ſum.

This method if decimals are uſed as in the 2d ſhort method, is exceeding eaſy; and the decimal to be annexed to the pounds, will be had by dividing the number of ſhillings by 20 (which is no greater difficulty than to take the half thereof) rejecting the pence; but calling the number of ſhillings, one more when the pence exceed ſixpence; as the error in ſo doing can never amount to the $\frac{1}{3}$ part of a farthing, which may always be corrected, ſo, as it can never at all affect the farthings in the valuation, by adding 1 to the figure in the fourth place of the decimal, before it is valued, for every two pence that was left out of the calculation by ſuch method of proceeding; or by ſubtracting therefrom 1, for every two pence that was thereby included above what ought to have been.

In the decimal method, the correction to be ſubtracted from the ſum of the quotients muſt be $\frac{1}{10000}$ part thereof; and the value of the decimal part in the Anſwer is had by inſpection, as I have ſhewn in the Reduction of Decimals.

Cor. From the foregoing proceſs by the Double Rule of Three, it appears, that the ſimple intereſt of any ſum of money, for any number of days at a given rate of intereſt, is found by multiplying the principal, the rate of intereſt, and the number of days together, and dividing the product by 36500.

And to divide by 36500, obſerve theſe rules:

I. Write down the given number, and under it its tenth part; alſo take the $\frac{1}{100}$ part of this part, and write below it; or which is the ſame, multiply it by 4, and ſet the product two figures forward to the right hand; then from the ſum of the two firſt numbers ſubtract the latter (which is eaſy to do in the courſe of adding up, when it is once familiarized) and divide the quotient by 40000, and it will give the Anſwer nearly; which muſt be corrected by deducting from it the $\frac{1}{10000}$ part, as before.

In working by this rule, when you come to divide, both the ſhillings and pence may be neglected; only, if the ſhillings are above 10, it will be as well to make the pounds 1 more; but that is not requiſite, as the error, without that, can never amount to the $\frac{1}{38}$ part of a farthing. Thus the operation is rendered exceeding eaſy.

II. Or the fifth part of the number to be divided, may be taken and that divided by 7300, which will be done by the ſame method that I have given for dividing by 73, only at ſetting out, two more places muſt be pointed off as decimals; viz. the firſt diviſor muſt be 10000 inſtead of 100. This, as well as the preceding method, will want no other correction than the ſubtracting of the $\frac{1}{10000}$ part.

III. Or thus, Write down the number to be divided by 36500; and underneath it write the $\frac{6}{1000}$ part thereof; or which is the ſame, ſet the product by 6, three places forward to the right hand. Alſo multiply this part by 12, placing the product one figure backward, to the left hand: then the ſum of the two under numbers, ſubtracted from the upper number, and the remainder divided by 1000, will give the Anſwer to be corrected as before.

I could give other methods of finding the firſt approximate Anſwer, but none ſeem better adapted to practice than theſe: which methods are ſolely my own, and have never been publiſhed before.

Example V. What is the intereſt of 1422l. 10s. 6d. for 25 days, at 3½ per cent. per annum?

$$\begin{array}{rrr}
\text{l.} & \text{s.} & \text{d.}\\
1422 & 10 & 6\\
 & & 3\frac{1}{2}\\
\hline
4267 & 11 & 6\\
711 & 5 & 3\\
\hline
4978 & 16 & 9\\
 & & 5\\
\hline
24894 & 3 & 9\\
 & & 5\\
\hline
\pounds\ 124470 & 18 & 9
\end{array}$$

1ſt Method of Dividing.

$$\begin{array}{r}
124471\\
+12447\\
-498\\
\hline
4000)13|6420\\
\hline
3.4105\\
-\quad 3\\
\hline
\pounds\ 3.4102\ \text{Anſwer.}
\end{array}$$

Or £ 3. 8s. 2½

2d Method of Dividing.

$$\begin{array}{r}
\pounds.\quad\\
5)\ 124471.\\
\hline
3)\ 2.4894\\
8298\\
830\\
83\\
\hline
3.4105\\
-3\\
\hline
\pounds\ 3.4102\ \text{Anſwer.}
\end{array}$$

3d Method of Dividing.

$$\begin{array}{r}
124471.\\
-746.826\\
-8962\\
\hline
3.4105\\
3\\
\hline
\pounds.\ 3.4102\ \text{Anſwer}
\end{array}$$

Schol. I. The dividing by 3650 or 365 is the ſame as the above, only in the quotient there will be one or two more places of whole numbers reſpectively, and it will be requiſite to annex to the pounds the decimal parts anſwering to the ſhillings, and in the latter caſe when the pence are above ſix-pence it will be as well to call the ſhillings one more, and then no error can ariſe.

Schol. II. Hence when the number of days is diviſible by 10 or 100, the principal may be multiplied by $\frac{1}{10}$ or $\frac{1}{100}$ part thereof inſtead of the whole, and the diviſion made as by 365, or 3650, accordingly.

Schol. III. When the rate of Intereſt is 5 per cent. the principal need only to be multiplied by the time, and the product divided by 7300; in which caſe the ſhillings, &c. may be rejected, or the pounds increaſed 1 more when the ſhillings exceed 10, as was ſhewn in the method for dividing by 36500.

Schol. IV. When the rate of Intereſt is 5 per cent. and the number of days is diviſible by 10 or 100, then the principal need only to be multiplied by $\frac{1}{10}$ or $\frac{1}{100}$ part of the days, and the product divided by 73, or 730; obſerving to retain the decimal of the ſhillings; and in the former caſe, regard being had to the pence, when above ſixpence, as was before ſhewn.

In dividing by 730, one figure more muſt be pointed off to the decimals, than is directed to be done in the dividing by 73.

Schol. V. When the given time conſiſts of years and days, the intereſt may be calculated firſt for the years, and then for the days, and the ſum of both will be the Anſwer; or, when the odd time is given in common months or weeks, without days, it may in ſome caſes be ſufficient to take aliquot parts of the intereſt for a year, for ſuch odd time.

Thus, for 6 months, to take ½, for 4 months, ⅓; for 3 months, ¼; for 2 months, $\frac{1}{6}$; and for 1 month, $\frac{1}{12}$. Alſo for 2 weeks, to take the ½; and for 1 week, the ¼ of the intereſt for 1 month, &c.

This way, however, is a looſe method of calculating, and ſhould never be adopted where ſtrict accuracy is required.

Schol. VI. If the amount, at Simple Intereſt, of any ſum of money for any propoſed time, at a given rate, per cent. is required, the intereſt muſt be found by the foregoing rules, and added to the principal.

Example V. If the Simple Intereſt of 575l. 12s. 6d. for a certain time, at 5 per cent. be 86l. 6s. 10½d. it is required to determine how long the ſame was out at intereſt?

l. pence. l. s. d. pence. year.
As 100 (or 24000) : 575 12 6 (or 138150) :: 1 : (1ſt Anſwer.)
l. farthings. l. s. d. farthings.
And as 5 (or 4800) : 86 6 10½ (or 82890) :: 1ſt Anſ. : (An. req.)

Then $\frac{24000 \times 1 \times 82890}{138150 \times 4800} = \frac{5 \times 8289}{13815} = \frac{8289}{2763} = 3$ years, the Anſwer.

Cor. I. Hence, when the principal, intereſt, and rate of intereſt, are given to find the time at Simple Intereſt.

The rule is, multiply the given intereſt by 100l. for a dividend; and the rate per cent. and the principal together for a diviſor; and the quotient will give the Anſwer in years, or years and parts, or parts of a year; and to know the number of days, if the time be not years complete, multiply the dividend, if the time be under a year; or, the remainder, if it be above a year, by 365; then divide by the ſaid diviſor, and the quotient will be the odd days.

But note, before the above rule is applied, the 100l. and the given principal muſt be reduced to one and the ſame denomination; likewiſe the rate per cent. and the given intereſt muſt alſo be reduced to the loweſt denomination mentioned in the intereſt; or, the odd money of the given principal and intereſt, if any, may be reduced to the decimal part of a pound, and annexed to the pounds, and then no other reduction will be neceſſary; only in multiplying and dividing; the rules for managing decimals, muſt be ſtrictly obſerved.

Cor. II. If the intereſt, the rate of intereſt, and the amount, be given to find the time, ſubtract the intereſt from the amount, and it will leave the principal, with which, and the reſt of the data, proceed as before.

Cor. III. If the rate of intereſt, the principal, and amount, be given to find the time, ſubtract the principal from the amount, and it will leave the intereſt; and ſo the time will be found according to the aforeſaid rule.

N. B. Other rules might have been given for theſe caſes, but none more eaſy than the above; and therefore it would be both needleſs and ſuperfluous to enlarge further on the matter.

Cor. IV. If inſtead of the rate of intereſt, the time be given, and the rate of intereſt be required, then multiply the principal by the time for a diviſor; the dividend will be as before; and quotient will be the rate of intereſt. But note,

1ſt. If the time be days, they muſt either be reduced to the decimal parts of a year, or otherwiſe the dividend, beforementioned, muſt be multiplied by 365, for a proper dividend in this caſe.

2d. If the time be years and days, then the decimal for the odd days may be taken, and annexed to the years; or the whole may be reduced into days, and the proceſs conducted according to the laſt note.

3d. The Anſwer will be of the ſame denomination into which the given intereſt was reduced; which muſt always, as was obſerved, be brought into the loweſt, if decimals are not uſed.

Cor. V. If the rate of intereſt, the time, and the intereſt be given to find the principal, then the rate muſt be multiplied by the time for a diviſor; the dividend being as before, viz. = the intereſt multiplied by 100l. and the Anſwer will be had in pounds, or pounds and parts of a pound.

N. B. All theſe caſes follow eaſy enough from the Rule of Three.

COMPOUND INTEREST.

Problem I. The principal, time, and rate of intereſt, being given, to find the amount or intereſt.

Rule. To 1l. add the decimal, anſwering to the intereſt of 1l. for a year, which, at 3 per cent. is .03, at 3½, is .035; at 4, is .04; at 4½. is .045; at 5, is .05. &c. and this is the amount of 1l. for a year. Then involve this amount to the power denoted by the time, viz. to the ſecond power, if it is 2 years; to the third power, if the time is 3 years; to the fourth, if 4 years, &c. and it will give the amount of 1l. for ſuch time; and this multiplied by the principal (taken decimally if there be odd money) will give the amount of the principal in pounds and decimal parts, from which ſubtract the principal, and it will leave the intereſt.

Example. What is the amount of 550l. for 4 years, at 5 per cent. Compound Intereſt?

Here 1.05 is the amount of 1l. for a year, which involved to the fourth power, is 1.21550625; which multiplied by the principal, 550l. gives 668.5284375l. = 668l. 10s. 6¼d. the Anſwer.

From this ſubtract 550l. and the remainder is 118l. 10s. 6¼d, the intereſt.

Schol. When the time runs high, or is not given in complete years, logarithms ſhould be uſed, or the trouble in ſome caſes would be almoſt immenſe.

But by logarithms, any caſe of this ſort is ſolved with the utmoſt diſpatch. The rule is this, take the logarithm of 1l. and multiply it by the time, taken in years; or, if there be odd days, the days muſt be taken in fractional or decimal parts of a year; and to the product, add the logarithm of the principal in pounds, or pounds and fractional or decimal parts of a pound, if there be odd ſhillings, and the ſum will be the logarithm of the amount; then look in the table of Logarithms for the correſponding number, and it will be the amount itſelf in pounds and decimal parts.

Example. What is the intereſt of 350l. 10s. for 5¼ years, at 3½ per cent. per annum, Compound Intereſt?

Here the amount of 1l. for a year, is 1.035l. and the logarithm thereof, is .0149403; which, multiplied by 5¼ = .0784366. Alſo 350l. 10s. = 350.5l. the logarithm of which is 2.544688, and this added to .0784366 = 2.6231246 = the logarithm of the amount; and conſequently the amount itſelf, is 419.8896l. From this, ſubtract 350.5, the principal, and the remainder is 69.3896l. = 69l. 7s. 9½d. the intereſt required.

Problem II. The intereſt, rate of intereſt, and the principal, or amount, being given to find the time, at Compound Intereſt.

Rule. From the logarithm of the amount, ſubtract the logarithm of the principal, and divide the remainder by the logarithm of the amount of 1l. for a year, and the quotient will be the time required.

Example. If the Intereſt of 350l. 10s. at 3½ per cent. per annum, Compound Intereſt, be 69l. 7s. 9½d. it is required to determine how long the ſame was out at Intereſt?

Here, the Intereſt 69l. 7s. 9½d. = 69.3896l. and the principal 350l. 10s. = 350.5l. conſequently the amount is 419.8896l. The logarithm thereof is 2.6231246. Alſo the logarithm of the principal (350.5l.) = 2.544688; which, ſubtracted from 2.6231246, leaves .0784366, and this divided by .0149403, (the logarithm of the amount of 1l. for a year) = 5.25 years, or 5¼ years, the Anſwer.

Problem III. Given the intereſt, the time, and the amount, or principal, to find the Rate of Intereſt.

Rule. From the logarithm of the amount, ſubtract the logarithm of the principal, and divide the remainder by the time, ſo will the quotient be the logarithm of the amount of 1l. for a year. Then the number anſwering thereto, will be the amount itſelf; from which ſubtract 1l. multiply the remainder by 100; and the product will be the Rate of Intereſt required.

Example. The Compound Intereſt of 350l. 10s. for 5¼ years, being 69l. 7s. 9½d. it is required to determine at what rate, per annum, the ſaid ſum was put out to Intereſt?

Here, as in the laſt Example, the amount is 419.8896l. and the logarithm thereof is 2.6231246. Alſo the logarithm of the principal (350.5l.) is 2.544688; and this ſubtracted from the former, leaves .0784366; which, being divided by 5.25, gives .0149403, the logarithm of 1.035l. and therefore .035l. is the intereſt of 1l. for a year; and 3.5 (or 3½ per cent.) is the rate of intereſt required.

Schol. To facilitate the computations of Compound Intereſt, it has been common to give tables of the amount of 1l. at the different Rates of Intereſt, calculated for as many years as it is probable will occur in practiſe.

Theſe, however, appear unneceſſary here, as in the Syſtem of Annuities, Chap. I. I have given ſuch tables as will always anſwer the ſame purpoſe, with their uſe at large; to which I refer the reader for further information.

DISCOUNT.

Diſcount is but a particular caſe of intereſt, being confined to the ſolution of this Problem, viz. Given the amount, the time, and Rate of Intereſt, to find the intereſt.

In which caſe, the Intereſt is termed the Diſcount; becauſe, it is that money which ought to be diſcounted, or allowed, for the payment of a ſum (equivalent to the amount) at ſo long a time before it becomes due, as is denoted by the given time.

Alſo the principal, in this caſe, is termed the preſent value; becauſe, it is that money which a creditor ſhould receive in preſent payment, in lieu of a ſum equivalent to the amount, and due not till ſuch a period hence, as is expreſſed by the given time.

In Simple Intereſt this, like the reſt of the caſes, is performed by the Rule of Three.

Example. What is the Diſcount of 573l. 15s. due 3 years hence, at $4\frac{1}{2}$ per cent. Simple Intereſt?

By Decimals, thus:

Year Years Int. of 100l. for a year.

As 1 : 3 :: 4.5l. : the Intereſt of 100l. for 3 years, $= 4.5 \times 3 = 13.5$ l.

The Amt. of 100l. for 3 years. The given Amount. Dif. of 1135l. for 3 years.

Then, as $100 + 13.5$ (or 113.5l.) : 573.75l. :: 13.5 : the Diſcount of 573.75l. for 3 years $= \frac{573.75 \times 13.5}{113.5} = \frac{573.75 \times 2.7}{22.7} = \frac{1549.125}{22.7} = 68.2434$ l. nearly $= 68$ l. 4s. $10\frac{1}{2}$d. the Anſwer.

Hence this rule, find the amount of 100l. for the given time, according to the proper Rate of Intereſt. And then ſay, as the amount of 100l. is to the ſum to be diſcounted; ſo is the intereſt of 100l. for the ſaid time, to the Diſcount required; and the Diſcount ſubtracted from the given ſum, leaves the preſent value, or the money, which the ſaid given ſum is worth, in ready caſh.

Schol. When Compound Intereſt is uſed, find, according to the propoſed Rate of Intereſt, the amount of 1l. by the method of Compound Intereſt for the given time. Then divide the given ſum by that amount, and it will give the preſent value; which, ſubtracted from the ſaid ſum, leaves the Diſcount.

In the foregoing Example, the amount of 1l. for 3 years, $= 1.141166125$; and $\frac{573.75}{1.141166} = 502.77523$l. And this ſubtracted from 573.75l. leaves 70.97477l. = 70l. 19s. 6d. nearly, = the Diſcount, at Compound Intereſt.

The rule in this caſe, by logarithms, is as follows: take the logarithm of the amount of 1l. for a year, and multiply it by the time, in years, or decimal parts of a year, and ſubtract the product from the logarithm of the ſum to be diſcounted, taken decimally, and the remainder will be the logarithm of the preſent value.

Then the number in the tables anſwering thereto, is the preſent value itſelf; which, ſubſtracted from the ſaid given ſum, gives the Diſcount as before.

N. B. The moſt correct and uſeful book of logarithms, of a reaſonable price, is that of which Dr. Hutton, F. R. S. and Profeſſor of Mathematics, at the Royal Academy at Woolwich, is the author.

He has been at extreme pains in comparing, amending, and enlarging the beſt editions of Sherwin's Tables; and has alſo given, by way of introduction, a valuable hiſtory of Logarithms, with the various methods of conſtructing them, and their application, in a variety of caſes.

ARTICLE XVIII.
EQUATION OF PAYMENTS.

Definition.

Equation of Payments, is the method of finding a time, at which, if ſeveral debts, due at different periods, be all paid at once, neither party ſhall either gain or loſe thereby.

The common rule is this:

Multiply each payment by the time at which it will become due from the preſent time, or from any fixed time that ſhall not be after the firſt payment; then divide the ſum of the products by the ſum of the payments, and the quotient will be the equated time required, reckoning from the ſaid fixed time.

Example. A owes B three ſeveral ſums of money; viz. 100l. due at the end of 6 months; 500l. due at the end of 12 months; and 400l. due at the end of 15 months; what is the equated time for paying the whole?

Here $100 \times 6 = 600$; $500 \times 12 = 6000$; and $400 \times 15 = 6000$. Alſo, $600 + 6000 + 6000 = 12600$; and $100 + 500 + 400 = 1000$.

Then $\frac{12600}{1000} = 12.6$ months, or 12 months and 18 days, allowing 30 days to the month, the equated time required.

Schol. This method, though much practiſed on account of the eaſy mode of calculation, is not ſtrictly true, as it neither agrees with the principles of Simple or Compound Intereſt. However, where the whole time concerned is not long, it will deviate but very little from the truth at Simple Intereſt.

The error of this method lies in making no difference between the intereſt and the diſcount, whereas the latter is ever leſs than the former. The equated time, by the above Rule, will be always ſomething too great.

But when the period between the firſt and laſt payments is conſiderable, the equated time ſhould be aſcertained according to the principle of Compound Intereſt, as it will be inequitable if only Simple Intereſt is regarded. And, as the calculation according to Simple Intereſt is ſo very tedious that no author which I have read has given themſelves the trouble of inveſtigating a true method for more than two payments; and even for two payments none have been ſtrictly accurate, except Mr. Burrow and Mr. Bonnycaſtle; and as the method already given is ſufficient when the time between the firſt and laſt payment is not very great, it would only be introducing ſuperfluous matter to deliver any thing further on this ſubject, ſaving the Rule of Compound Intereſt, which is this:

Find the preſent value of each ſeparate payment, diſcounted at Compound Intereſt, according to the given rate of intereſt, from the time of its becoming due, to the time of the firſt payment. Then, making the ſum of all the preſent values a principal, find in how long a time, at Compound Intereſt, the ſame would amount to the ſum of the payments, and that will be the time required.

The application hereof is eaſy enough from what has been delivered in the Rules of Compound Intereſt and Diſcount, without intruding further Examples.

ART. XIX. ARITHMETICAL PROGRESSION.

Definitions.

I. An Arithmetical Progreſſion is a ſeries or rank of numbers, wherein each ſucceeding number either increaſes or decreaſes by ſome common difference.

II. The Common Difference is called the Arithmetical Ratio of ſuch Progreſſion.

III. Each number in the Progreſſion is called a Term.

IV. The Term which immediately precedes another, is named the Antecedent of that other; and that other is named the Conſequent of the preceding Term.

V. The firſt and laſt Terms of a Progreſſion are called the Extremes; and the other Terms, the Means.

Theorem I. In any even number of continued arithmetical proportionals, the ſum of the extremes is equal to the ſum of any two means that are both equally diſtant.

Thus, in the Progreſſion, 2, 4, 6, 8, 10, 12, the ſum of the extremes, viz. $12 + 2$, is equal to the ſum of any two equi-diſtant means; viz. $10 + 4$ or $8 + 6$.

Theorem II. In any odd number of continued arithmetical proportionals, the double of the middle term is equal to the ſum of any two terms that are equally diſtant.

Thus, in the Progreſſion, 1, 3, 5, 7, 9, the double of the middle term (5) is $10 = 1 + 9 = 7 + 3$.

Theorem III. The difference between any two terms in an arithmetical progreſſion is equal to the difference between any other two in that progreſſion that are at the ſame diſtance from each other.

Thus, in the ſeries 2, 5, 8, 11, 14, 17, 20, the difference between any two terms, for inſtance, between 2 and 8, is equal to the difference between any other two terms that are alike remote from each other; viz. to the difference between 5 and 11, 8 and 14, 11 and 17, and 14 and 20.

Cor. I. If there are two arithmetical ſeries, having the ſame common difference, then the difference between any two terms in the one is equal to the difference between any two terms in the other, taken at the ſame diſtance from one another in each.

Cor. II. Any ſeries which conſiſts of a conſiderable number of terms, may be reſolved into two or more ſeries, whoſe ratio or common difference ſhall be double or treble, &c. to that of the given one.

Theorem IV. If there be two ranks of numbers in arithmetical progreſſion, having the like number of terms in each, their ſum will be in arithmetical progreſſion, whoſe ratio or common difference ſhall be equal to the ſum of the ratios of the two given progreſſions.

Thus, let the 1ſt rank be 5, 7, 9, 11, 13, 15, 17, com. diff. = 2.
2d rank 3, 6, 9, 12, 15, 18, 21, com. diff. = 3.
Their ſum = 8, 13, 18, 23, 28, 33, 38, a progreſſion whoſe common difference is 5.

Theorem V. If three numbers are in Arithmetical Progreſſion, the rectangle of the extremes, together with the ſquare of the common difference, is equal to the ſquare of the middle term.

Thus, if the quantities be 4, 6, 8, the rectangle of the extremes, viz. 4×8 or 32, added to the ſquare of the common difference, viz. 4 (or 2×2) $= 32 + 4 = 36 =$ the ſquare of the middle term, viz. 6×6.

Theorem VI. The product of the ſum of the extremes, by the number of terms in any Arithmetical Progreſſion, is equal to twice the ſum of the ſum of the ſeries; and, conſequently, the ſum of the ſeries is equal to half that product.

Thus; let the ſeries be 5, 8, 11, 14, 17.

Then, $5 + 8 + 11 + 14 + 17$, or the ſum of the ſeries $= \frac{17 + 5 \times 5}{2} = \frac{22 \times 5}{2} = 11 \times 5 = 55$.

Cor. I. Twice the ſum of any arithmetical ſeries, divided by the ſum of the extremes, is equal to the number of terms.

Cor. II. Twice the ſum of the ſeries, divided by the number of terms, is equal to the ſum of the extremes; and, therefore, if one extreme is given, the other is had by Subtraction.

Theorem VII. In any arithmetical ſeries, the laſt term in an increaſing progreſſion, or the firſt term in a decreaſing one, is equal to the ſum of the other extreme, and the product under the number of terms, leſs 1, and the common difference.

Thus; let the ſeries be 3, 6, 9, 12, increaſing; or 12, 9, 6, 3, decreaſing.

Then $3 + 9$ (or 3×3) $= 12 =$ the laſt term in the former, or the firſt term in the latter ſeries.

Theorem VIII. In any arithmetical ſeries, the firſt term in an increaſing progreſſion, or the laſt in a decreaſing one, is equal to the difference between the other extreme; and the product under the number of terms, leſs 1, and the common difference.

Thus, in the foregoing ſeries, $12-9=3$, the firſt term in the increaſing progreſſion, and the laſt in the decreaſing one.

Cor. I. The ratio, or common difference, is equal to the difference of the extremes, divided by the number of terms, leſs 1.

Cor. II. The quotient produced by dividing the difference of the extremes by the ratio, or common difference, is equal to the number of terms, leſs 1; and, conſequently, the ſaid quotient, more 1, is equal to the number of terms.

Theorem IX. If the roots of a ſeries of ſquare, cube, biquadrate, &c. numbers, are in arithmetical progreſſion, the 2d, 3d, 4th, &c. differences of ſuch ſquare, cube, biquadrate, &c. numbers, reſpectively, are equal.

Roots	1,	3,	5,	7,	9						
Squares	1,	9,	25,	49,	81	1ſt diff.	8,	16,	24,	32	
						2d diff.		8,	8,	8	equal.
Cubes	1,	27,	125,	343,	729	1ſt diff.	26,	98,	218,	386	
						2d diff.	—	72,	120,	168	
						3d diff.	—	—	48,	48	equal.

QUESTIONS IN ARITHMETICAL PROGRESSION.

Question I. A maſter hires a ſervant for 6 weeks, and agrees to pay him for the firſt day, two pence, for the ſecond, four pence, for the third, ſix pence, and ſo on, advancing his wages two pence per day. What is the amount of the ſix weeks wages?

Here the firſt term is 2, the ratio 2, and the number of terms 42. And, by Theorem VII. the laſt term is $\overline{41\times 2}+2=82+2=84$.

Alſo, by Theorem VI. $\frac{\overline{84+2}\times 42}{2}=$ ſum of the ſeries $=86\times 21=1806$ pence $=$ 7 l. 10 s. 6 d. the Anſwer.

Question II. A perſon undertakes to walk 400 miles; and to walk 31 miles the firſt day, and encreaſe each day's journey by a certain conſtant portion, in ſuch ſort, that the laſt day's journey ſhall be 49 miles. It is required to determine how long he will be in performing this undertaking, and what will be the increaſe wherewith he will daily mend his pace?

Here there is given the ſum of the ſeries, and the extremes.

And, by Theorem VI. Cor. I. $\frac{400\times 2}{31+49}=\frac{800}{80}=10=$ the number of days he would be on his journey: alſo, by Theorem VIII. Cor. I. $\frac{49-31}{10-1}=\frac{18}{9}=2$, the miles he walked each day more than on the preceding day.

Question III. A perſon paid off, by inſtalments, a certain debt; the firſt payment was 20 s. the next 25 s. the next 30 s. and ſo on; increaſing the payments each time by 5 s. Now the laſt payment was 10 guineas. I demand what was the debt, and in how many payments the ſame was diſcharged?

By Theorem VIII. Cor. II. the number of payments is $=\frac{210-20}{5}+1=\frac{190}{5}+1=38+1=39$. Then, by Theorem VI. the debt is $=\frac{\overline{210+20}\times 39}{2}=\frac{230\times 39}{2}=115\times 39$ $=4485$ ſhillings $=$ 224 l. 5 s.

A SYNOPSIS OF THE DIFFERENT CASES IN ARITHMETICAL PROGRESSION.

Caſe	Given.	Required.	Solution.
1	*a, d, n,*	*l, s,*	$l=a+\overline{n-1}\times d$ $s=na+\overline{n-1}\times\frac{1}{2}nd$
2	*a, d, l,*	*n, s,*	$n=\frac{l-a}{d}+1$ $s=\frac{\overline{l-a+d}\times\overline{l+a}}{2d}$
3	*a, l, s,*	*d, n,*	$d=\frac{\overline{l+a}\times\overline{l-a}}{2s-l-a}$ $n=\frac{2s}{l+a}$
4	*a, n, s,*	*d, l,*	$d=\frac{2s-2na}{\overline{n-1}\times n}$ $l=\frac{2s}{n}-a$
5	*a, n, l,*	*d, s,*	$d=\frac{l-a}{n-1}$ $s=\frac{a+l}{2}\times n$
6	*s, n, d,*	*a, l,*	$a=\frac{s}{n}-\frac{n-1}{2}\times d$ $l=\frac{s}{n}+\frac{n-1}{2}\times d$
7	*a, d, s,*	*n, l,*	$n=\frac{\sqrt{\overline{2a-d}\,\vert^{2}+8ds}-\overline{2a-d}}{2d}$ $l=\frac{\sqrt{\overline{2a-d}\,\vert^{2}+8ds}-d}{2}$
8	*d, n, l,*	*a, s,*	$a=l-\overline{n-1}\times d$ $s=\frac{2l-nd+d}{2}\times n$
9	*d, l, s,*	*a, n,*	$a=\frac{d\pm\sqrt{\overline{2l+d}\,\vert^{2}-8ds}}{2}$ $n=\frac{2l+d\mp\sqrt{\overline{2l+d}\,\vert^{2}-8ds}}{2d}$
10	*l, n, s,*	*a, d,*	$a=\frac{2s}{n}-l$ $d=\frac{2nl-2s}{\overline{n-1}\times n}$

Note in the above.
$a=$ leaſt term.
$l=$ greateſt term.
$n=$ number of terms.
$d=$ common difference.
$s=$ ſum of the ſeries.

ARTICLE XX.

OF FIGURATE OR POLYGONAL NUMBERS.

Definitions.

I. The ſums of numbers in a continued arithmetic proportion from unity, are called Figurate or Polygonal Numbers.

II. The ſeveral ſums of a ſeries of Figurate Numbers, are called Solid Figurates or Pyramids. Alſo, the ſums of the Pyramids are named Second Pyramidals; Pyramidals, the Sums of Second Pyramidals, Third Pyramidals; and ſo on.

Arithmetical Series.	Diff. 1.	Diff. 2.	Diff. 3.	Diff. 4.
	1, 2, 3, 4, &c.	1, 3, 5, 7, &c.	,4, 7, 10, &c.	1, 5, 9, 13, &c.
Figurates of the	Triangulars.	Squares.	Pentagonals.	Hexagonals.
Firſt order	1, 3, 6, 10	1, 4, 9, 16	1, 5, 12, 22	1, 6, 15, 28
Second order	1, 4, 10, 20	1, 5, 14, 30	1, 6, 18, 40	1, 7, 22, 50
Third order	1, 5, 15, 35	1, 6, 20, 50	1, 7, 25, 65	1, 8, 30, 80

Note. All the figurate orders of the ſeries, 1, 2, 3, 4, &c. where the difference is 1, are of the triangular kind; becauſe the units of each number in the firſt order (after the firſt) may be regularly diſpoſed in a triangular form; viz. trees, or any other things to the amount of thoſe numbers, may be ſo diſpoſed. Alſo, all the orders of the ſeries, 1, 3, 5, 7, where the difference is 2, are of the ſquare kind, becauſe the numbers in the firſt order form ſquares: and all the orders of the ſeries, 1, 4, 7, 10, where the difference is 3, are of the pentagon kind, becauſe the numbers in the firſt order form pentagons; where the difference is 4, they are of the hexagon kind; and, in general, all the orders of any ſeries are denominated after the name of that polygon whoſe number of ſides or angles exceed the common difference by 2.

Note alſo, The number of terms compoſing any figurate number of the firſt order, ſhews the number of units to be diſpoſed on each ſide of the polygon to which it relates.

Problem I. Given the ſide or number of terms compoſing any figurate of the firſt order, and the common difference of the arithmetical ſeries from which it is derived, to find the figurate number.

Rule. Multiply the ſide or number of terms, leſs 1, by half the product under the ſide and common difference; to the reſult add the ſaid ſide, and it will be the Anſwer required.

Example. Let the common difference of the arithmetical ſeries be 4, and the number of terms 10; what is the figurate number?

Here $10+\overline{10-1}\times\frac{4\times 10}{2}=10+9\times 2\times 10=10+180=190$, the figurate number required.

Cor. I. Since a figurate number of this order is $=$ to the ſum of all the given number of terms in the arithmetical ſeries, it follows, that this caſe is equivalent to the finding of the ſum of an arithmetic ſeries proceeding from unity, the common difference and number of terms being given.

Cor. II. If the number of the ſides or angles of the polygon, inſtead of the common difference of the arithmetical ſeries had been given, the caſe would have been the ſame, ſince the number of ſides or angles, leſs 2, is $=$ common difference.

Problem II. Given a figurate number of the firſt order, and the common difference of the arithmetical ſeries, to find the ſide, or number of terms compoſing it.

Rule. To 8 times the given number, add the common difference, and from the ſum ſubtract 4; then multiply the remainder by the difference, add 4 to the product, divide the ſum by 4 times the ſquare of the difference, and extract the ſquare root of that quotient. Alſo take the difference between 2, and the common difference, and divide the ſame by twice the difference; then, if the common difference was above 2, the quotient thus obtained muſt be added to, but, if leſs, ſubtracted from, the ſaid ſquare root, and the reſult will be the Anſwer.

If the common difference be 2, the ſquare root itſelf is the Anſwer.

Example. Let the figurative number be 190, and of the hexagon kind, what number of terms is it compoſed of, or what term is it in the figurate rank?

Here $6 =$ number of ſides, and $6 - 2 = 4$, the common difference. Alſo $190 \times 8 + 4 - 4 = 1520$.

And $\frac{1520 \times 4 + 4}{4 \cdot 4^2} = \frac{1520 + 1}{4^2} = \frac{1521}{4 \times 4} = \frac{380.25}{4} = 95.0625$.

Then $\sqrt{95.0625} = 9.75$. Likewiſe $\frac{4-2}{2 \times 4} = \frac{2}{8} = \frac{1}{4} = .25$; and $9.75 + .25 = 10$, the Anſwer ſought.

Cor. I. This caſe amounts to the ſame thing, as finding the number of terms in an arithmetic ſeries, proceeding from unity; by having the ſum of the ſeries, and the ratio or common difference given.

Prob. III. To find any aſſigned term of a triangular ſeries of any given order.

Rule. Let *n* denote the place of the term in the ſeries, and *m* the number expreſſing the given order; then, if as many terms of the following ſeries, as is denoted by $m + 1$, be multiplied together, the reſult will be the Anſwer.

Note alſo, the denominator of the laſt term, included in the operation, is always $= n$.

The ſeries, $n, \frac{n+1}{2}, \frac{n+2}{3}, \frac{n+3}{4}, \frac{n+5}{6}, \frac{n+6}{7}$, &c. *ad infinitum.*

Example. What is the 6th term of a ſeries of the 5th order of the triangular kind?

Here $n = 6$; and $m = 5$; and therefore the number of terms to be multiplied $= 5 + 1 = 6$.

Conſequently, $6 \times \frac{7}{2} \times \frac{8}{3} \times \frac{9}{4} \times \frac{10}{5} \times \frac{11}{6} . = \frac{6 \times 7 \times 8 \times 9 \times 10 \times 11}{2 \times 3 \times 4 \times 5 \times 6}$ $= \frac{7 \times 2 \times 9 \times 2 \times 11}{6} = 7. \times 2 \times 3 \times 11 = 462$, the Anſwer.

Cor. The ſum of *n* terms, in any order, is equal to the *n*th term in the next ſuperior order. Hence, the above Anſwer, is equal to the ſum of 6 terms in the 4th order?

Problem IV. To find the figurate number in any place of any order, and of what ſpecies ſoever the polygon is of.

Rule. Find by the laſt Problem the figurate number, in the given place, and order, of the triangular ſpecies; alſo find the figurate number, in the preceding place of the ſaid order and ſpecies; and multiply the ſame by the number of the order, leſs 1; to the product, add the firſt found figurate number, and the ſum will be the Anſwer ſought.

Example. Let it be required to find the fourth term in the ſeries of the 3d order of pentagonals.

Here $n = 4$; and $m = 3$; and, therefore, the fourth term in the triangular ſeries $= 4 \times \frac{4+1}{2} \times \frac{4+2}{3} \times \frac{4+3}{4}, = \frac{4 \times 5 \times 6 \times 7}{2 \times 3 \times 4} = 5 \times 7 = 35$. And the preceding term in that order, &c. $= \frac{3 \times 4 \times 5 \times 6}{2 \times 3 \times 4} = 3 \times 5 = 15$. Then $15 \times \overline{3 - 1} = 15 \times 2 = 30$, and $30 + 35 = 65$, the Anſwer.

Cor. The like remark takes place here as in the preceding Problem, ſo that this Anſwer is equal to the ſum of 4 terms of the ſeries in the 2d order of pentagonals, or the 2d order of the 3d ſpecies of figurates.

ART. XXI. GEOMETRICAL PROGRESSIONS.

Definitions.

I. Any ſeries of numbers increaſing by a conſtant multiplication, or decreaſing, by a conſtant diviſion, is ſaid to be in geometrical progreſſion, thus; 2, 4, 8, 16, 32, &c. is an increaſing ſeries by a continual multiplication by 2, and 81, 27, 9, 3, 1, &c. is a decreaſing ſeries by a conſtant diviſion by 3.

II. The number, by which the ſeries is conſtantly multiplied, or divided, is called the ratio.

III. Duplicate, triplicate, quadruplicate, &c. ratio, is the ſquare, cube, biquadrate, &c. of ſome given ratio.

IV. The greateſt and leaſt terms are called the extremes, and the intermediate terms the means.

V. The antecedent of any term, is that term which immediately precedes it; and the conſequent of any term, is that term which follows next in order after it.

Theorem I. In any ſeries of numbers, in geometrical progreſſion, the product of the extremes is equal to the product of any two means equally diſtant from the extremes. Thus, in the geometric progreſſion, 3, 6, 12, 24, 48, 96, the product of the extremes, viz. 3×96 (or 108) $= 6 \times 48 = 12 \times 24$.

Cor. In a ſeries where the number of terms is odd, the product of the extremes is alſo equal to the ſquare of the middle term.

Theorem II. If out of any geometric ſeries, there be taken any ſeries of equidiſtant terms, that ſeries will alſo be in geometric progreſſion.

Thus in the ſeries 1, 3, 9, 27, 81, 343, 1029, &c. there be taken the terms, 3, 27, 343, theſe terms are alſo in geometrical progreſſion, and are in the triplicate ratio of the former.

Cor. Hence, any geometric ſeries, where the number of terms is conſiderable, may be reduced in two or more other ſeries.

Theorem III. If there be a ſeries of terms in geometric progreſſion, their reſpective differences will alſo be in the ſame geometric progreſſion. Thus, in the ſeries 1, 3, 9, 27, 81, 343, &c. the differences $3 - 1$, $9 - 3$, $27 - 9$, $81 - 27$, &c. $= 2, 6, 18, 54$, reſpectively, are in the ſame geometric progreſſion with the given ſeries, viz. the ratio in both progreſſions is the ſame.

Cor. Hence, the differences of theſe differences; and again, the differences of theſe latter differences, will be in the ſame geometric progreſſion.

Theorem IV. The laſt term in any deſcending geometric ſeries, or the firſt term in any aſcending one, is equal to the other extreme divided by the ratio, raiſed to the power denoted by the number of terms, leſs 1.

Thus, in the ſeries 2, 6, 18, 54, aſcending; or 54, 18, 6, 2, deſcending; the firſt term in the former, or laſt in the latter, is equal to 54 divided by the cube of the ratio, viz. by 3^3, or 27; $= \frac{54}{27} = 2$.

Cor. I. The laſt term in any aſcending ſeries, or the 1ſt in any deſcending one, is equal to the other extreme, multiplied by the ratio, raiſed to the power, denoted by the number of terms, leſs 1.

Cor. II. In general the *n*th term of an aſcending ſeries, is equal to the firſt term, multiplied by r^{n-1}; where *r* is put to denote the ratio.

Cor. III. The *n*th term of any deſcending ſeries, is equal to the firſt term, divided by r^{n-1}.

Theorem V. In any geometric ſeries, whether aſcending or deſcending, the difference between the ſquare of the firſt term, and the product of the ſecond and laſt, divided by the difference between the firſt and ſecond terms, is equal to the ſum of all the ſeries.

Thus in the aſcending ſeries 2, 4, 8, 16, 32, the ſquare of the firſt term (2) is 4; the product of the ſecond and laſt $= 4 \times 32 = 128$; and $128 - 4 = 124$. Alſo the difference between the firſt and ſecond terms $= 4 - 2 = 2$; and $\frac{124}{2} = 62$, the ſum of the ſeries.

Again, in the deſcending ſeries 32, 16, 8, 4, 2, the ſquare of the firſt term (32) is $32 \times 32 = 1024$; the product of the ſecond and laſt $= 16 \times 2 = 32$; and $1024 - 32 = 992$. Alſo the difference between the firſt and ſecond terms $= 32 - 16 = 16$; and $\frac{992}{16} = \frac{248}{4} = 62$, the ſum of the ſeries, as before.

Cor. I. Or, if the difference between the firſt and laſt terms be divided by the difference between the firſt and ſecond terms, and the quotient be multiplied by the ſecond term; then this product, added to the firſt term, will be the ſum of the ſeries, whether the ſame be an aſcending or deſcending one.

Cor. II. If the greateſt term of any geometric ſeries, be multiplied by the ratio; and, if from the product, the leaſt term be ſubtracted, and the remainder divided by the ratio, leſs 1, the quotient will be the ſum of the ſeries.

Cor. III. If in any geometric ſeries, the difference between the greateſt and leaſt terms, be divided by the ratio, leſs 1; and, if the quotient be added to the greateſt term, the reſult will be the ſum of all the ſeries.

Cor. IV. If the ratio of any geometric ſeries, be raiſed to the power denoted by the number of terms, and 1 be ſubtracted therefrom; and, if this remainder be divided by the ratio, leſs 1, and the quotient be multiplied by the leaſt term, the product will be the ſum of the ſeries.

Cor. V. If the ratio of any geometric ſeries, be raiſed to the power denoted by the number of terms, and 1 be ſubtracted therefrom; and, if this remainder be divided by the next inferior power of the ratio, or by the ratio raiſed to the power, denoted by the number of terms, leſs 1, and this quotient be multiplied by the greateſt term, the product will be the ſum of all the ſeries.

Cor. VI. In any infinite decreaſing geometric progreſſion, if the ſquare of the firſt term be divided by the difference between the firſt and ſecond terms, the quotient will be the ſum of the ſeries.

Cor. VII. If in any infinite decreaſing geometric progreſſion, the product of the firſt and ſecond terms be divided by the difference of thoſe terms, and the quotient added to the firſt term, the reſult will be equal to the ſum of the ſeries.

Cor. VIII. If in any infinite decreaſing geometric progreſſion, the firſt term be multiplied by the ratio, and the product be divided by the ratio, leſs 1, then the quotient will be the ſum of the ſeries.

Cor. IX. If the ſum of an infinite decreaſing geometric progreſſion, be divided by the difference between the ſum and the firſt term, the quotient will be the ratio of ſuch ſeries.

Cor. X. If the ſum of an infinite decreaſing geometric progreſſion, be divided by the ratio, and the quotient ſubtracted from the ſaid ſum, or multiplied by the ratio, leſs 1, the remainder in the former caſe, or the product in the latter, will be the firſt term.

N. B. Moſt of the operations in geometric progreſſion, are beſt wrought by logarithms; as through their uſe, Multiplication is performed by Addition; Diviſion, by Subtraction; Involution, by Multiplication; and Evolution, by Diviſion.

QUESTIONS IN GEOMETRIC PROGRESSION.

Question I. What debt will be diſcharged in 9 months, by paying 3 l. the firſt payment, 6 l. the ſecond, 12 l. the third, and ſo on, doubling the payment each time; and what will be the laſt payment?

Here, by Theorem V. Cor. IV. $\frac{2^9-1}{2-1}\times 3=$ the debt $=\overline{2^9-1}\times 3$; alſo, $2^9=2\times2\times2\times2\times2\times2\times2\times2\times2=512$; and therefore $512\times3=1533$ l. the debt.

And, by Theorem IV. Cor. I. $2^8\times3=$ laſt payment $=256\times3=768$ l.

Question II. What debt will be diſcharged by monthly payments in geometric progreſſion, the firſt payment being 1 l. and the laſt 2048 l. the ratio being 2?

Here, by Cor. III. $\frac{2048-1}{2-1}+2048=2047+2048=4095$ l. the Anſwer.

Question III. Suppoſe a body to move perpetually after this manner; viz. the firſt year 20 miles, the ſecond, 19 miles, the third, $18\frac{1}{20}$, and ſo on, in a geometric progreſſion, whoſe ratio is $\frac{20}{19}$, how far will it move in an eternity, or what is the diſtance beyond which it can never paſs?

Here, by Theorem V. Cor. VIII. $20\times\frac{20}{19}\div\frac{1}{19};=\frac{20\times20\times19}{19}=20\times20=400$ miles, the diſtance required.

A SYNOPSIS OF THE DIFFERENT CASES IN GEOMETRIC PROGRESSION.

Caſe	Given	Required.	Solution.
1	*a*, *r*, *n*,	*l*, *s*,	$l=ar^{n-1}$ $s=\frac{r^n-1}{r-1}\times a$
2	*a*, *r*, *l*,	*s*, *n*,	$s=\frac{l-a}{r-1}+l$ $n=\frac{\log.\,l-\log.\,a}{\log.\,r}+1$
3	*a*, *r*, *s*,	*l*, *n*,	$l=s-\frac{s-a}{r}$ $n=\frac{\log\,\overline{\overline{r-1}\times s+a}-\log.\,a}{\log.\,r}$
4	*a*, *l*, *s*,	*r*, *n*,	$r=\frac{s-a}{s-l}$ $n=\frac{\log.\,l-\log.\,a}{\log.\,\overline{s-a}-\log.\,\overline{s-l}}+1$
5	*a*, *n*, *s*,	*r*, *l*,	*r*, will be had by ſolving this equation, viz. $-r^n+\frac{rs}{a}=\frac{s-a}{a}$; and *l*, will be had by ſolving this equation, $l\times\overline{s-l}\vert^{n-1}=a\times\overline{s-a}\vert^{n-1}$
6	*a*, *n*, *l*,	*r*, *s*,	$r=\overline{\frac{l}{a}}\vert^{\frac{1}{n-1}}$ $s=\frac{l-a}{\overline{l\div a}\vert^{\frac{1}{n-1}}-1}+l$
7	*r*, *n*, *l*,	*a*, *s*,	$a=\frac{l}{r^{n-1}}$ $s=\frac{r^n-1}{r-1}\times\frac{l}{r^{n-1}}$
8	*r*, *n*, *s*,	*a*, *l*,	$a=\frac{r-1}{r^n-1}\times s$ $l=\frac{sr^{n-1}}{r^n-1}\times\overline{r-1}$
9	*r*, *l*, *s*,	*a*, *n*,	$a=rl-\overline{r-1}\times s$; or $s-\overline{s-l}\times r$ $n=\frac{\log.\,l-\log.\,\overline{s-\overline{s-l}\times r}}{\log.\,r}+1$
10	*n*, *l*, *s*,	*a*, *r*,	*a*, will be had by ſolving this equation, viz. $a\times\overline{s-a}\vert^{n-1}=l\times\overline{s-l}\vert^{n-1}$; and *r* will be had by this equation, viz. $-r^n+\frac{s}{s-l}r^{n-1}=\frac{l}{s-l}$

Note, in the above Synopſis,
$a=$ leaſt term.
$l=$ greateſt term.
$s=$ ſum of the ſeries.
$n=$ number of terms.
$r=$ ratio.

ART. XXII. OF HARMONIC PROPORTION.

Definitions.

I. When three terms are ſo diſpoſed that the difference between the firſt and ſecond is to the difference between the ſecond and third, as the firſt term is to the third, they are ſaid to be harmonically proportional.

II. When four terms are ſo diſpoſed, that the difference between the firſt and ſecond is to the difference between the third and fourth, as the firſt term is to the fourth, they are alſo harmonically proportional.

III. If the terms of an harmonic proportion be continued, then it is called an Harmonic Progreſſion.

Problem I. Given two terms to find a third in harmonic proportion.

Rule. Divide the product of the two terms by the difference between twice the firſt and ſecond term, and the quotient will be the third term of the proportion; but if it be the ſecond and third term that is given, and the firſt term is wanted, then divide their product by the difference between twice the third term and the ſecond, and the quotient will be the firſt term.

Note. The firſt or third term (according as the caſe ſhall be propoſed) muſt be greater than half the ſecond, otherwiſe the queſtion will be impoſſible.

Example. Let the firſt and ſecond terms be 10 and 15, reſpectively, what is the third term in an Harmonic Proportion?

Here $\frac{10\times15}{20-15}=\frac{10\times3}{4-3}=30$, the Anſwer.

Problem II. Given three terms to find a fourth in harmonic proportion.

Rule I. If the three firſt terms be the firſt, ſecond, and third, then divide the product of the firſt and third by the difference between twice the firſt term and the ſecond term, and the quotient will be the fourth term of the proportion.

Note. Here the firſt term muſt be propoſed greater than half the ſecond, or the caſe will be impoſſible.

II. If the given terms be the ſecond, third, and fourth, to find the firſt, then divide the product of the ſecond and fourth by the difference between twice the fourth term and the third, and the quotient will be the firſt term.

Here the fourth term muſt be greater than half the third.

Example. Let the ſecond, third and fourth terms be 16, 24, and 60, reſpectively, what is the firſt term?

Here $\frac{16\times60}{120-24}=\frac{16\times5}{10-2}=\frac{8\times5}{5-1}=\frac{40}{4}=10$, the Anſwer.

ART. XXIII. THE RULE OF FALSE POSITION.

Definitions.

I. This Rule is called Falſe Poſition, becauſe by a Poſition or Suppoſition of falſe numbers, it teaches how to obtain the true Anſwer.

II. Queſtions which come under this Rule are ſuch as cannot be eaſily ſolved by the common rules, and are of two ſorts, ſome requiring the ſuppoſition of only one falſe number, and others requiring two.

III. Where one ſuppoſition only is uſed, the method is called Single Poſition; where two ſuppoſitions are made, it is named Double Poſition.

In caſes where the reſults are proportional to their ſuppoſitions, the Single Rule will give the Anſwer.

THE RULE FOR SINGLE POSITION.

Suppoſe ſome fit number at pleaſure to denote the Anſwer, and try according to the tenor of the queſtion, whether the ſame be true or falſe. If it anſwer the conditions of the queſtion, you have hit upon the right number; but if not, you muſt obſerve what the falſe reſult or concluſion is. Then ſay by the Rule of Three, As the falſe concluſion is to the true number given, ſo is the falſe ſuppoſition to the true Anſwer.

Question. A gentleman dying left 10000 l. among his three ſons, A, B, C, in ſuch proportion, that A's part ſhould be one ſixth of B's part, and B's part five ſixths of C's part. What was the ſhare of each?

Suppoſe A's part = 500 l. then B's = 3000 l. and C's = 2500 l. their ſum is 6000 l. which ſhould have been 10000 l. therefore, As 6000 l. : 10000 l. :: 500 l. to A's part $=\frac{5000000}{6000}=\frac{5000}{6}=$ 833 l. 6 s. 8 d. and, conſequently, B's ſhare = 5000 l. and C's = 4166 l. 13 s. 4 d. which together make 10000 l.

THE RULE FOR DOUBLE POSITION.

Suppoſe two fit numbers, and proceed with each, as the conditions of the queſtion direct; then, if either of the numbers ſo taken ſhall anſwer all the conditions, you have hit upon the true Anſwer; but, if not, obſerve what the errors are; viz. how much is the exceſs or defect of each ſuppoſition, writing the ſuppoſitions one under another, with their errors oppoſite to them. This done, multiply the numbers croſswiſe; viz. the firſt ſuppoſition by the laſt error, and the laſt ſuppoſition by the firſt error; then, if the ſuppoſitions are of different kinds, viz. one greater than the truth, and the other leſs, divide the ſum of thoſe products by the ſum of the errors; but, if the ſuppoſitions are alike, viz. either both greater or both leſs than the truth, divide the difference of the products by the difference of the errors; ſo will the quotient in either caſe be the Anſwer required.

Or, you may proceed to find a correction to be added to either ſuppoſition. Thus ſay, as the difference of the errors, if alike, or ſum, if they are unlike, is to the difference of the ſuppoſitions, ſo is either error to the correction to be added to or ſubtracted from the ſuppoſition to which it belongs, according as the ſame was leſs or greater than the truth. And here, in order to prevent miſtakes, it will be proper, when a ſuppoſition is leſs than the truth, to annex thereto the ſign (+) to ſhew that the correction is to be added; and, when greater, the ſign (—) to denote that the correction is to be ſubtracted.

Question I. Two perſons, A and B, were diſcourſing of their money; A ſaid to B, give me 5 guineas of your money, and I ſhall have juſt as much as you. No, replied B to A, rather give me 5 guineas of your money, and I ſhall have juſt three times as much as you. How much money had each?

Here, ſuppoſe A had 10 guineas; then, according to the firſt condition of the queſtion, B muſt have had 20; then, by the ſecond condition, if A give B 5 guineas, A will have 5, and B 25; but thrice A's, viz. 15, ſhould have been equal to B's; therefore, this ſuppoſition of A's money comes ſhort by 10.

Again: Suppoſe A had 18 guin. then, according to the firſt condition, B muſt have had 28; and, by the ſecond condition, if 5 be taken from A's and put to B's money, A will have 13 guineas, and B 33 guineas. But thrice A's, in this caſe, (viz. 39) ſhould be juſt equal to B's. Wherefore this ſuppoſition exceeds the truth by 6. So I write down the ſuppoſitions with their errors, and proceed as under.

1ſt Method.

$$\begin{array}{lccc} & & \text{Error.} & \\ \text{1ſt Suppoſ.} & 10 & 10 & \\ \text{2d Suppoſ.} & \underline{18} & \underline{6} & \Big\}\,16 \\ \text{Prod.} & 180 & 60 \text{ Prod.} & \\ \text{Add} & \underline{60} & & \\ 16\,) & 240 & (\,15 \text{ Anſwer.} & \\ & \underline{16} & & \\ & 80 & & \\ & \underline{80} & & \\ & .. & & \end{array}$$

2d Method.

$$\begin{array}{lccc} & & & \text{Error.} \\ \text{1ſt Suppoſ.} & 10 & + & 10 \\ \text{2d Suppoſ.} & \underline{18} & - & \underline{6} \\ \text{Difference} & 8 & & 16 \text{ Sum.} \end{array}$$

Then, as 16 : 8 :: 6 : 3, the Cor.
And 18 — 3 = 15, the Anſ.
Or, as 16 : 8 :: 10 : 5, the Cor.
And 10 + 5 = 15, the Anſ.

Question II. A and B, working together on the ſame work, can earn 40 ſhillings in ſix days; A and C together can earn 54 ſhillings in 9 days; and B and C 80 ſhillings in 15 days. It is required to determine, what each perſon, alone, can earn per day?

Here, ſuppoſe A can earn 3 ſhillings per day; then it is plain that B muſt earn 22 ſhillings in 6 days, and C muſt earn 54 ſhillings in 9 days, or as much as A; wherefore, B and C together will, at this rate, earn 100 ſhillings in 15 days, which is 20 ſhillings more than is allotted to them by the queſtion; and, as it is evident that the wages of B and C will decreaſe when thoſe of A are increaſed, it follows, that the value of A's wages has been aſſumed too ſmall. Wherefore, for a ſecond ſuppoſition, ſuppoſe A's wages to be 4 ſhillings per day, then B muſt earn 16 ſhillings in 6 days, and C 18 ſhillings in 9 days; and, therefore, B and C together would earn 70 ſhillings in 15 days, which is 10 ſhillings too little; and therefore the ſuppoſition of 4 ſhillings a day for A is too much.

Hence the following operation:

By 1ſt Method.

$$\begin{array}{lccc} & & \text{Error.} & \\ \text{1ſt Suppoſ.} & 3 & 20 & \\ \text{2d Suppoſ.} & \underline{4} & \underline{10} & \Big\}\,30 \\ \text{Prod.} & 80 & 30 \text{ Prod.} & \\ \text{Add} & \underline{30} & & \\ 3|0\,) & \underline{11|0} & & \\ & 3\text{s. } 8\text{d. Anſwer.} & & \end{array}$$

Or thus, by 2d Method.

$$\begin{array}{lccc} & & & \text{Error.} \\ \text{1ſt Suppoſ.} & 3 & + & 20 \\ \text{2d Suppoſ.} & \underline{4} & - & \underline{10} \\ \text{Difference} & 1 & & 30 \text{ Sum} \end{array}$$

As 30 : 1 :: 20 : $\frac{2}{3}$s. = 8d.
which, added to 3, gives 3s. 8d.

So it appears, that A can earn 3s. 8d. per day, or 22 ſhillings in 6 days; and therefore, B muſt earn 18 ſhillings in 6 days, or 3 ſhillings per day; and C muſt earn 21 ſhillings in nine days, or 2s. 4d. per day; and, conſequently, B and C together will earn 80 ſhillings in 15 days, agreeably to the queſtion, which proves the Anſwer to be true.

It will be needleſs to give more Examples, as thoſe who underſtand the above will find no difficulty in any other.

ARTICLE XXIV.

OF PERMUTATION AND COMBINATION, &c. OF QUANTITIES.

Definitions.

I. The Permutation of Quantities, is the ſhewing how many different ways the diſpoſition or order of any given number of things may be changed. This is alſo called Variation, Alternation, or Changes.

II. The Combination of Quantities, is the ſhewing how often a leſs number of quantities or things can be taken out of a greater, and combined together, without conſidering their places, or the order they ſtand in. This is ſometimes called Election or Choice.

Note. Here every parcel muſt be different from all the reſt; and no two are to have preciſely the ſame Quantities or Things.

III. The Compoſition of Quantities, is the taking a given number of quantities out of as many equal rows of different quantities, one out of every row, and combining them together.

Here no regard is had to their places, and it differs from Combination, in which there is but one row of things.

IV. Combinations of the ſame form, are thoſe wherein there are the ſame number of quantities, and the ſame repetitions: as *a b c c*, *b b a d*, *e f f g*, &c. are of the ſame form. Alſo, $A\,B^3\,C^2$, $D\,A^2\,E^3$, $C^3\,E\,D^2$, &c. are of the ſame form. But, $A\,B^2\,C$, $A\,B^3$, $A^2\,C^2$, &c. are of different forms.

Here obſerve, when any quantity is written with an index at the top, it denotes ſo many repetitions of that quantity; thus a^2 ſignifies *a a*, a^3, *a a a*, &c.

Problem I. To find the number of Permutations or Changes of any given number of things, all different from one another.

Rule. Multiply all the terms of the natural ſeries of numbers, (viz. 1, 2, 3, 4, 5, 6, 7, &c. from 1, up to the given number, continually together, and the laſt product will be the Anſwer required.

Example I. How many changes can be rung upon 8 bells?

Here $1\times2\times3\times4\times5\times6\times7\times8 = 40320$, the Anſwer.

Example II. How many days can 7 perſons be placed in a different poſition at dinner?

Here $1\times2\times3\times4\times5\times6\times7=5040$ days, or 13 yrs. 41 weeks, and 5 days, ſuppoſing three leap years to fall within that period.

Problem II. Any number of things being given to find how many changes can be made out of them, by taking any propoſed number of quantities at a time?

Rule. Take as many terms of a ſeries of numbers, beginning at the number of things given, and decreaſing by 1, as is denoted by the number of quantities to be taken at a time, and multiply them into one another, and the product will be the Anſwer.

Example. How many changes can be rung with four bells, out of eight?

Here $8\times7\times6\times5 = 1680$, the Anſwer.

Problem III. Any number of things being given, whereof there is a certain given quantity of things of one ſort, and a certain given quantity of another, &c. to determine how many changes can be made out of them all?

Rule. Let m denote the whole number of things; alſo, let p denote the number of one ſort, and q the number of things of another ſort, &c. then $\frac{1\times2\times3\times4\times5,\ \&\text{c. to } m \text{ terms}}{1\times2\times3,\&\text{c. to } p \text{ ter.}\times1\times2\times3,\&\text{c. to } q \text{ ter.}\&\text{c.}}$ will be the Anſwer required.

Example. How many different numbers can be made out of the following figures, 1220005555?

Here, the whole number (or m) = 10; alſo, there being one 1, two 2's, three 0's, and four 5's, the Anſwer will be exhibited as follows; viz. $\frac{1\times2\times3\times4\times5\times6\times7\times8\times9\times10}{1.\times\overline{1\times2}.\times\overline{1\times2\times3}.\times\overline{1\times2\times3\times4}} = 1260$, the Anſwer.

Problem IV. To find the changes of any given number of things, taken a given number at a time, in which there are ſeveral things of one ſort, ſeveral of another, &c.

Rule. Find all the different forms of Combination of all the given things, taking as many at a time as is ſpecified in the queſtion: alſo find the number of changes in any form, and multiply it by the combinations in that form. Do the ſame for each diſtinct form, and the ſum of all the products will give the whole ſum of the changes required.

Note. All the difficulty here, is to find the combinations required, and this is eaſily done when the quantities are but few, by joining together every two, every three, &c. till you come at the given number to be taken at a time, and then reckoning how many different forms there are, having the given number at a time, and how many in each form. But when the quantities are many, and often repeated, this method will be impracticable; ſo that recourſe muſt then be had to Problem VI. following, to find theſe Combinations?

Example. How many changes can be made of every four letters out of theſe eight; viz. *a a a b b b c c*?

Set down the quantities as though you were going to multiply them in an algebraical manner, and note down all the products accordingly, except ſuch as happen to be the ſame as ſome of the foregoing, and ſuch as are out of the queſtion.

a, *b*, *c*,
a, *b*, *c*,
aa, *ab*, *ac*, *bb*, *bc*, *cc*,
a, *b*, *c*,
aaa, *aab*, *aac*, *abb*, *abc*, *acc*, *bbb*, *bbc*, *bcc*,
a, *b*, *c*,
aaab, *aaac*, *aabb*, *aabc*, *aacc*, *abbb*, *abbc*, *abcc*, *bbbc*, *bbcc*.

Here there are 4 of this form, *aaab*, and the number of changes is 4, } therefore $4\times4=16$
There are 3 of this form, *aabb*, and the changes are 6, } $3\times6=18$
And there are 3 of this form, *aabc*, and the changes are 12, } $3\times12=36$
Number of changes required 70

Problem V. To find the number of combinations of any given number of things, all different from one another, and taken any given number at a time.

Rule. Let m denote the number of things, and n denote the number taken at a time.

Then $\frac{m\times\overline{m-1}\times\overline{m-2}\times\overline{m-3}\times\overline{m-4},\ \&c.\ \text{to } n \text{ terms}}{1\times2\times3\times4\times5,\ \&c.\ \text{to } n \text{ terms.}}$ = to the Anſw.

Example. How many combinations can be made with three letters of the alphabet, reckoning but 24 letters in the alphabet?

Here $\frac{24\times\overline{24-1}\times\overline{24-2}}{1\times2\times3} = 6\times23\times22 = 2024$, the Anſwer.

Cor. I. The number of Combinations of *n* things, taken out of *m*, is equal to the co-efficient of the $\overline{n+1}$*th* term of a binomial, raiſed to the *mth* power.

Cor. II. The number of all the poſſible Combinations of all the one's, two's, three's, &c. is one leſs than the ſum of all the co-efficients of a binomial raiſed to the m^{th} power, and that is equal to 2^m-1. This is the number of all the elections.

Cor. III. There is the ſame number of combinations of *n* things out of *m*, as of *m*—*n* things out of *m*.

Cor. IV. There is but one Combination of *m* things out of *m*, whether they be all different, or ſeveral of one or more ſorts.

Cor. V. The number of Permutations of *m* things, taken *n* at a time, is equal to the like number of Combinations multiplied into *n* terms of the natural ſeries, 1, 2, 3, 4, 5, &c.

Problem VI. To find the number of combinations of any number of things, in which there are certain quantities of different ſorts, and in the combinations of which ſuppoſing any number to be taken at a time.

Here, when the quantity is often repeated, as *aaa*, *bbbb*, &c. they may be written thus a^3, b^4, &c. where the index ſhews the number of repetitions of any quantity, or how often it is to be taken, then proceed as follows:

Place the number of things ſo that the greateſt indices may be firſt, and the reſt decreaſe in order. Then begin at the firſt letter, and join it with the ſecond, third, fourth, &c. to the laſt; alſo, take the ſecond letter and join it to the third, fourth, &c. and likewiſe the third, and proceed in the ſame way; and then the fourth, fifth, &c. till all be done; always taking care to reject ſuch combinations as you had before. Thus you have the combination of all the two's.

Then, for all the three's, join the firſt letter of every one of the two's ſucceſſively; and then the ſecond and third, &c. to the laſt, leaving out ſuch combinations as are had before. So you will have the combinations of the three's.

Proceed the ſame way to get the combinations of all the four's, five's, &c. till you come at the given number to be taken at a time, and ſo you will at laſt get all the ſeveral forms of combination, and how many there are of each ſort.

But, when there are many terms, it will be proper to proceed in this manner: let the ſeveral ſorts of things denoted be *a*, *b*, *c*, *d*, &c. and their number be *m*, and let the quantity to be taken at a time be *n*; alſo, let *p*, *q*, *r*, *s*, &c. be the reſpective numbers of each ſort; ſo will a^p, b^q, c^r, d^s, &c. denote the repetitions of the ſeveral different ſorts of things, whether equal or unequal.

Likewiſe, let a^t, b^v, c^w, d^x, &c. be the form to be combined, the indices being *t*, *v*, *w*, *x*, &c. either equal or unequal; then the Rule for any Single Form will be as under.

Let A, B, C, D, &c. be the number of different letters in the *m* things expoſed, the indices of which are equal to or greater than (*t*, *v*, *w*, *x*, &c. reſpectively) the indices in the *n* things. Then the number of combinations in that form, is $\frac{A\times\overline{B-1}\times\overline{C-2}\times\overline{D-3}\,\&c}{R\,S,\ \&c.}$ continued to as many terms as there are different letters in the form propoſed; where $R = 1\times2$, or $1\times2\times3$, or $1\times2\times3\times4$, &c. when any index in the form is twice, thrice, or four times, &c. repeated; and the like for S, &c.

The operation muſt be repeated for every form, and the ſum of all will give the number of combinations required.

Cor. Hence, before the required number of combinations can be determined, all the different forms of combination muſt be firſt found; the beſt method for which is this:

Set down all the indices contained in the *m* quantities, taking the greateſt firſt, and the reſt in like order. Then, to get all the forms, write down the greateſt index firſt, and the next leſs, towards the right hand; and ſo on, till the ſum be equal to *n*; obſerving that the number of places cannot exceed the number of different letters.

Proceed from row to row, in breaking the leaſt figures, viz. thoſe towards the right hand, into others that are ſtill leſs, till they be units. And thus go on, figure by figure, from right to left, till the numbers are diminiſhed as low as the caſe will admit.

Example. How many combinations are there in a^4, b^2, c^2, d, e, taking 8 at a time?

Here the indices of the given quantity, are 42211; $n = 8$, and the number of places, in any form, cannot exceed 5.

	Forms.	Combinations.
	422	1
	4211	6
	41111	1
	3221	2
	32111	2
	22211	1
Total		13 the Anſw.

Here the method of deriving the forms in this Example, is ſo obvious, that it is needleſs to ſay any thing about it; but it may be neceſſary to explain the application of the preceding Rule, in finding the number of combinations according to each form.

The firſt form is 422. Now there is but one index in the given quantity that contains the firſt index of this form (4); therefore, $A = 1$; but there are three indices that contain the ſecond and third indices of this form; and therefore, $B = 3$, and $C = 3$; alſo, ſince in the ſaid form there is one index, (namely 2) that occurs twice, therefore, $R = 1\times2 = 2$.

Hence, by the Rule, the number of combinations $= \frac{1\times2\times1}{2} = 1$; in the ſecond form, $A = 1$, $B = 3$, $C = 5$, and $D = 5$; alſo one index (viz. 1) occurs twice; therefore, $R = 1\times2 = 2$.

Hence the number of combinations $\frac{1\times2\times3\times2}{2} = 6$.

In the third form, $A = 1$, $B = 5$, and $C = 5$, $D = 5$; and $E = 5$; and one index (viz. 1) occurs four times; therefore, $1\times2\times3\times4 = 24 = R$; and the number of combinations $= \frac{1\times4\times3\times2\times1}{24} = 1$.

In the fourth form, $A = 1$, $B = 3$, and $C = 3$, $D = 5$; and $R = 2$; conſequently the number of combinations $= \frac{1\times2\times1\times2}{2} = 2$.

In the fifth form, $A = 1$, $B = 3$, $C = 5$, $D = 5$, and $E = 5$; and $R = 1\times2\times3 = 6$; therefore, the number of combinations $= \frac{1\times2\times3\times2\times1}{6} = 2$.

In the laſt form, $A = 3$, $B = 3$, $C = 3$, $D = 5$, and $E = 5$; and here one index, (viz. 2) occurs thrice, therefore, $R = 1\times2\times3 = 6$; and another index (viz. 1) occurs twice, therefore, $S = 1\times2 = 2$; and, conſequently, the number of combinations $= \frac{3\times2\times1\times2\times1}{6\times2} = 1$.

The ſum of all the combinations is 13, the Anſwer.

Problem VII. To find how many compoſitions of things, each conſiſting of any ſpecified number, can be taken out of the ſpecified number of rows, each containing any given number of things.

Rule. Involve the number of things in each row, to the power denoted by the number, that is, in each compoſition; or, which is the ſame, to the power denoted by the number, which expreſſes the quantity of rows, and the reſult will be the Anſwer.

Cor. If *n* be the number of rows, or number in each compoſition, and *m* = number of things in each row; then $\frac{m^{n+1}-m}{m-1}$, (or $\frac{m^n-1}{m-1}\times m$.) is equal to the number of compoſitions of all the one's, two's, three's, &c. to *n*.

Example I. How many combinations of three letters are there in three alphabets, each containing 24 letters?

Here $24^3 = 13824$, the Anſwer.

Example II. How many words can be formed out of the whole alphabet, ſuppoſing any compoſition from 2 to 24, to make a word.

Here $m = 24$, and $n = 24$; and by the above Corollory $\frac{24^{24}-1}{23}\times24 =$ the number of words, if the compoſitions of 1 were included. Now the compoſitions of $1 = 24$; and therefore $\frac{24^{24}-1}{23}\times24-24 = 1391724288887252999425128493402176$, the Anſwer required.

Other Problems of the like nature might be given; but they are ſuch, as are ſeldom wanted; and, indeed, more have been already introduced, than are to be met with in moſt books of Arithmetic.

ART. XXV. OF CIRCULATING DECIMALS.

Definitions.

I. A Circulating, or Recurring Decimal, is that wherein one or more figures are continually repeating; as 42.5876666, &c. which is named a Single Circulate; and 285,264264264, &c. which is called a Compound Circulate.

II. The recurring part of a Decimal, is named the Repetend.

III. A Single Repetend, is expreſſed by writing a point over the circulating figure, thus .2333, &c. is denoted by $.2\dot{3}$.

IV. A Compound Repetend, is diſtinguiſhed by putting points over the firſt and laſt repeating figures; thus .375375375, &c. is expreſſed $.\dot{3}7\dot{5}$.

V. Similar Circulating Decimals, are ſuch as conſiſt of the ſame number of figures, and begin at the ſame place, either before or after the Decimal point; thus $.\dot{3}$ and $.\dot{4}$ are Similar Circulates; ſo alſo are $\dot{3}.4\dot{2}$ and $\dot{5}.2\dot{7}$, &c.

VI. Diſſimilar Repetends, conſiſt of an unequal number of figures, and begin at different places.

VII. Similar and conterminous Circulates, are ſuch as begin and end at the ſame place; as $2.4\dot{6}3\dot{8}$, $5.3\dot{2}4\dot{6}$, and 7.5435, &c.

N. B. Any Proper Vulgar Fraction, whoſe denominator is compounded of any other number than 2 and 5, will produce a Circulating Decimal; which will always repeat before there are as many figures obtained, as there are units in the denominator.

Theorem. In any Circulating Decimal, the whole circulating or repeating part, running on for ever, is equal to a Vulgar Fraction, whoſe numerator is the number repeating (or repetend) and the denominator as many 9's as there are figures in the repetend.

Cor. I. The circulation may be ſuppoſed to begin at any figure of the repetend.

Cor. II. If any circulating number be multiplied by any given number, the product will be a circulating number, and the repetend will conſiſt of the ſame number of figures as before.

Cor. III. If a circulating decimal has a repetend of any number of figures, it may be conſidered as having a repetend of twice, thrice, or any multiple of that number. Thus $4\dot{1}3\dot{7}$, is equivalent to $4.\dot{1}373\dot{7}$, or $4.\dot{1}37373\dot{7}$, &c.

Cor. IV. If two or more numbers be added together that have repetends of equal places, the ſum will have a repetend of the ſame number of places.

Prob. I. Having a vulgar fraction given in the loweſt terms, and the denominator a prime, (but neither 2 nor 5) to find the number of figures that circulate in the decimal thereof.

Rule. Divide 99999, &c. by the denominator till 0 remains; then the number of 9's, made uſe of, will be equal to the number of places in the repetend.

Example. Let the fraction be $\frac{2}{7}$,

Then $\frac{7)999999,\ \&c.}{142857,\ \text{and 0 remains}}$

So, in taking 6 nines, there is no remainder; and conſequently if the fraction $\frac{2}{7}$ be reduced to a decimal, it will have a repetend of ſix places.

Prob. II. Having a vulgar fraction in the loweſt terms, and the denominator made up of two or more primes (2 and 5 excluded) to find the number of figures that circulate in the decimal thereof.

Rule. Find by the laſt Problem the number anſwering to each prime; alſo find by Prob. IV. of fractions, the leaſt dividend that will divide by each ſuch number without a remainder, and it will be equal to the number of figures in the repetend of the decimal.

Example. Let the fraction be $\frac{13}{11\times37}$, or $\frac{13}{407}$.

Here the repetend by 11, conſiſts of 2 places, and that by 37, of 3 places: alſo the leaſt number that will divide by 2 and 3 is 6. Conſequently the fraction $\frac{13}{407}$ will produce a repetend of 6 places.

Problem III. Having given any number of diſſimilar repetends, to reduce them to ſimilar and conterminous ones.

Rule. Find the leaſt dividend that will divide by the ſeveral figures, denoting the number of places in the propoſed repetends. Then that dividend will denote the number of places in each ſimilar and conterminous repetend; then that number, whoſe repetend begins the farthermoſt to the right hand, (viz. at the greateſt diſtance from the units figure) muſt be increaſed till the repetend conſiſt of the due number of figures, as above mentioned; and then the decimals in the reſt of the numbers muſt be augmented, if need be, ſo as to have a like number in each.

Example. Let the diſſimilar repetend be $6.\dot{2}1\dot{4}$, $.\dot{1}\dot{5}$, and $1.\dot{2}$.

Here the number of places in the firſt repetend is 3; in the ſecond 2; and in the third 1; and the leaſt number that will divide by each of theſe is 6.

Therefore there muſt be ſix places in the repetend, and conſequently the numbers will become $6.\dot{2}1421\dot{4}$; $.\dot{1}5151\dot{5}$; and $1.\dot{2}2222\dot{2}$, reſpectively; and thus they are made ſimilar and conterminous. The nature of this proceſs is farther evident from what has been ſaid in Corollories I. and III. of the preceding Theorem.

Note. If a number be propoſed that is not a repetend of itſelf, yet one or more cyphers (as decimals) may be annexed, and ſo it may be conſidered as having a repetend of cyphers.

Problem IV. To add circulating decimals together.

Rule. Make the repetends ſimilar and conterminous, if they are not ſo already; find the ſum of the ſimilar repetends, and divide the ſame by a number, conſiſting of as many nines as is the common number of places in the ſimilar repetends; then the remainder will be the repetend of the required ſum; and the quotient will be the number to be carried to the next column to be added as finite decimals.

Example. Let it be required to add $2.\dot{5}$; $62.\dot{3}4\dot{2}$; and $.\dot{3}2\dot{7}$ together.

$$\begin{array}{r} 2.\dot{5}5555\dot{5} \\ 62.\dot{3}4234\dot{2}3 \\ .\dot{3}27327\dot{3} \\ \hline 65.2\dot{2}5225\dot{2} \\ \hline \end{array}$$

Here, the numbers being made ſimilar, and placed in order for addition, will ſtand as they are here put down; and the ſum of the repetends is 1252251, which divided by 999999, the quotient is 1, to be carried to the next row, and the remainder is 252252, to be put down for the repetend; and ſo the whole ſum is $65.2\dot{2}5225\dot{2}$, but it is obvious that this repetend may be taken in fewer figures; thus the above ſum is $= 65.\dot{2}2\dot{5} = 65.\dot{2}\dot{2}$.

Problem V. To ſubtract circulating decimals.

Rule. Make the repetends ſimilar and counterminous, and ſubtract as in finite decimals; obſerving to make the laſt figure in the remainder 1 leſs, when the repetend in the number ſubtracted is greater than the repetend in the number ſubtracted from.

Example. From $35.\dot{1}\dot{2}$ take 2.764.

Here the numbers reduced to a like repetend, are $35.12\dot{1}\dot{2}$, and $2.76\dot{4}\dot{4}$. And $35.12\dot{1}\dot{2} - 2.76\dot{4}\dot{4} = 32.3568$. But the repetend in the number ſubtracted (viz. $\dot{4}\dot{4}$) being greater than the other (viz. $\dot{1}\dot{2}$) therefore I take 1 from the laſt decimal figure, and ſo the proper remainder is $32.35\dot{6}\dot{7}$; the two laſt figures being a repetend.

Problem VI. To multiply or divide circulating decimals.

Rule. By the foregoing Theorem, turn both the terms into their equivalent vulgar fractions, and find the product or quotient of theſe fractions as uſual. Then, if the Anſwer is required in decimals, reduce the fractional product, or quotient, to a decimal.

Exampe I. Multiply $4.7\dot{2}$ by $3.\dot{6}$

Here $4.72 = 4.7\frac{2}{9} = \frac{42.5}{9} = \frac{425}{90}$; and $3.\dot{6} = 3\frac{6}{9} = 3\frac{2}{3} = \frac{11}{3}$.

Then, $\frac{425}{90}\times\frac{11}{3} = \frac{425\times11}{90\times3} = \frac{185\times11}{18\times3} = \frac{935}{54} = 17.\frac{17}{54} = 17.3\dot{1}4\dot{8}$.

Example II. Divide $3.\dot{5}$ by $.\dot{2}\dot{4}$.

Here $3.\dot{5} = 3.\frac{5}{9} = \frac{32}{9}$; and $.\dot{2}\dot{4} = \frac{24}{99}$. And $\frac{32}{9} \div \frac{24}{99} = \frac{32}{9}\times\frac{99}{24} = \frac{32\times99}{9\times24} = \frac{4\times11}{3} = \frac{44}{3} = 14.666,\ \&c. = 14.\dot{6}$.

ART. XXVI. OF PERFECT NUMBERS.

Definition.

A perfect number is one that is equal to the ſum of all its aliquot parts.

Theorem. If any number of terms of the following geometric progreſſion, 1, 2, 4, 8, 16, &c. be taken, and if the ſum be a prime number, then ſuch ſum, multiplied by the laſt term, will give a perfect number.

Thus the ſum of the two firſt terms $1+2=3$, a prime, and $2\times3=6$, a perfect number; for its aliquot parts are 3, 2 and 1, which make 6; and therefore 6, is a perfect number.

If three terms of the ſeries are taken $1+2+4=7$, a prime; and $4\times7=28$, a perfect number.

Alſo $1+2+4+8+16=31$, a prime; and $31+16=496$, a perfect number.

Likewiſe $1+2+4+8+16+32+64=127$, a prime; and $127\times64=8128$, a perfect number.

Again, if 13 terms of the ſeries be taken, the ſum will be 8191, a prime; which multiplied by the laſt term, (4096) gives 33550336, a perfect number.

This method will always find a perfect number; and, I believe, every perfect number, though that has not yet been demonſtrated; nor has it been demonſtrated what number of terms of the given ſeries muſt be taken each time that the ſum may be a prime; ſo that the finding whether the ſum be a prime or not, in large numbers is exceeding tedious, and renders the proceſs very intricate.

There are but few perfect numbers yet diſcovered; and Dr. Harris, in his Lexicon Technicum, ſays, there are but 10 ſuch numbers between 1, and 1 million of millions.

A SUPPLEMENT TO ARTICLE XII.

The following Rule for extracting the Cube Root, is derived from the ſame principles as the laſt in Art. XII. but it will be ſtill more commodious for practice.

Rule. Take $\frac{1}{3}$ of the difference between the number to be extracted, and the neareſt Cube: alſo take the *ſum of*, or *difference between*, the number to be extracted, and the ſaid third part, according as ſuch Cube is *leſs*, or *greater*, than the given number, and divide the reſult by the aforeſaid Cube; then the ſquare Root of the quotient, added to the aſſumed Root, will be equal to twice the required Root, *nearly*.

If more accuracy is requiſite, the operation muſt be repeated.

Generally, If any number to be extracted be denoted by N, the index of the power by *n*, and an aſſumed Root, taken at pleaſure (but as near as may be to the true one) by *r*, then will

$$\frac{1}{n-1}\times\sqrt{\frac{N \overset{+}{\backsim} \frac{n-2}{n}\overline{N \backsim r^n}}{r^{n-2}}} + \overline{n-2}.r,$$

be equal to the required Root, *nearly*.

N. B. When the aſſumed Root (r) is too ſmall, then $\frac{n-2}{n}\overline{N \backsim r^n}$ muſt be *added*, to N; but when *r*, is too great, then the *difference* between this quantity and N muſt be taken. This approximation, commonly *trebles* the number of true figures in the Root at each operation.

The above *general method* I inveſtigated after the Copy of this Syſtem went to the preſs. It appears inferior to none for eaſe and expedition; and, I believe, I need not ſcruple to aſſert, that it is *intirely new*.

I have nothing more to add under this Syſtem. And indeed (excepting duodecimal arithmetic or croſs multiplication, which will be introduced when we come to Mensuration*) I have ſo exhauſted the ſubject, that there ſcarce remains any thing that I could have farther inſiſted on; the conſideration of which, together with that correctneſs, and mathematical order, which, I truſt, is conſpicuous through the whole, gives me the moſt ſanguine hopes that it will completely anſwer the deſire of every Subſcriber.*

EXCISE OFFICE, BROAD STREET. *ROBERT MOODY.*

ARITHMETICAL, in a general ſenſe, implies any thing partaking of the nature of Arithmetic, whether whole or broken numbers, or analogical calculation.

ARITHOMANCY, ſignifies a ſpecies divination performed by numbers, which were written down at random by ſeveral perſons on various ſlips of paper, or parchment, for the uſe of the conjuror to impoſe on the underſtandings of weak credulous people.

ARISTOXENIANS, in the peripatetic ſcience, ſignify the diſciples of Ariſtoxenes of Tarentum, a ſcholar of Ariſtotle, who were diametrically oppoſite in their principles to the Pythagoreans, with regard to the meaſure of ſounds in muſic, and its intervals; as the former had recourſe to the ear, whilſt the latter laid claim to mathematical calculations to aſcertain their doctrine.

ARK, or *Noah's* Ark, in holy writ, ſignifies a floating veſſel built by Noah for the preſervation of his family and the ſeveral ſpecies of animals during the deluge.

The ark has afforded ſeveral points of curious inquiry among critics and naturaliſts, relating to its form, capacity, materials, &c.

By the deſcription Moſes gives of the ark, it appears to have been divided into three ſtories, each ten cubits or 15 feet high; and it is agreed on, as moſt probable, that the loweſt ſtory was for the beaſts, the middle for the food, and the upper for the birds, with Noah and his family; each ſtory being ſubdivided into different apartments, ſtalls, &c. Though Joſephus, Philo, and other commentators, add a kind of fourth ſtory under all the reſt; being, as it were, the hold of the veſſel, to contain the ballaſt and receive the filth and feces of ſo many animals: but F. Calmet thinks, that what is here reckoned a ſtory, was no more than what is called the keel of ſhips, and ſerved only for a conſervatory of freſh water.

Ark *of the Covenant*, in Scripture, denotes a ſmall cheſt or coffer, three feet nine inches in length, two feet three inches in breadth, and two feet three inches in height, in which were contained the golden pot that had manna, and Aaron's rod, and the tables of the covenant.

This coffer was made of ſhittim-wood, and covered with a lid, which was made of ſolid gold. The ark was repoſited in the holieſt place of the tabernacle. It was taken by the Philiſtines, and detained 20, ſome ſay 40, years, at Kirjath-jearim; but the people being afflicted with emerods on account of it, returned it with divers preſents. It was afterwards placed in the temple.

The lid or covering of the ark was called the propitiatory or mercy-ſeat; over which were two figures placed, called cherubims, with expanded wings of a peculiar form. Here the Schechinah reſted both in the tabernacle and temple in a viſible cloud: hence were iſſued the divine oracles by an audible voice; and the high prieſt appeared before this mercy-ſeat once every year on the great day of expiation; and the Jews, wherever they worſhipped, turned their faces towards the place where the ark ſtood.

In the ſecond temple there was alſo an ark, made of the ſame ſhape and dimenſions with the firſt, and put in the ſame place, but without any of its contents and peculiar honours. It was uſed as a repreſentative of the former on the day of expiation, and a repoſitory of the original copy of the holy Scriptures, collected by Ezra, and the men of the great ſynagogue, after the captivity.

And in imitation of this, the Jews to this day have a kind of ark in their ſynagogues, wherein their ſacred books are repoſited. This they call aron. Leo of Modena gives a deſcription thereof in his account of the cuſtoms and ceremodies of thoſe of his nation. "The Jews (ſays he), in the eaſtern ſide of their ſyuagogues, have an ark, or armory, called aron, in memory of the ark of the covenant. In this are preſerved the five books of Moſes."

A cheſt or coffer, very nearly reſembling the Jewiſh ark, and called the houſe of the god, was found in Huaheine, one of the iſlands in the ſouthern ſea. Sir Joſeph Banks could obtain no other information concerning it than what the name imports. Hawkeſworth's Account, &c. Vol. ii. p. 252.

ARM, in anatomy, implies a part of the human body, terminating at one end in the ſhoulder, and at the other in the hand.

Arm, in geography, ſignifies a branch of a ſea or river. Italy and Sicily are only parted by an arm of the ſea. St. George's arm in the Mediterranean is the Thracian Boſphorus.

Arm is alſo uſed figuratively for power. The ſecular arm is the lay or temporal authority of a ſecular judge; to which recourſe is had for the execution of the ſentences paſſed by eccleſiaſtical judges.

The church ſheds no blood: even the judges of inquiſition, after they have found the perſon guilty, ſurrender him to the ſecular arm.

The council of Antioch, held in 341, decrees, that recourſe be had to the ſecular arm to repreſs thoſe who refuſe obedience to the church: for ſecular arm, they here uſe exterior power.

ARMADA, a Spaniſh term, ſignifying a fleet of men of war. The armada which attempted to invade England in the time of Queen Elizabeth, is famous in hiſtory. It was in part diſperſed by the winds, and the reſidue ſubdued by the Engliſh fleet.

This armada, to which the Spaniards, in confidence of ſucceſs, gave the name of Invincible, conſiſted of 150 ſhips, moſt of which were greatly ſuperior in ſtrength and ſize to any that had been ſeen before. It had on board near 20,000 ſoldiers and 8000 ſailors, beſides 2000 volunteers of the moſt diſtinguiſhed families in Spain. It carried 2650 great guns, was victualled for half a year, and contained ſnch a quantity of military ſtores, as only the Spaniſh monarch, enriched by the treaſures of the Indies and America, could ſupply. After this total defeat there was a medal ſtruck on the occaſion with this motto, "Afflavit Deus, et diſſipantur."

ARMADARE, to give arms, in an heraldic phraſe, implies the giving title to, or dubbing of a knight: hence the king is ſaid to arm his ſubjects with honours; i. e. beſtowing on them titles that require a regiſtry in the office of arms, as family achievements.

ARMADILLA, in Spaniſh America, denotes a ſquadron of men of war, to the number of ſix or eight, from twenty-four to fifty pieces of cannon, which the king maintains, to prevent foreigners from trading with the Spaniards and the Indians, both in time of peace, and war.

The veſſels of this armadilla are thoſe that have been ſo much talked of, under the name of guarda coſtas. They have even power to take all Spaniſh merchant-ſhips they meet with on the coaſts that have not licences from the king.

The South ſea has its armadilla as well as the North ſea. The ordinary abode of the former are at Calao, a port of Lima; that of the latter at Carthagena.

ARMADILLO, in zoology, is a ſynonyme of the daſypus.

ARMAMENT, in military or ſea language, implies a large body of forces, raiſed and provided with the furniture of war, either for land or ſea ſervice.

ARMAMOLUTA, in law, implies acts performed with ſharp or dangerous weapons: hence, the puniſhment of fine and impriſonment for carrying concealed armamoluta.

ARMAMUTARE, or exchange of arms, was anciently a ceremony uſed to confirm a league of friendſhip between European powers; which is ſtill retained by the Northern States, and is always practiſed with rigid ceremony by the grand ſeignor, and all potentates of the Mahometan perſuaſion.

ARMAREVERSATA, inverted arms, was a puniſhment enforced by law when a man was convicted of treaſon or felony.

ARMATURA, or Armature, in a general ſenſe, is the ſame with what we otherwiſe call armour.

Armatura is more particularly uſed in the ancient military art, for a kind of exerciſe, performed with miſſive weapons, ſuch as darts, ſpears, arrows, and the like. In this ſenſe, armatura ſtands contradiſtinguiſhed from palaria; the latter being the exerciſe of the heavy-armed, the former of the light-armed.

The armatura was practiſed with great diligence among the Romans: they had their campidoctores, on purpoſe to inſtruct the tyrones or young ſoldiers in it. Under it were included the throwing of the ſpear or javelin, ſhooting with bows and arrows, &c.

ARMED, in heraldry, is uſed when the horns, feet, beak, or talons, of any beaſt or bird of prey, are of a different colour from the reſt of the body.

Armed *Ship*, is a veſſel occaſionally taken into the ſervice of government in time of war, and employed to guard ſome particular coaſt, or attend on a fleet. It is armed and equipped in all reſpects like a ſhip of war, commanded by an officer of the navy, who has the rank of maſter and commander. All ſhips of this ſort are upon the eſtabliſhment of the king's ſloops, having a lieutenant, maſter, purſer, ſurgeon, &c.

ARMENA, in botany, a ſpecies of wild aſparagus; alſo a ſynonyme of many eſculent plants, particularly young cabbages or greens in the ſprout.

ARMENIACA, in botany, is a ſynonyme of the apricot or prunus.

ARMENIANS, in eccleſiaſtical hiſtory, denote the Chriſtians who reſide in the country of Armenia, who are partly of the Greek church, having no communion with the Romiſh religion; but are governed by patriarchs and epiſcopacy peculiar to themſelves.

The Armenians are an honeſt, civil, polite people, ſcarce troubling themſelves about any thing elſe but trade, which they carry on in moſt parts of the world, by which means they have ſpread themſelves over the eaſt, and alſo great part of Europe; and wherever they come, commerce is carried on with ſpirit and advantage.

The religion of the Armenians is the Chriſtian, of the Eutychian ſect: that is, they own but one nature in Jeſus Chriſt; and when they ſpeak of the hypoſtatical union, that he is perfect God and perfect man without mixture.

The Armenian clergy conſiſt of patriarchs, archbiſhops, doctors, ſeculiar prieſts, and monks. The ſeculiar prieſts are not allowed to marry a ſecond time; and therefore they take care to chooſe young healthy wives: they maintain themſelves and families by following ſome occupation, inſomuch that they have hardly time to perform their eccleſiaſtical functions: they lie in the churches on the vigils of thoſe days they are obliged to officiate.

The Armenian monks are of the order of St. Baſil; and every Wedneſday and Friday they eat neither fiſh, nor eggs, nor oil, nor any thing made of milk; and during Lent they live upon nothing but roots: they are allowed wine only on the Saturday in the Holy Week, and meat on the Eaſter Sunday. Beſides the great Lent, they have four others of eight days each, which are inſtituted to prepare for the four great feſtivals of the Nativity, the Aſcenſion, the Annunciation, and of St. George; in which times they muſt not ſo much as ſpeak of eggs, fiſh, oil, or butter.

The Armenians have ſeven ſacraments: baptiſm, confirmation, penance, the euchariſt, extreme unction, orders, and matrimony. In baptiſm, the child is plunged three times into the water, and the ſame form of words that is uſed with us is repeated every time; the prieſt then puts a ſmall cord made with ſilk and cotton on the neck of the infant, and anoints his forehead, chin, ſtomach, arm-pits, hands, and feet, making the ſign of the croſs on each part. When the child is baptized, he is carried home by the godfather with the ſound of drums and trumpets. The women do not go to church till forty days after their delivery; and they obſerve many Jewiſh cuſtoms.

At the communion, to which infants of two or three months old are admitted, the prieſts give a piece of the conſecrated hoſt ſoaked in the conſecrated wine. The elements are covered with a great veil, and placed in a cup-board near the altar, on the ſide of the goſpels. When the prieſt takes the chalice and pattin, he is followed by his deacons and ſubdeacons, with flambeaux and plates of copper furniſhed with bells: in this manner, with a cenſer before him, he goes in proceſſion round the ſanctuary: he then ſets them on the altar, pronounces the words of conſecration, and turns himſelf to the people, who fall down, kiſs the earth, and beat their breaſts: then, after taking it himſelf, he diſtributes the hoſt ſoaked in wine to the people.

The Armenians ſeem to place the chief part of their religion in faſtings and abſtinences: and among the clergy, the higher the degree the lower they muſt live; inſomuch that it is ſaid the archbiſhops live on nothing but pulſe. They conſecrate holy water but once a-year; at which time every one fills a pot and carries it home, which brings in a conſiderable revenue to the church.

ARMENUS Lapis, Armenian ſtone, in natural hiſtory, denotes a mineral ſubſtance, improperly called a ſtone; being only an ocherous earth, and properly called blue ochre.

It was in ſo high eſteem as a paint among the ancients, that counterfeits were continually attempted to ſerve in its place.

It is of an even regular texture; and of a fine blue, and frequently mixed with green. It is ſoft, tender, and light; of an even, but ſomewhat duſty, ſurface; it adheres firmly to the tongue, and is dry, but not harſh to the touch. It eaſily breaks between the figures, and does not ſtain the hands.

It is of a brackiſh taſte, dut does not ferment with acids. It is a ſcarce foſſil, found very pure, though in ſmall quantities, in the mines at Goſſelaer in Saxony.

It is frequently found ſpotted with green, and ſometimes with black; and very often is mixed among the green ochre, called berggruen by the Germans, which has thence been erroneouſly called by its name.

ARMIGER, ſignifies a title of dignity, belonging to ſuch gentlemen as bear arms: and theſe are either by curteſy, as ſons of noblemen, eldeſt ſons of knights, &c.; or by creation, ſuch as the king's ſervants, &c.

ARMILAUSA, implies a ſhort jacket, or coat worn anciently by the archers and others in a military department. Hence the Armilauſians or Archers.

ARMILLA Membranosa, or Membrosa, in anatomy, ſignifies the circular ligament which comprehends all the tendons belonging to the whole band within a circle, in the region of the carpus.

ARMILLARY, in a general ſenſe, ſomething conſiſting of rigns or circles.

Armillary *Sphere*, is an artificial ſphere compoſed of a number of circles of the mundane ſphere, put together in their natural order, to eaſe and aſſiſt the imagination in conceiving the conſtitution of the heavens, and the motions of the celeſtial bodies. The armillary ſphere revolves upon its axis within a ſilvered horizon, which is divided into degrees, and moveable every way upon a braſs ſupporter. The other parts are the equinoctial, zodiac, meridian, the two tropics and the two polar circles.

Armillary Trigonometer, in mechanics, implies an inſtrument ſo contrived as to facilitate operations in aſtronomy, dialling, and trigonometry.

ARMILLATI Milites, in hiſtory, ancient and modern, comprehend all thoſe who wear a badge in commemoration of ſome exploit performed for the good of their country, and in token of which, ſuch conſpicuous mark is given by the ſovereign, but if ſuch badges of honour was only to the reward of real merit, the noble and honourable orders in theſe realms would have but few knights companions to wear ſtars, garters, or collars.

ARMINIANS, in eccleſiaſtical hiſtory, imply a religious ſect, which aroſe in Holland, by a ſeparation from the Calvaniſts; their apoſtle Armenius began his ſchiſm in the Dutch eſtabliſhed church by thinking the doctrine of Calvin, with regard to free-will, predeſtination, and grace, too ſevere, expreſſed his doubts concerning them in the year 1591; and upon farther inquiry adopted ſentiments more nearly reſembling thoſe of the Lutherans than of the Calviniſts.

The diſtinguiſhing tenets of the Arminians may be compriſed in the following five articles; relating to predeſtination, univerſal redemption, the corruption of man, converſion and perſerverance.

1. Predeſtination they maintain, "That God, from all eternity, determined to beſtow ſalvation on thoſe whom he foreſaw would perſevere unto the end in their faith in Chriſt Jeſus; and to inflict everlaſting puniſhments on thoſe who ſhould continue in their unbelief, and reſiſt, unto the end, his divine ſuccours; ſo that election was conditional, and reprobation in like manner the reſult of foreſeen infidelity and continued wickedneſs."

2. Univerſal redemption they maintain, "That Jeſus Chriſt, by his ſufferings and death, made an atonement for the ſins of all mankind in general, and of every individual in particular; that, however, none but thoſe who believe in him can be partakers of their divine benefit."

3. On the third article, they held, "That true faith cannot proceed from the exerciſe of our natural faculties and powers, nor from the force and operation of free will; ſince man, in conſequence of his natural corruption, is incapable either of thinking or doing any good thing; and that therefere it is neceſſary, in order to his converſion and ſalvation, that he be regenerated and renewed by the operation of the Holy Ghoſt, which is the gift of God through Jeſus Chriſt."

4. Converſion they maintain, "That this divine grace, or energy of the Holy Ghoſt, begins and perfects every thing that can be called good in man, and conſequenty all good works are to be attributed to God alone; that, nevertheleſs, this grace is offered to all, and does not force men to act againſt their inclination, but may be reſiſted and rendered ineffectual by the perverſe will of the impenitent ſinner." Some modern Arminians interpret this and the laſt article with a greater latitude.

5. Perſeverance they maintain, "That God gives to the truly faithful, who are regenerated by his grace, the means of preſerving themſelves in this ſtate;" and though the firſt Arminians made ſome doubt with reſpect to the cloſing part of this article, their followers uniformly maintain, "that the regenerate may loſe true juſtifying faith, forfeit their ſtate of grace, and die in their ſins."

The modern ſyſtem of Arminianiſm likewiſe, founded on a comprehenſive plan projected by Arminius himſelf, as appears from a paſſage in his laſt will, extends the limits of the Chriſtian church, and relaxes the bonds of fraternal communion in ſuch a manner, that Chriſtians of all ſects and denominations, whatever their ſentiments and opinions may be, papiſts excepted, may be formed into one religious body, and live together in brotherly love and concord. But, in order to avoid the reproach of being altogether unconnected by any common principles, Epiſcopius drew up a confeſſion of faith, expreſſed for the moſt part in words and phraſes of Holy Scripture, which the Arminians have generally adopted, though not enjoined upon them by any authoritative obligation. The Arminians are alſo called Remonſtrants, from an humble petition intitled their Remonſtrance, which, in the year 1610, they addreſſed to the Sates of Holland. The principal writers are, Arminius, Epiſcopius, Vorſtius, Grotius, Curcellæus, Limborch, Le Clerc, and Wetſtein.

ARMISTICE, in military affairs, implies a temporary truce or ceſſation of arms for a ſhort time. The word is Latin, *armiſtitium*; and compounded of *arma*, "arms," and *ſto*, "to ſtand, or ſtop."

ARMOISIN, a ſilk ſtuff, or kind of taffety, manufactured in the Eaſt Indies, at Lyons in France, and at Lucca, in Italy. That of the Indies is ſlighter, than thoſe made in Europe.

ARMONIAC, the ſame as Ammoniac.

ARMONICA, the ſame as Harmonica.

ARMORIAL, in an heraldic phraſe, implies ſomething relating to coats of arms.

ARMORACIA, in botany, is a ſynonymous term for the eſculent plant, the ſimple rhadiſh, which was uſed as the table vegetables of the ancients, who uſe them as the moderns do that of cabbage.

ARMORIC, in Galic antiquities, implies thoſe remains of time which have been collected in Brittany. Hence, the language of the provincials, is called the Armoric or Bas-breton; which ſeems to partake of the Welch, Iriſh and Erſe.

ARMORIST, in heraldry, ſignifies a perſon ſkilled in the knowledge of armory.

ARMORUM Concussio, in ancient hiſtory, denotes the claſhing of armour, practiſed by the Roman armies previous to an engagement, and intended to ſtrike terror in their enemies: it always followed the Claſſicum and the Barritus.

ARMOUR, in war, implies a defenſive habit, to ſecure the body from the attacks of an enemy. In ancient ſtatues, it is frequently called *harneſs*. Parts of armour are, the buckler, curiaſs, helmet, coat of mail, gantlet, &c.

A complete coat of armour, anciently conſiſted of a caſque or helm, a gorget, cuiraſs, gantlets, taſſes, braſſets, cuiſhes and covers for the legs, to which the ſpurs were faſtened. This they called *armour cap-a-pie*; and was the wear of the cavaliers and men at arms. The infantry had only part of it; viz. a pot or head-piece, a cuiraſs, and taſſes; but very light.

The horſes had alſo their armour, to cover the head and neck. Of all this furniture of war, ſcarce any thing is now retained except the cuiraſs; the gorget or neck-piece, worn by officers, being at preſent only a badge of honour, and of no defence.

Armour *of Coat*, is the eſcutcheon of any perſon, or family, with its ſeveral charges, and other furniture; as mantling, creſt, ſupporters, mottos, &c.

ARMOURER, a maker of arms, or armour. The Roman armourers were diſpoſed in certain places in the empire, it being forbid either to ſell, or buy, or make arms elſewhere. They were exempt from all offices and taxes, and received a ſalary from the public.

When once they had taken the employment on themſelves, neither they, nor their children, were allowed to quit it.

Armourer *of a Ship*, ſignifies a perſon whoſe office is to take care that the arms be in a condition fit for ſervice.

ARMOURY, is a ſtore-houſe of arms, or military habiliments, ſo as to be ready for uſe. There are armouries in the tower, and alſo in all arſenals, citadels, caſtles, &c.

Armoury is likewiſe uſed as a branch of heraldry; being the knowledge of coat-armours, as to their blazonry, and various intendments.

ARMS, *Arma*, in a general ſenſe, includes all kinds of weapons, whether for defence or offence.

It is ſuppoſed that the firſt artificial arms were of wood, and were only employed againſt beaſts; and that Belus, the ſon of Nimrod, was the firſt that waged war: whence, according to ſome, came the appellation bellum. Diodorus Siculus takes Belus to be the ſame with Mars, who firſt trained ſoldiers up to battle. Arms of ſtone, and even of braſs, appear to have been uſed before they came to iron and ſteel.

Joſephus aſſures us, that the patriarch Joſeph firſt taught the uſe of iron arms in Egypt, arming the troops of Pharoah with a caſque and buckler.

What contributed moſt to render the Romans, maſters of the world, was, that having ſucceſſively warred againſt all nations, they conſtantly renounced their own methods, arms, &c. whenever they met with better. Thus Romulus, during his war with the Sabins, a bold and warlike nation, adopted their broad buckler in lieu of the ſmall Argian buckler, which he had uſed till that time.

The principal arms of the ancient Britons were hatchets, ſcythes, lances, ſwords, and bucklers: the Saxons, &c. brought in the halbard, bow, arrows, arbalets, &c. It was enacted by the ancient laws of England, that every man was obliged to bear arms, except the judges and clergy.

Under Henry VIII. it was expreſsly enjoined on all perſons to be regularly inſtructed, in the exerciſe of the arms then in uſe; viz. the long bow and arrows; and to be provided with a certain number of them. Vide 33 H. VIII.

Arms, *Arma*, in law, are extended to any thing which a man takes in his hand in his wrath, to caſt at, or ſtrike another.

Arms of offence in uſe among us at preſent are, the ſword, piſtol, muſket, bayonet, pike, &c.

The arms of the Highlanders are, the broad ſword, target, poinard, and whinyar or durk, &c. There are ſeveral acts of parliament for diſarming the Highlanders; ſee 1 Geo. I. c. 54; 11 Geo. I. c. 26; 19 Geo. II. c. 39; 21 Geo. II. c. 34; 26 Geo. II. c. 22. and 29.

Fire **Arms** are thoſe charged with powder and ball: ſuch are cannon, mortars, and other ordinance; muſkets, carabines, piſtols, and even bombs, granadoes, carcaſſes, &c. In the Hiſtory of the Royal Academy for the year 1707, there is an account of ſome experiments made with fire-arms differently loaded, by M. Caſſini. And among other things he obſerves, that by loading the piece with a ball which is ſomewhat leſs than the caliber, and only laying a little gunpower below the ball and a good deal above it, it will yield a vehement noiſe, but have no ſenſible effect or impulſe on the ball.

Arms, *paſs of*, was a kind of combat in uſe among the ancient cavaliers.

Arms, *ſtand of*, ſignifies a muſket, a bayonet, a ſword, belt, and cartridge box.

Arms denote the natural weapons, or parts of defence, of beaſts: as claws, teeth, tuſks of elephants, beaks of birds, &c.

Arms are alſo uſed figuratively for the profeſſion of a ſoldier. Thus we ſay, he was bred to arms.

Arms, or *Armories*, are alſo uſed in heraldry for marks of dignity and honour, regularly compoſed of certain figures and colours, given or authoriſed by ſovereigns, and borne in banners, ſhields, coats, &c. for the diſtinction of perſons, families, and ſtates; and paſſing by deſcent to poſterity.

They are called arms, in regard they are borne principally on the buckler, cuiraſs, banners, and other aparatus of war.

They are alſo called *coats of arms*, *coat armour*, &c. becauſe anciently embroidered on fur-coats, &c.

Arms, at preſent, follow the nature of titles, which being made hereditary, theſe are alſo become ſo, being the ſeveral marks for diſtinguiſhing of families and kindreds, as names are of perſons and individuals.

Arms are variouſly diſtinguiſhed by the heralds.

Arms *of Alliance*, are thoſe which families or private perſons join to their own, to denote the alliances which they have contracted by marriage.

Arms, *Aſſumptive*, are ſuch as have a right to aſſume of themſelves, arms in virtue of ſome gallant action.

As, if a man who is no gentleman of blood, nor has coat armour, takes a gentleman, lord, or prince, priſoner, in any lawful war, he becomes intitled to bear the ſhield of ſuch priſoner, and enjoy it to him and his heirs. The foundation of which is that principle in military law, that the dominion of things taken in lawful war paſſes to the conqueror.

Arms, *charged*, are ſuch as retain their ancient integrity and value, with the addition of ſome new honourable charge or bearing, in conſideration of ſome noble action.

Arms *of Community*, are thoſe of biſhoprics, cities, univerſities, and other bodies corporate.

Arms *of Conceſſion*, or augmentation of honour, are either entire arms, or elſe one or more figures given by princes, as a reward for ſome extraordinary ſervice.

Arms *of Dominion*, are thoſe which emperors, kings, and ſovereign ſtates bear; being annexed to the territories which they poſſeſs. Thus the three lions, are the arms of England; the fleurs de lys, thoſe of France; the harp, Ireland, &c.

Arms *of Family*, or *Paternal Arms*, are ſuch as belong to a particular family, and which no other perſon has a right to aſſume.

Arms, *full*, or *entire*, are ſuch as retain their primitive purity, integrity, or value; without any alterations, diminutions, or abatements.

It a rule, that the ſimpler and leſs diverſified the arms, the more noble and ancient they are. For this reaſon Garcias Ximenes, firſt king of Navarre, and his ſucceſſors for ſeveral ages, bore only gules, without any figure at all.

The arms of princes of the blood, of all younger ſons, and junior families, are not pure and full; but diſtinguiſhed and diminiſhed by proper differences.

Arms *of Patronage*, are thoſe which governors of provinces, lords of manors, &c. add to their family arms, in token of their peculiar ſuperiority and juriſdiction.

Arms *of Pretenſion*, are thoſe of ſuch kingdoms or territories to which a prince or lord has ſome claim, and which he adds to his own, though the kingdoms or territories are poſſeſſed by a foreign prince or other lord.

Thus the kings of England have quartered the arms of France with their own, ever ſince the claim of Edward III. to that kingdom, in 1330.

Arms *of Succeſſion*, are aſſumed by thoſe who inherit eſtates, manors, &c. by will, entail, or donation, and which they either impale or quarter with their own arms.

Arms are alſo ſaid to be *parted*, *couped*, *quartered*, &c.

Arms are ſaid to be falſe and irregular, when there is ſomething in them contrary to the eſtabliſhed rules of heraldry. As, when metal is put on metal, or colour on colour, &c.

The laws, and other affairs of arms, with the cognizance of offences committed therein, belong to the earl-marſhal and college of arms of theſe realms.

ARMY, ſignifies a great number of ſoldiers, conſiſting of horſe and foot, completely armed, and provided with artillary, ammunition, proviſions, &c. under the command of one general, having lieutenant-generals, major-generals, brigadiers, and other officers, under him.

An army is compoſed of ſquadrons and battalions; and is uſually divided into three corps, and formed into three lines: the firſt line is called the *van-guard*, the ſecond the *main-body*, and the third the *rear-guard* or *body of reſerve*.

The middle of each line is poſſeſſed by the foot; the cavalry form the right and left wing of each line; but ſometimes there are placed ſquadrons of horſe in the intervals between the battalions.

When the army is drawn up in order of battle array, the horſe are placed at five feet diſtance from each other, and the foot at three. In each line the battalions are diſtant from each other 180 feet, which is nearly equal to the extent of their front; and the ſame holds of the ſquadrons, which are about 300 feet diſtant, the extent of their own front. Theſe intervals are left for the ſquadrons and battalions of the ſecond line to range themſelves againſt the intervals of the firſt, that both may more readily march through theſe ſpaces to the enemy: the firſt line is uſually 300 feet diſtant from the ſecond, and the ſecond from the third, that there may be ſufficient room to rally when the ſquadrons and battalions are broken.

This is to be underſtood of a land-army, only. A naval or ſea-army implies a number of ſhips of war, equipped and manned with ſailors, mariners, and marines, under the command of an admiral, with other inferior officers under him.

It has been obſerved, that in Europe a prince with a million of ſubjects cannot keep an army of above 10,000 men, without ruining himſelf. It was otherwiſe in the ancient republics: the proportion of ſoldiers to the reſt of the people, which is now as about 1 to 1000, might then be as about 1 to 8. The reaſon ſeems owing to that equal partition of lands which the ancient founders of commonwealths made among their ſubjects; ſo that every man had a conſiderable property to defend, and means to defend it with: whereas, among us, the lands and riches of a nation being ſhared among a few, the reſt have no way of ſubſiſting but by trades, arts, and the like; and have neither any free property to defend, nor means to enable them to go to war in defence of it, without ſtarving their families. A large part of our people are either artiſans or ſervants, and ſo only miniſter to the luxury and effeminacy of the great. While the equality of land ſubſiſted, Rome, though only a little ſtate, being refuſed the ſuccours which the Latins were obliged to furniſh after the taking of the city in the conſolate of Camillus, preſently raiſed ten legions within its own walls; which was more, Livy aſſures us, than they were able to do in his time, though maſters of the greateſt part of the world. A full proof, adds the hiſtorian, that we are not grown ſtronger; and that what ſwells our city is only luxury, and the means and effects of it.

Our armies anciently were a ſort of militia, compoſed chiefly of the vaſſals and tenants of the lords. When each company had ſerved the number of days or months enjoined by their tenure, they returned home.

The armies of the German empire, conſiſt of divers bodies of troops furniſhed by the ſeveral circles.

The groſs of the French armies, under the Merovingian race, conſiſted of infantry. Under Pepin and Charlemagne, the armies conſiſted almoſt equally of cavalry and foot: but ſince the declenſion of the Carlovingian line, the fees being become hereditary, the national armies, ſays Le Gendre, are chiefly cavalry.

" As it is only by means of a well-regulated ſtanding army that a civilized country can be defended, ſo it is only by means of it that a barbarous country can be ſuddenly and tolerably civilized. A ſtanding army eſtabliſhes, with an irreſiſtible force, the law of the ſovereign through the remoteſt provinces of the empire, and maintains ſome degree of regular government in countries which could not otherwiſe admit of any. Whoever examines with attention the improvements which Peter the Great introduced into the Ruſſian empire, will find that they almoſt all reſolve themſelves into the eſtabliſhment of a well regulated ſtanding army. It is the inſtrument which executes and maintains all his other regulations. That degree of order and internal peace which that empire has ever ſince enjoyed, is altogether owing to the influence of that army.

" Men of republican principles have been jealous of a ſtanding army as dangerous to liberty. It certainly is ſo, wherever the intereſt of the general and that of the principal officers are not neceſſarily connected with the ſupport of the conſtitution of the ſtate. The ſtanding army of Cæſar, deſtroyed the Roman republic; the ſtanding army of Cromwell turned the long parliament out of doors. But where the ſovereign is himſelf the general, and the principal nobility and gentry of the country the chief officers of the army; where the military force is placed under the command of thoſe who have the greateſt intereſt in the ſupport of the civil authority, becauſe they have themſelves the greateſt ſhare of that authority: a ſtanding army can never be dangerous to liberty; on the contrary, it may in ſome caſes be favourable to liberty. The ſecurity which it gives to the ſovereign renders unneceſſary that troubleſome jealouſy which in ſome modern republics ſeems to watch over the minuteſt actions, and to be at all times ready to diſturb the peace of every citizen. Where the ſecurity of the magiſtrate, though ſuppotred by the principal people of the country, is endangered by every popular diſcontent where a ſmall tumult is capable of bringing about in a few hoursa great revolution; the whole authority of government muſt be employed to ſuppreſs and puniſh every murmur and complaint againſt it. To a ſovereign, on the contrary, who feels himſelf ſupported not only by the natural ariſtocracy of the country, but by a well regulated ſtanding army, the rudeſt, the moſt groundleſs, and the moſt licentious remonſtrances, can give little diſturbance. He can ſafely pardon or neglect them, and his conſciouſneſs of his own ſuperiority naturally diſpoſes him to do ſo. That degree of liberty which approaches to licentiouſneſs can be tolerated only in countries where the ſovereign is ſecured by a well regulated ſtanding army. It is in ſuch countries only that the public ſafety does not require that the ſovereign ſhould be truſted with any diſcretionary power for ſuppreſſing even the impertinent wantonneſs of this licentious liberty."

ARNABOS, in the language of medical writers, implies the ſame as cinnamon, which was anciently ſo called in the Greek pharmacopiæs.

ARNALDIA, in medicine, ſignifies a low fever, which occaſioned a dropping off of the hair of the head, attending by pains in the joints, which fully anſwers to the Kentiſh and Cambridgeſhire agues, ſo fatal to ſtrangers who hire themſelves to gather in the harveſt of thoſe countries.

ARNICA, LEOPARDS BANE, in botany, is a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The receptacle is naked; the pappus is ſimple; and the filaments are five, without antheræ.

There are ſeven ſpecies all natives of Ethiopia, except the two following, viz.

1. The montana, with oval leaves, which grows naturally on the Alps, and alſo upon many of the high mountains in Germany, and other cold parts of Europe.

2. The ſcorpioides, with ſawed leaves growing alternately, is a native of Bohemia and Siberia.

The firſt ſpecies delights in a moiſt ſhady ſituation, and may be propagated by roots or ſeeds ſown in autumn.

The ſecond ſort is to be propagated in the ſame manner. Both are very hardy, and require no other care than to be kept free from weeds.

The montana has an acrid bitter taſte, and when bruiſed, emits a pungent odour, which excites ſneezing.

It is recommended in paralytic affections, and in caſes where a loſs or diminution of ſenſe ariſes from an affection of the nerves, as in inſtances of amauroſis, under which circumſtances it ſhould be employed by infuſion.

℞. From a dram to half an ounce of the flowers, may be infuſed in a pint of boiling water, and taken in different doſes in the courſe of the day; ſometimes it produces vomiting, ſweating, or diureſis; but frequently its uſe is attended with no ſenſible operation, unleſs it can be conſidered as ſuch, that in ſome caſes of paralyſis, the cure is ſaid to be preceded by a peculiar prickling, and by ſhooting pains in the affected parts.

Beſides being thus employed, it is repreſented as a powerful antiſpaſmodic; and to have been ſucceſsfully employed in fevers, particularly thoſe of the intermittent kind, and alſo in caſes of gangrene.

In thoſe diſeaſes it is as efficacious as the Peruvian bark, when employed under the form of a ſtrong decoction taken in ſmall doſes frequently repeated, or under the form of an electuary with honey.

ARNOT, in botany, the Engliſh name of the bunium.

ARNULPHIN, in commerce, was a French coin current in the 15th century, and which bore the ſame value as a modern ducat now does in that country, i. e. 4^{s}. 9d. ſterling.

AROLE, ſignifies an American weight, equal to 25 pounds, avoirdupoiſe weight.

AROMA PHILOSOPHORUM, denotes either ſaffron, or the aroph of Paracelſus; as *aroma germanicum* denotes elecampane.

AROMATIC, in medicine and perfumery, is an appellation given to ſuch plants as yield a briſk fragrant ſcent and a warm taſte; as all kinds of ſpices, &c.

AROMATITIS, in ancient phiſiology, indicated a bituminous foſſil, which had much the appearance and effluvia of myrrh. It was common to the countries of Arabia and Egypt, where it was uſed as a faſhionable perfume by the higher orders of people.

AROPH, implies a contraction of *aroma philoſophorum*; a name given to ſaffron.

AROPH, *Paracelſi*, a name given to a kind of chemical flowers, probably of the ſame nature with the Ens Veneris, elegantly prepared by ſublimation from equal quantities of lapis hæmatitis and ſal ammoniac.

AROURA, was an ancient Grecian meaſure of 50 feet. It was more frequently uſed for a ſquare meaſure of half the plethron. The Egyptian aroura was the ſquare of 100 feet.

ARPEGGIO, in muſic, ſignifies the method of cauſing the different ſounds of an accord to be heard ſucceſſively and rapidly, inſtead of ſtriking them all at one time.

ARPENT, ſignifies an acre or furlong of ground; and, according to the old French account in domeſday-book, 100 perches make an arpent. The moſt ordinary acre, called *l' arpent de France*, is 100 perches ſquare: but ſome account it but half an acre.

ARRAIGNMENT, in law, implies the arraigning a perſon to anſwer in form of law upon an indictment preferred before and admitted by the grand inqueſt or jury of a ſhire or corporation. town or city.

When brought to the bar, the criminal is called upon by name to hold up his hand; which, though it may ſeem a trifling circumſtance, yet is of this importance, that by the holding up of his hand he owns himſelf to be of that name by which he is called. However it is not an indiſpenſable ceremony; it being calculated merely for the purpoſe of identifying the perſon, for any other acknowledgement will anſwer the purpoſe as well: therefore, if the priſoner obſtinately and contemptuouſly refuſes to hold up his hand, but confeſſes he is the perſon named, it is fully ſufficient.

Then the indictment is to be read to him diſtinctly in the Engliſh tongue, that he may fully underſtand his charge. After which it is to be demanded of him, whether he be guilty of the crime of which he ſtands indicted, or not?

When a criminal is arraigned, he ſtands mute, confeſſes or pleads to the indictment.

If he will not ſpeak, the court are *ex officio* to impannel a jury to inquire whether he ſtands obſtinately mute, or whether he be dumb, *ex viſitatione Dei*. If the latter appears to be the caſe, the judges of the court are to proceed to the trial, and examine all points as if he had pleaded not guilty.

If he be found to be obſtinately mute, then it is equivalent to a conviction, and, if his crime deſerves it, he ſhall receive judgment and execution.

The Engliſh judgment for ſtanding mute was anciently as follows: " That the priſoner be remanded to the priſon from whence he came, and put into a low, and dark chamber; and there be laid on his back on the bare floor, naked, unleſs where decency forbade; and then there ſhould be placed upon his body as great a weight of iron as he could bear, and more; that he had no ſuſtenance, ſave only, on the firſt day, three morſels of the worſt bread; and, on the ſecond day, three draughts of ſtanding water that ſhould be neareſt to the priſon-door; and in this ſituation this ſhould be alternately his daily diet, *till he died*, or, as anciently the judgment ran, *till he anſwered*."

If the priſoner makes a ſimple and plain confeſſion, the court hath nothing to do but to award judgment: but it is uſually very backward in receiving and recording ſuch confeſſion, out of tenderneſs to the life of the ſubject; and will generally adviſe the priſoner to retract it, and plead to the indictment—Not Guilty.

ARRANGEMENT, or RANGEMENT, in rationals, implies the diſpoſition of the parts of a whole, in certain order.

Modern philoſophy ſhows, that the diverſity of the colours of bodies depends entirely on the ſituation and arrangement of the parts, which reflect the light differently; the diverſity of taſtes and ſmells on the different arrangements of the pores, which render them differently ſenſible; and the general diverſity of bodies on the different arrangements of their parts. Hence, the arrangement of words makes the beauty of diſcourſe.

ARRAS *Hangings*, in commerce and mercantile tranſactions, denote an article imported from the city of Arras, the capital of the county of Artois, in French Flanders. It is properly ſpeaking, a ſuperfine tapeſtry; but of late years, it is become of little uſe in this country, as the ſtaple commodities give ſeveral ſorts of uſeful and ornamental fabrics, which can no where be excelled for beauty of colour, texture, and durability.

ARRAY, in law, implies the ranking or ſetting forth of a jury, or inqueſt of men impanelled on a cauſe.

Battle ARRAY, in military matters, indicates the order or diſpoſition of an army, drawn up with a view to engage the enemy.

ARRAYERS, or ARRAGERS, ARRAITORES, in law, was uſed to imply in ancient ſtatutes, ſuch officers as had the care of the ſoldiers armour, and ſaw them duly accoutred.

In ſome reigns, commiſſioners have been appointed for this purpoſe. Such were the commiſſioners of array appointed by king Charles I. in the year 1642.

ARREARS, in law, ſignifies the remainder of a ſum due, or money remaining in the hands of an accountant. It likewiſe ſignifies the money due for rent, wages, &c. or what remains unpaid of penſions, taxes, &c.

ARRENTATION, in the foreſt law, implies the licenſing the owner of lands in a foreſt to incloſe them with a low hedge and a ſmall ditch, in conſideration of a yearly rent.

ARREST, in Engliſh law, from the French *arreſter*, to *ſtop* or *ſtay*, is the reſtraint of a man's perſon, obliging him to be obedient to the law; and is defined to be the execution of the command of ſome court of record.

An arreſt is the beginning of impriſonment; where a man is firſt taken, and reſtrained of his liberty, under colour of a lawful warrant.

Arreſts are either in *civil* or *criminal* caſes, viz.

1. An arreſt in a *civil cauſe* is reſtraining one's perſon by proceſs in execution of the command of ſome court of record.

An arreſt muſt be by corporal ſeiſing or touching the defendant's body; after which the bailiff may juſtify breaking open the houſe in which he is, to take him: otherwiſe he has no power to raiſe a latch, much leſs to unlock or break a door; but muſt watch his opportunity to arreſt him. For every man's houſe is in law his caſtle of defence and aſylum, wherein he ſhall ſuffer no violence. Which principle is carried ſo far in the civil law, that, for the moſt part, not ſo much as a common citation or ſummons, much leſs an arreſt, can be executed upon a man within his own walls.

Peers of the realm, members of parliament, and corporations, are privileged from arreſts; and of courſe from outlawries. And againſt them the proceſs to inforce an appearance muſt be by ſummons and diſtreſs *infinite*, inſtead of a *capias*.

Likewiſe attornies, and all other perſons attending the courts of juſtice, are not liable to be arreſted by the ordinary proceſs of the court, but muſt be ſued by bill, as being perſonally preſent in court.

Clergymen performing divine ſervice, and not merely ſtaying in the church with a fraudulent deſign, are for the time privileged from arreſts, by ſtatute 50 Edw. III. c. 5. and 1 Rich. II. c. 16.; as are likewiſe members of convocation actually attending thereon, by ſtatute 8 Hen. VI. c. 1.

Suitors, witneſſes, and other perſons, neceſſarily attending any courts of record upon buſineſs, are not to be arreſted during their actual attendance, which includes the neceſſary coming and returning.

Seamen in the king's ſervice are privileged from arreſts for debts under 20l. 1 Geo. II. c. 14. and 14 Geo. II. c. 38.; and ſoldiers or marines are not liable to arreſts for a debt of leſs than 10l. 30 Geo. II. c. 6, 11. Nor can any arreſt be made in the king's preſence, or within the verge of his palace or court, nor in any place where the king's juſtices are actually ſitting.

The king hath a ſpecial prerogative, that he may by his writ of protection privilege a defendant from all perſonal ſuits, for one year at a time, and no longer; in reſpect of his being engaged in his ſervice out of the realm.

The king may alſo by the common law take his creditor into his protection, ſo that no one may ſue or arreſt him till the king's debt is paid: but by the ſtatute 25 Edw. III. c. 19. notwithſtanding ſuch protection, another creditor may proceed to judgment againſt him, with a ſtay of execution, till the king's debt be paid; unleſs ſuch creditor will undertake for the king's debt, and then he ſhall have execution for both.

By 29 Car. II. c. 7. no arreſt can be made, nor proceſs ſerved, upon a Sunday, except for treaſon, felony, or breach of the peace.

2. An arreſt in a *criminal cauſe* is the apprehending or reſtraining one's perſon, in order to be forthcoming to anſwer an alledged crime. To this arreſt all perſons whatſoever are, without diſtinction, equally liable; and doors may be broke open to arreſt the offender: but no man is to be arreſted, unleſs charged with ſuch a crime as will at leaſt juſtify holding him to bail when taken.

There is this difference between arreſts in civil and criminal caſes; that none can be arreſted for debt, treſpaſs, or other cauſe of action, but by virtue of a precept or commandment out of ſome court of record; but for treaſon, felony, or breach of the peace, any man may arreſt with or without warrant or precept; however, in the laſt caſe, it will be hazardous to arreſt, unleſs a warrant is firſt given to a perſon duly authorized to ſerve it on the defendant; for otherwiſe the perſon ſo arreſted, upon proving his innocence may ſue the arreſtor for falſe impriſonment, and of courſe get ample damages.

But the king cannot command any one by word of mouth to be arreſted; for he muſt do it by writ, or order of his courts, according to law: nor can the king arreſt any man on ſuſpicion of treaſon, or felony, as his ſubjects may; becauſe, if he doth wrong, the party cannot have an action againſt him.

Arreſts by private perſons are in ſome caſes commanded. Perſons preſent at the committing of a felony muſt uſe their endeavours to apprehend the offender, under penalty of fine and impriſonment; and they are alſo, with the utmoſt diligence, to purſue and endeavour to take all thoſe who ſhall be guilty thereof out of their view, upon a hue and cry levied againſt them. By the vagrant act 17 Geo. II. c. 5. every perſon may apprehend beggars and vagrants; and every private perſon is bound to aſſiſt an officer requiring him to apprehend a felon.

In ſome caſes arreſts are rewarded by law. For by the 4 and 5 William and Mary, c. 8. perſons apprehending highwaymen, and proſecuting them to a conviction, are intitled to a reward of 40l. and if they are killed in the attempt, their executors, &c. are intitled to the like reward.

By the 6 and 7 William III. c. 17. perſons apprehending counterfeiters and clippers of the coin or coiners, and proſecuting them to conviction, are intitled to 40l.

By 5 Ann. c. 31. perſons who ſhall take any one guilty of burglary, or feloniouſly breaking and entering any houſe in the day-time, and proſecute them to conviction, ſhall receive the ſum of 40l. within one month after ſuch conviction.

With regard to arreſts by public officers, as watchmen, conſtables, &c. they are either made by their own authority, which differs but very little from the power of a private perſon; or by a warrant from a juſtice of peace.

ARREST *of Judgment*, in law, ſignifies the aſſigning juſt reaſon why judgment ſhould not paſs: as, want of notice of the trial; a material defect in the pleading; when the record differs from the deed impleaded; when perſons are miſnamed; where more is given by the verdict than is laid in the declaration, &c. This may be done either in criminal or civil caſes.

ARRESTANDIS *Bonis de diſſipentur*, is a writ which lies for a defendant againſt a plaintiff, in a cauſe at iſſue, by which the former releaſes his cattle or other property ſeized by the latter, who might otherwiſe be at liberty to make ſale of them; but is by this mode prevented from ſo doing, as not being reſponſible for their value, if required by law to give ſatisfaction, from the narrowneſs of his circumſtances.

ARRESTANDO *Ipſum*, ſignifies the bounty paid to a ſeaman on entering on board a ſhip, which holds him covenanted to the king as his ſervant during his wars, ſo that he can be ſecured under this writ if he deſerts from his employment.

ARRESTMENT, in the general acceptation of the word, denotes that diligence by which a creditor detains the goods or effects of his debtor in the hands of third parties, till the debt due to him be either paid or ſecured.

ARRESTO *Facto ſuper bonis*, &c. in law, is a writ brought by a denizen againſt the goods of aliens found within this kingdom, as a recompence for goods taken from him in a foreign country.

ARRESTS, in farriery, are mangy tumors upon a horſe's hinder-legs, between the ham and the paſtern.

ARRIERE BAN, in the French cuſtoms, ſignifies a general proclamation, by which the king may ſummons to the war all that holds of him, as vaſſals, i. e. the nobleſſe, as his vaſſals, and the vaſſals of his vaſſals, or their dependants or tenants.

ARRIERE *Fee*, or *Fief*, in law, is a fee dependent on a ſuperior one. Theſe fees commenced, when the dukes and counts, rendering their governments hereditary in their families, diſtributed to their officers parts of the royal domains which they found in their reſpective provinces, and even permitted thoſe officers to gratify the ſoldiers under them in the ſame manner.

ARROBAS, or Arobas, in commerce, is a weight uſed in Spain, Portugal, and the foreign dominions of both. The Arrobas of Portugal is alſo called Arata, and contains thirty-two Liſbon pounds; that of Spain contains twenty-five Spaniſh pounds. In Peru it is called arroue.

ARRONDEE, in heraldry, is a croſs, the arms of which are compoſed of ſections of a circle, not oppoſite to each other, ſo as to make the arms bulge out thicker in one part than another; but the ſections of each arm lying the ſame way, ſo that the arm is every where of an equal thickneſs, and all of them terminating at the edge of the eſcutcheon like the plain croſs.

ARROW, in war, is a miſſive weapon of offence, ſlender, pointed, and barbed, to be caſt or ſhot with a bow.

Arrow *Makers*, or *Fletchers*, were formerly called bowyers, and were perſons of great conſequence in the commonwealth.

Arrow *Heads and Quarrels* were to be well boched or braſed, and hardened at the points with ſteel; the doing of which ſeems to have been the buſineſs of the arrow ſmith.

Arrow *Head*, in botany, is the ſame as Sagittaria.

Arrow *Root*, in botany, is the ſame with Maranta.

ARSCHIN, in commerce, ſignifies a long meaſure uſed in China to meaſure ſtuffs. Four arſchins make three yards, Engliſh meaſure.

ARSENAL, ſignifies a royal or public magazine, appointed for the making and keeping of arms, neceſſary either for defence or aſſault.

ARSENIC, in mineralogy and chemiſtry, is an heavy opake ſubſtance, uſually ſold in white maſſes, which, when broken, diſcover a ſemi-tranſparency ſomewhat reſembling that of ſal ammoniac, but by expoſure to the air become white and opake like the outſide of the original maſs.

By various chemical proceſſes it may be made to aſſume the appearance either of an acid ſalt or metal, at the pleaſure of the operator; and therefore has been conſidered both as a ſaline ſubſtance and as a ſemi-metal It is not known by whom arſenic was firſt reduced to a metallic form. Paracelſus aſſerts that arſenic, ſublimed with egg-ſhell lime becomes like ſilver; and, in 1675, M. Lemeri makes mention of a method of ſubliming arſenic with fixed alkali and ſoap.

The true nature of arſnic being thus ſo little known, it is no wonder to find chemiſts differing very much as to the claſs of natural bodies in which it ought to be placed. Avicenna and a great number of others claſs it with the ſulphurs; Albertus Magnus and his followers, among the ſalts. Becher conſiders it as a kind of ſoap, or ſaline ſulphureous body. Later experiments, however, have made it evident, that white arſenic conſiſts of an acid united to phlogiſton; and that by diminiſhing the latter, the acid becomes more and more apparent; while, on the contrary, by augmenting the quantity of phlogiſtic matter, the arſenic aſſumes the metallic form.

With reſpect to the ſulphurous nature of arſenic, it appears that the regulus itſelf, as well as orpiment and realgar, are inflammable ſubſtances; but it is not ſo with white arſenic. This inflammability, therefore, which arſenic in a certain ſtate has in common with zinc and ſeveral other ſubſtances, will not denominate it ſulphurous, any more than thoſe of other bodies which poſſeſs the common property of inflammability can be denominated ſulphurs.

This mineral, ſo troubleſome to the mineralogiſt, occaſioned the alchemiſts to ſuſpect the exiſtence of a certain arſenical principle indiſpenſably neceſſary to the perfection of every metal. And even ſo late as 1773 a queſtion to this purpoſe was propoſed by the Royal Academy of Sciences at Berlin: the prize was adjudged to M. Monnet, who in his anſwer conſidered arſenic as a ſemi-metal of a peculiar kind, which is ſo far from conſtituting any aſſential part of metals, that its preſence is always attended with inconveniences, either by carrying off the metal as it flies away, or ſpoiling the maſs in which it remains.

Theſe conſiderations, however, do not hinder us from aſſerting that the acid of arſenic, like others, is a mineralizing ſubſtance, if at any time it happens to meet with metals in the bowels of the earth, and to unite with it in that form.

Arſenic in its pure ſtate is well known to be a moſt deſtructive and deadly poiſon, for which the art of medicine has ſcarcely as yet afforded a cure. Mr. Bergman is of opinion that it acts as an highly corroſive acid, even when applied externally. He alſo tells us, that the dry acid is more deſtructive than white arſenic; the regulus and realgar leſs ſo.

From an experiment of Mr. Scheele, in which eight grains of arſenical acid were given to a cat, it does not appear that it acts more violently than white arſenic. The extreme danger attending this ſubſtance when taken into the human body, ariſes from its inſolubility, and the difficulty of decompounding it; for there can but little danger ariſe from a liquid, unleſs, like corroſive acids, it ſhould at once burn the ſubſtance of the ſtomach like fire; or, like laurel-water ſuſpend the action of the nervous ſyſtem.

Corroſive ſublimate, ſolutions of mercury in aquafortis, &c. will as certainly poiſon as arſenic; but they are much leſs difficult to cure, becauſe any alkaline ſubſtance will certainly decompound them and deſtroy their deleterious efficacy.

Arſenic, on the contrary, cannot be decompounded, nor united with any known ſubſtance, at leaſt in ſuch a ſhort time as the exigence of the caſe we ſpeak of would require, without a conſiderable degree of heat. It will of courſe remain in the ſtomach, continually exerting its miſchievous qualities, unleſs it can be diſcharged by vomiting.

The ſymptoms attending arſenic when ſwallowed are, nauſea, ſickneſs, and retching to vomit, about half an hour after it is taken. Theſe indications are followed by violent vomitings, hiccoughs, and pains in the ſtomach and bowels. Convulſions and palſies of the limbs preſently ſucceed, with intenſe heats, cold ſweats, palpitations of the heart, extreme anxiety, reduction of ſtrength, thirſt and dryneſs of the mouth and throat, loſs of reaſon, and at laſt death.

If the quantity taken is conſiderable, the patient dies in ſeven or eight hours after; and the ſtomach and inteſtines are found, upon diſſection, to be corroded and perforated. When this is not the caſe, violent putrefactive ſymptoms ſoon enſue after arſenic is ſwallowed; for the bodies of thoſe who are poiſoned by it, generally have abundance of red or purple ſpots even before death.

It remarkably inflames the coats of the ſtomach, and the putrefaction is ſaid particularly to take place in the genitals of men.

Mr. Bergman relates, that in the body of a man who was poiſoned with arſenic and diſſected in the anatomical theatre at Upſal, the putrefaction had been ſo ſtrong that the mineral was deprived of part of its phlogiſton, and emitted the garlic ſmell, that peculiar characteriſtic of arſenic when in this ſituation.

Many antidotes have been propoſed againſt this dreadful poiſon by authors of the higheſt reputation; but without that ſucceſs which the confidence of thoſe who propoſed them ſeemed to enſure.

ARSIS and Thesis, in muſic, and proſody, implies a term applied to compoſitions in which one part riſes and the other falls.

ARSMART, in botany, is the ſame as Persicaria.

ARSON, in Engliſh law, is the malicious and wilful burning of the houſe or outhouſe of another man; which is felony in common law.

This is an offence of very great malignity, and much more pernicious to the public than ſimple theft: being an offence againſt that right of habitation which is acquired by the law of nature as well as by the laws of national ſociety; next, becauſe of the terror and confuſion that neceſſarily attends it; and, laſtly, becauſe in ſimple theft the thing ſtolen only changes its owner, but ſtill remains *in eſſe* for the benefit of the public; whereas by burning, the very ſubſtance is abſolutely deſtroyed.

It is in the eye of the law more deſtructive than murder; and of which too it is often the cauſe: ſince murder, atrocious as it is, ſeldom extends beyond the felonious act deſigned; whereas fire too frequently involves in the common calamity perſons unknown to the incendiary, and not intended to be hurt by him, and conſequently friends as well as enemies.

ARSURA, in ancient cuſtoms, is a term uſed for the melting of gold or ſilver, either to refine them, or examine their value.

The method of performing it is explained at large in the black book of the Exchequer, aſcribed to Gervaiſe in the chapter *De Officio Militis Argentarii*, being in thoſe days of great uſe, on account of the various places and different manners in which the king's money was paid.

Arsura, alſo implies the loſs or diminution of metal in infuſion. In this ſenſe, a pound was ſaid *tot ardere denarios*, to loſe ſo many penny-weights.

Arsura likewiſe implies the duſt and ſweepings of ſilverſmiths, and others, who work in ſilver, melted down.

ART is a proper diſpoſal of the things of nature by human thought and experience, ſo as to anſwer the ſeveral purpoſes of mankind; in which ſenſe art ſtands oppoſed to nature.

Art is principally underſtood to be a ſyſtem of rules ſerving to facilitate the performance of certain actions; in which ſenſe it ſtands oppoſed to ſcience, or a ſyſtem of ſpeculative principles.

Art is generally divided into uſeful or mechanic, liberal or polite. The former are thoſe in which the hand and body are more concerned than the mind: of this kind are moſt of thoſe which furniſh us with the neceſſaries of life, and are popularly known by the name of trades; as baking, brewing, carpentry, ſmithery, weaving, &c.

Polite arts are ſuch as depend more on the labour of the mind than that of the hand; and are the produce of imagination; their eſſence conſiſts in expreſſion, and their end is pleaſure. Of this kind are poetry, painting, muſic, &c.

Some of the arts muſt be nearly coeval with the human race; for food, cloathing, and habitation, even in their original ſimplicity, required ſome art. And many other arts are of ſuch antiquity as to place the inventors beyond the reach of tradition.

In all countries where the people are barbarous and illiterate, the progreſs of arts is extremely ſlow.

The progreſs of art ſeldom fails to be rapid, when a people happen to be rouſed out of a torpid ſtate by ſome fortunate change of circumſtances. Proſperity, contraſted with former abaſement, gives to the mind a ſpring, which is vigorouſly exerted in every new purſuit.

The reign of Auguſtus Cæſar, which put an end to the rancour of civil war, and reſtored peace to Rome with the comforts of ſociety, proved an auſpicious æra for literature; and produced a cloud of Latin hiſtorians, poets, and philoſophers, to whom the moderns are indebted for their taſte and talents. One who makes a figure rouſes emulation in all: one catches fire from another, and the national ſpirit is every where triumphant: claſſical works are compoſed, and uſeful diſcoveries made in every art and ſcience. With regard to Rome, it is true, that the Roman government, under Auguſtus was in effect deſpotic: but deſpotiſm, in that ſingle inſtance, made no obſtruction to literature, it having been the politic of that reign to hide power as much as poſſible.

As the progreſs of arts and ſciences toward perfection, is greatly promoted by emulation, nothing is more fatal to an art or ſcience, than to remove that ſpur, as where ſome extraordinary genius appears who ſoars above rivalſhip.

Mechanical arts, in proceſs of time, introduced polite arts; for the profeſſors of the former had beſtowed every convenience, and turned their thoughts to the latter. Beauty was ſtudied in objects of ſight; and men of taſte attached themſelves to the fine arts, which multiplied their enjoyments, and improved their benevolence.

Sculpture and painting made an early figure in Greece; which afforded plenty of beautiful originals to be copied in theſe imitative arts. Statuary, a more ſimple imitation than painting, was ſooner brought to perfection: the ſtatue of Jupiter by Phidias, and of Juno by Polycletes, though the admiration of all the world, were executed long before the art of light and ſhade was known.

Apollodorus, and Zeuxis his diſciple, who flouriſhed in the 15th Olympiad, were the firſt who became eminent in that art. Another cauſe concurred to advance ſtatuary before painting in Greece, viz. a great demand for ſtatues of their gods.

Uſeful arts will never be neglected in a country where there is any polity, for every man finds his account in them. Fine arts are more precarious. They are not reliſhed but by perſons of taſte, who are very few indeed; for which reaſon, they will never flouriſh in any country, unleſs patronized by the ſovereign, or men of power and opulence. They merit ſuch patronage, as one of the ſprings of government; by multiplying amuſements, and humanizing manners; upon which account they have always been encouraged by princes of wiſdom and diſcernment.

The eſſence of the polite arts conſiſts in expreſſion. The end of all theſe is pleaſure; whereas the end of the ſciences is inſtruction and utility.

Some of the polite arts, ſuch as eloquence, poetry, and architecture, are frequently applied to objects that are uſeful, or exercifed in matters that are inſtructive: but in theſe caſes, though the ground-work belongs to thoſe ſciences which employ the underſtanding, yet the expreſſion ariſes from the inventive faculty. This union forms the perfection of the art, according to that ſententious and well known precept of Horace: *Omne tulit punctum, qui miſcuit utile dulci.*

Under the denomination of polite arts, is comprehended oratory, poetry, muſic, painting, ſculpture, engraving, and architecture. Particular deſcriptions of theſe arts are given under their reſpective names.

There is one very eſſential reflection, which it appears proper to make, on the polite arts in general; viz. all the rules in the world are not ſufficient to make a great poet, an able orator, or an excellent artiſt; becauſe the qualities neceſſary to form theſe, depend on the natural diſpoſition, and the fire of genius, which no human art can confer, but which is the pure gift of heaven.

The rules, however, will prevent a man from being a bad artiſt, a dull orator, or a wretched poet; being the reflections of the greateſt maſters in thoſe arts, and that they point out the method by which the ſtudent ſhould exerciſe his talents: and they are of uſe in facilitating his labours, and in directing him to arrive by the ſhorteſt and ſureſt road to perfection. They refine, ſtrengthen, and confirm, his taſte.

Art, founded on juſt and ſagacious rules, gives to nature elegance, dignity, and politeneſs.

Beauty is the object of all the polite arts, and conſiſts, principally, in the agreeable and delightful proportions which are found, 1. Between the ſeveral parts of the ſame objects; 2. Between each part and the whole together; 3. Between the parts and the end or deſign of the object to which they belong.

Genius, or invention, is that faculty of the mind, by which beauty is produced.

Taſte, diſpoſition, or rather the natural ſenſation of the mind, refined by art, ſerves to guide the genius in diſcerning, embracing, and producing, that which is beautiful of every kind.

From whence it follows, that the general theory of the polite arts is nothing more than the knowledge of what they contain that is truly beautiful and agreeable; and it is this knowledge, this theory, which modern philoſophers call by the Latin name of *æſthetica.*

The eſſence of the polite arts conſiſts in expreſſion. This expreſſion lies ſometimes in the words, and ſometimes in the pen; ſometimes in ſounds and their harmony, and at others, in corporeal attitudes; ſometimes in the pencil or in the chiſel, and at others, in the graver; ſometimes in a proper diſpoſition, or judicious employment of the mechanic arts, and at others, merely in their manner of acting the artiſt's part.

Every artiſt ought inceſſantly to labour in the improvement of his taſte or genius; in acquiring that refined diſcernment, by which he will be enabled to diſtinguiſhed the real beauties in each object, the ornaments that are agreeable to it, and the proportions and relations that ſubſiſt analogically in the ſeveral parts: and by this faculty, he will be regulated in the employment of his natural talents.

This labour conſiſts, not only in the profound reflections he muſt make on the properties of objects, as they relate to the fine arts, but alſo in a conſtant, aſſiduous ſtudy of the grand models of beauty.

A very material rule to be obſerved in the practice of the polite arts, is the imitation of nature. Every object in the univerſe has its peculiar nature, of which the artiſt ſhould never loſe ſight in his manner of treating it. In vain will he otherwiſe ornament his work with the moſt refined and moſt brilliant ſtrokes; for, if nature be not juſtly imitated, it will for ever remain imperfect.

In all the polite arts, and the ſubjects they embrace, there muſt neceſſarily reign an elevation of ſentiment, that expreſſes each object in the greateſt perfection of which it is capable, and that imitates nature in her moſt exalted beauty.

The deſign of the fine arts being ſolely to excite pleaſure by the expreſſion of that which is beautiful, every artiſt ſhould therefore raiſe himſelf above his ſubject, and chuſe the moſt favourable light to place it in; beſides, he ſhould embelliſh it with the moſt noble, and beautiful ornaments, that his genius can ſuggeſt; ſtill obſerving a ſtrict imitation of nature.

Art is alſo an appellation given to ſeveral ſuperſtitious practices, as, St. Anſelhm's art, St. Paul's art, &c.

ARTABA, in hiſtory, ſignifies an ancient meaſure of capacity, uſed by the Perſians, Medes, and Egyptians.

ARTADA, or **Artedar**, in pharmacy, implies calcined realgar, uſed in caſes of malignant ulcers, and the cure of the polypus.

ARTEDIA, in botany, is a genus of the digynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 45th order, Umbellatæ.

The characters generic are the involucra, which are pinnatifid; the floſcules of the diſc are maſculine; and the fruit is hiſpid with ſcales.

There is but one ſpecies, the ſquamata, with ſquamoſe ſeeds, a native of the Eaſt Indies.

It is an annual plant, whoſe ſtalks riſe about two feet high, ſending out a few ſide-branches, which are garniſhed with narrow compound leaves, reſembling thoſe of a daffodil; the extremity of the ſtalk is terminated by a large umbel of white flowers, compoſed of five unequal petals.

ARTEMESIA, in antiquity, were yearly feſtivals obſerved by the Greeks, in honour of Diana, ſurnamed Artemis.

At this feſtival, a mullet was offered as a ſacrifice to the goddeſs, being ſaid to partake of her nature, i. e. hunting. The mullet, it is ſaid, will hunt and kill the ſea-hare or lernia.

ARTEMIA, in ornithology, is the trivial name of the Italian water-fowl, called the avis diomedis, of which it is a ſynonyme.

ARTEMISIA, *Mugwort, Southernwood,* or *Wormwood,* in botany, is a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and, in the natural method, ranking under the 49th order, Compoſitæ-nucamentaceæ. The receptacle is either naked, or a little downy; it has no pappus; the calyx is imbricated with roundiſh ſcales; and the corolla has no radii.

There are 23 ſpecies; the moſt material of which are the following:

1. The vulgaris, or common mugwort, grows naturally in many parts of England; it flowers in June, at which time the plant is ready for uſe.

2. The dracunculus, or tarragon, which is frequently uſed in ſallads, eſpecially by the French.

3. The abrotanum, or ſouthernwood, which is kept in gardens for its agreeable ſcent, is a low ſhrub, ſeldom riſing more than three or four feet high, ſending out lateral ſhrubby branches, growing erect, garniſhed with five briſtly leaves, having an agreeable ſcent when bruiſed: the flowers are produced in ſpikes from the extremity of the branches.

4. The ſantonicum produces the ſemen ſantonicum, which is much uſed for worms in children. It grows naturally in Perſia, from whence the ſeeds are brought to Europe.

5. The artemiſia maritima, or ſea-wormwood, grows naturally on the ſea-coaſts in moſt parts of Great Britain, where there are ſeveral varieties, if not diſtinct ſpecies, to be found.

6. The pontica, or pontic wormwood, commonly called Roman wormwood, is a low herbaceous plant, whoſe ſtalks die in autumn, and new ones appear in the ſpring.

7. The abſinthium, or common wormwood, grows naturally

in uncultivated places, and is too well known to require any particular deſcription.

8. The arboreſcens, or tree wormwood, grows naturally in Italy and the Levant, near the ſea.

The other ſpecies are of little note.

The ſouthernwood is propagated by ſlips, planted in a ſhady border about the beginning of April, where they may remain till the following autumn, when they ſhould be tranſplanted where they are to remain. The ſantonicum is likewiſe propagated by ſlips.

The true wormwood is eaſily propagated in the ſame manner.

The other ſorts ſpread by their creeping roots; and require no culture, as they are very hardy, and will thrive any where.

The ſeeds of the ſantonicum are ſmall, light, chaffy, compoſed as it were of a number of thin membranous coats, of a yellowiſh colour, an unpleaſant ſmell, and a very bitter taſte. They are celebrated for anthelmintic virtues.

The leaves of the ſea, common, and Roman wormwood, are uſed as ſtomachics, but are all very diſagreeable.

The diſtilled oil of wormwood is ſometimes made uſe of to rub on the belly as a cure for worms.

The leaves of the vulgaris, or common mugwort, have a light aromatic ſmell, and an herbaceous bitteriſh taſte; and were formerly celebrated as uterine and antihyſteric. This medicine is certainly a very mild one, and conſiderably leſs hot than moſt others to which theſe virtues are attributed. It is now very little employed in medicine; and it is probably with great propriety that the London College of phyſicians have rejected it from their pharmacopœia.

The moxa, ſo famous in the Eaſtern countries for curing the gout by burning it on the part affected, is the lanugo or down growing on the under ſide of the leaves of a ſpecies of mugwort, ſuppoſed to be the ſame with our common ſort.

ARTERIACS, in pharmacy, are medicines ſuited to diſorders of the trachea and the voice.

ARTERIAL, or Arterious, in anatomy, implies ſomething acting in or with the arteries: hence arterial or live blood.

ARTERIOSUS Canalis, in anatomy, implies a tube which leads to the heart of a fœtus, which the foramen ovale ſerves to maintain the circulation of blood, and to convey it from the lungs.

ARTHRITICA, in botany, is ſynonymous with the ground pine; as alſo with the primroſe.

ARTERIOTOMY, in ſurgery, ſignifies the opening an artery, with deſign to procure a diſcharge of blood.

ARTERY, in anatomy, implies a tube or canal which conveys the blood from the heart to all parts of the body.

ARTHRITIS, in medicine, indicates an attack of the gout.

ARTHRODIA, in natural hiſtory, is a genus of imperfect cryſtals, found always in complex maſſes, and forming long ſingle pyramids, with very ſhort and ſlender columns.

Arthrodia, in anatomy, is a ſpecies of articulation, in which the flat head of one bone is received into a ſhallow ſocket in the other. The humerus and ſcapula are joined by this ſpecies of articulation.

ARTICHOKE, in botany, is the ſame as Cinara.

ARTICLE, in human œconomy, implies a clauſe or condition of a contract, treaty, &c. It is alſo a ſmall part or diviſion of a diſcourſe, book, or writing, &c.

Article *of Faith*, in a religious ſenſe, implies a point of chriſtian doctrine, which we are obliged to believe, as having been revealed by God himſelf, and allowed and eſtabliſhed as ſuch by the church.

The thirty-nine articles of the church by England, were founded, for the moſt part, upon a body of articles compiled and publiſhed in the reign of Edward VI. and were firſt paſſed in the convocation, and confirmed by royal authority in the year 1562. They were afterwards ratified anew in the year 1571, and again by Charles I.

The law requires a ſubſcription to theſe articles by all perſons ordained deacons or prieſts, 13 El. cap. 12. and by all clergymen inducted to any eccleſiaſtical living; and by the ſame ſtatute, all licenſed lecturers and curates, 13 El. cap. 12. and 13. and 14. Ch. 2. cap. 4. by the heads of colleges, chancellors, officials and commiſſaries, and ſchool-maſters.

By 1 Will. 3. cap. 18. diſſenting teachers are to ſubſcribe all, except the 34th, 35th, and 36th, and part of the 20th (and in the caſe of Anabaptiſts, except alſo part of the 27th); otherwiſe they are exempted from the benefits of the act of toleration.

Article, in grammar, denotes a particle uſed in moſt languages for the declining of nouns, and denoting the ſeveral caſes and genders thereof.

The uſe of articles ariſes chiefly hence, that in languages which have no different terminations, to expreſs the different ſtates and circumſtances of nouns, there is ſomething required to ſupply that office.

ARTICULATE Sounds, in acouſtics, are ſuch ſounds as expreſs the letters, ſyllables, or words, of any alphabet or language: ſuch are formed by the human voice, and by ſome few birds, as parrots, &c.

ARTICULATION, or Jointing, in anatomy, is the joining of bones together.

Articulation, in botany, is the connection of parts that conſiſt of joints or knees, ſuch as the pods of French honeyſuckles, which when ripe divide into ſo many parts as there are knees or joints; alſo thoſe parts of plants which ſwell into nodes or joints, and which uſually ſend forth branches.

ARTIFICER, a perſon whoſe employment it is to manufacture any kind of commodity, as in iron, braſs, wool, &c. ſuch are ſmiths, braziers, carpenters, &c.

ARTIFICIAL, in a general ſenſe, denotes ſomething made, faſhioned, or produced by art, in contradiſtinction from the productions of nature.

Artificial *Lines*, on a ſector or ſcale, in mathematics, are certain lines ſo contrived, as to repreſent the logarithmic ſines and tangents; which, by the help of the line of numbers, will ſolve all queſtions in trigonometry, navigation, &c. with tolerable exactneſs.

ARTILLERY in its general ſenſe, denotes the offenſive apparatus of war, particularly of the miſſile kind.

In its modern acceptation it ſignifies fire arms, mounted on their carriages and ready for action, with their balls, bombs, grenades, &c.

By artillery is likewiſe underſtood the ſcience which the officers of artillery ought to poſſeſs. Which ſcience teaches to know the nature of all the materials and ingredients relative to artillery, ſuch as, nitre, ſulphur, charcoal; the properties of air and fire; the compoſition and preparation of gun-powder; the materials for fire-works; the conſtruction, proportion, &c. of the different warlike machines; the arrangement, movement, and whole management, of cannon, &c. in the field or in ſieges, in ſuch a manner, that each of them, according to the length of its tube and the diameter of its bore, may be ſituated in the moſt proper place for execution, and that the whole train taken together may reciprocally aſſiſt and ſupport each other with the greateſt advantage.

The hiſtory of the riſe and progreſs of fire arms, comes within the province of Projectiles or Gunnery, to which the reader is referred.

Artillery *Park*, in war, is the place in the rear of both lines in the army, for encamping the artillery, which is drawn up in lines, of which one is formed by the guns; the ammunition-waggons make two or three lines, 60 paces behind the guns, and 30 diſtant from each other; the pontoons and tumbrils make the laſt line. The whole is ſurrounded with a rope which forms the park: the gunners and matroſſes encamp on the flanks; and the bombardeers, pontoon-men, and artificers, in the rear.

Artillery *of Train*, implies a certain number of pieces of ordnance mounted on carriages, with all their tackle, apparel, and furniture fit for marching.

Artillery *Company*, denotes a band of infantry, conſiſting of 600 men, making part of the militia or city-guard of London.

ARTISCUS, *αρτος*, *bread*, in pharmacy, denotes the preparation of viper ſfleſh with bread, in the compoſition of Venice treacle.

ARTIST, or Artisan, in a general ſenſe, denotes a perſon ſkilled in ſome art. In an academical ſenſe, it denotes a philoſopher or proficient in the faculty of arts.

ARTIZOOS, among the faculty, implies an infant who dies as ſoon as it is born. The word is compounded of *αρτι*, *ſhort*, and *ζωη*, *life*.

ARTOCARPUS, in botany, is the bread-fruit tree: a genus of the monandria order, belonging to the monœcia claſs of plants. It has a cylindric amentum or catkin, which thickens gradually, and is covered with flowers; the male and female in a different amentum. In the male, the calyx is two-valved, and the corolla is wanting. In the female, there is no calyx or corolla; the ſtylus is one, and the drupa is many-celled.

Though this tree has been mentioned by many voyagers, particularly Dampier, Rumphius, and Lord Anſon, yet little notice was taken of it till the return of Captain Wallis from the South Seas.

Captain Dampier relates, that in Guam, one of the Ladrone iſlands, "there is a certain fruit called the bread-fruit, growing on a tree as big as our large apple trees, with dark leaves. The fruit is round, and grows on the boughs like apples, of the bigneſs of a penny loaf: when ripe, it turns yellow, ſoft, and ſweet; but the natives take it green, and bake it in an oven till the rind is black: this they ſcrape off, and eat the inſide, which is ſoft and white, like the inſide of new-baked bread, having neither ſeed nor ſtone; but if it is kept above twenty-four hours, it is harſh. As this fruit is in ſeaſon eight months in the year, the natives feed upon no other ſort of bread during that time. They told us that all the Ladrone iſlands had plenty of it. I never heard of it in any other place."

Rumphius, after deſcribing the tree, obſerves, that "the fruit is ſhaped like a heart, and increaſes to the ſize of a child's head. Its ſurface or rind is thick, green, and covered every where with warts of a quadragonal or hexagonal figure, like cut diamonds, but without points. The more flat and ſmooth theſe warts are, the fewer ſeeds are contained in the fruit, and the greater is the quantity of pith, and that of a more glutinous nature. The internal part of the rind, or peel, conſiſts of a fleſhy ſubſtance, full of twiſted fibres, which have the appearance of fine wool; theſe adhere to, and in ſome meaſure form it. The fleſhy part of this fruit becomes ſofter towards the middle, where there is a ſmall cavity formed without any nuts or ſeeds, except in one ſpecies, which has but a ſmall number, and this ſort is not good unleſs it is baked, or prepared ſome other way: but if the outward rind be taken off, and the fibrous fleſh dried, and afterwards boiled with meat, as we do cabbage, it has then the taſte of artichoke bottoms. The inhabitants of Amboyna dreſs it in the liquor of cocoa-nuts; but they prefer it roaſted on coals, till the outward part or peel is burnt. They afterwards cut it into pieces, and eat it with the milk of the cocoa-nut. Some people make fritters of it, or fry it in oil; and others, as the Sumatrians, dry the internal ſoft part, and keep it to uſe inſtead of bread with other food. It affords a great deal of nouriſhment, and is very ſatisfying, therefore proper for hard-working people: and, being of a gentle aſtringent quality, is good for perſons of a laxative habit of body. It is more nouriſhing boiled in our manner, with fat meat, than roaſted on coals.

"The milky juice which diſtils from the trunk, boiled with the cocoa-nut oil, makes a very ſtrong bird-lime.

"This tree is to be found on the eaſtern parts of Sumatra, and, in the Malay language, is called ſoccus and ſoccum capas. It grows likewiſe about the town of Bantam, in Java, and in Balega and Madura, and is known there by the name of ſoccum."

In Anſon's voyage we are informed, "that the rima, or bread-fruit teee, is common in all the Ladrone iſlands, and ſome of the Philippines. It is ſomewhat larger than our apple-tree, and bears a broad, dark-coloured leaf, with five indentures on each ſide. The fruit hangs on boughs, like apples; and of the ſize of a penny loaf, with a thick tough rind, which, when full ripe, turns yellow. The natives gather it before it is quite ripe, and bake it till the cruſt is pretty black; then they raſp it, and there remains a pretty loaf, with a tender yellow cruſt, and the crumb of it is ſoft and ſweet as a new-baked roll: it is without any ſeeds or ſtones.

"This fruit the inhabitants enjoy for about ſeven months; during which they never eat any other kind of bread: but they are obliged to bake it every day; for, when it grows a little ſtale, it becomes harſh and huſky, ſomewhat like the potato-bread made in the weſt of England. There is, however, a remedy for this; which is cutting the loaf into ſlices, when it is new, and drying it in the ſun, by which it is changed into the pleaſanteſt ruſk that can be eaten."

Captain Cook obſerves, that this fruit not only ſerves as a ſubſtitute for bread among the inhabitants of Otaheite, and the neighbouring iſlands in the South Seas, but alſo, variouſly dreſſed, compoſes the principal part of their food. It grows on a tree that is about the ſize of a middling oak, whoſe leaves are frequently a foot and an half long, of an oblong ſhape, deeply ſinuated, like thoſe of the fig-tree, which they reſemble in colour and conſiſtence, and produce a milky juice when broken.

The fruit is about the ſize and ſhape of a child's head; and the ſurface is reticulated, not much unlike a truffle; it is covered with a thin ſkin, and has a core about as big as the haft of a ſmall knife. The eatable part lies between the ſkin and the core; it is extremely white, and ſomewhat of the conſiſtence of new bread; but it muſt be roaſted before it is eaten, being firſt divided into three or four parts; its taſte is inſipid, with a ſlight ſweetneſs, ſomewhat reſembling that of the crumb of wheaten bread mixed with a Jeruſalem artichoke.

This fruit is alſo cooked in a kind of oven, which renders it ſoft, and ſomething like a boiled potatoe; not quite ſo farinaceous as a good one, but more ſo than thoſe of the middling ſort.

Of the bread-fruit they alſo make three diſhes, by putting either water, or the milk of the cocoa-nut to it, then beating it to a paſte with a ſtone peſtle, and afterwards mixing it with ripe plantains, bananas, or the ſour paſte, which they call mahie.

The mahie, which is likewiſe made to ſerve as a ſuccedaneum for ripe bread-fruit before the ſeaſon comes on, is thus made: the fruit of the bread-tree is gathered juſt before it is perfectly ripe; and being laid in heaps, is cloſely covered with leaves: in this ſtate it undergoes a fermentation, and becomes diſagreeably ſweet; the core is then taken out entire, which is done by gently pulling out the ſtalk, and the reſt of the fruit is thrown into a hole which is dug for that purpoſe, and neatly lined in the bottom and ſides with graſs; the whole is then covered with leaves, and heavy ſtones laid upon them; in this ſtate it undergoes a ſecond fermentation, and becomes ſour; after which it will ſuffer no change for many months. It is taken out of the hole as it is wanted for uſe; and, being made into balls, it is wrapped up in leaves, and baked: after it is dreſſed, it will keep five or ſix weeks. It is eaten both cold and hot; and the natives ſeldom make a meal without it, though to Europeans the taſte is as diſagreeable as that of a pickled olive generally is the firſt time it is eaten. The fruit itſelf is in ſeaſon eight months in the year, and the mahie ſupplies the inhabitants during the other four.

To procure this principal article of their food, coſts theſe happy people no trouble or labour, except climbing up a tree: the tree which produces it does not indeed grow ſpontaneouſly; but if a man plants ten of them in his life-time, which he may do in about an hour, he will as completely fulfil his duty to his own and future generations, as a native of our leſs temperate climate can do by ploughing in the cold of winter, and reaping in the ſummer's heat, as often as theſe ſeaſons return; even if, after he has procured bread for his preſent houſhold, he ſhould convert a ſurplus into money, and lay it up for his children.

There are two ſpecies of artocarpus, viz. the inciſus, with gaſhed leaves; and the integrifolia, with entire leaves. There is alſo ſaid to be another diſtinction, into that which bears fruit with ſtones or ſeeds, and that in which the fruit has none. The parts of fructification of that tree which bears the fruit without ſtones, are defective. The amentum, or catkin, which contains the male parts, never expands. The ſtyli, or female part of the fruit, are likewiſe deficient. Hence it may be inferred, that there can be no ſeeds; therefore this tree can only be propagated by ſuckers or layers.

Dr. Solander was aſſured, by the oldeſt inhabitants of Otaheite and the adjoining iſlands, that they well remember there was, formerly, plenty of the ſeed bearing bread-fruit; but they had been neglected upon account of the preference given to the bread-fruit without ſeeds, which they propagate by ſuckers.

ARVALES Fratres, in Roman antiquity, was a college of twelve prieſts, inſtituted by Romulus, and choſen out of the moſt noble families, himſelf being one of that body: they aſſiſted in the ſacrifices of the ambervalia, annually offered to Ceres and Bacchus, for the proſperity of the fruits of the earth; when they wore on their heads crowns made of ears of corn.

The origin of this inſtitution was as follows: Acca Laurentia, Romulus's nurſe, was accuſtomed, once a year, to make a ſolemn ſacrifice for a bleſſing on the fields; her twelve ſons always aſſiſting her in the ſolemnity; but at laſt, loſing one of her ſons, Romulus offered himſelf to ſupply his place, and gave this ſmall ſociety the name of Arvales Fratres.

This order was in great repute at Rome: they held the dignity for life, and never loſt it upon account of impriſonment, baniſhment, or any other accident.

ARVIL Supper, in Engliſh cuſtoms, ſignifies a feaſt or entertainment, made at funerals in the north of England. Arvil bread is the bread delivered to the poor at funeral ſolemnities: and arvil, arval, arſal, are uſed for the burial or funeral rites.

ARUM, Wakerobin, or Cuckow Pint, in botany, is a genus of the polyandria order, belonging to the gynandria claſs of plants, and, in the natural method, ranking under the 2d order, Piperitæ.

The ſpatha is monophyllous, and cowl-ſhaped; the ſpadix is naked above, female below, and ſtamened in the middle.

There are 22 ſpecies, of which the following are the principal.

1. The maculatum, or common wake-robin, grows naturally in moſt parts of Great Britain. The leaves are halberd-ſhaped, and ſpotted; the berries numerous, growing in a naked cluſter. The flowers appear in April; and their wonderful ſtructure hath given riſe to many diſputes among the botaniſts. The receptacle is long, in the ſhape of a club, with the ſeed-buds ſurrounding its baſe. The chives are fixed to the receptacle, amongſt the ſeed-buds, ſo that there is no occaſion for the tips to be ſupported upon threads, and therefore they have none; but they are fixed to the fruit-ſtalk, and placed between two rows of tendrils: the point in diſpute is, what is the uſe of thoſe tendrils?

2. The proboſcidium.

3. The ariſarium.

4. The tenuifolium.

Theſe three ſpecies have uſually been ſeparated from this genus, and diſtinguiſhed by the general name of ariſarum, or friar's cowl, on account of the reſemblance of their flowers to the ſhape of the cowls worn by friars.

5. The italicum, is a native of Italy, Spain, and Portugal.

6. The dracunculus, or common dragons, grows naturally in moſt of the ſouthern parts of Europe.

7. The trilobatum, or arum of Ceylon, is a native of that iſland and ſome other parts of India.

8. The colocaſia.

9. The divaricatum, with ſpear-ſhaped leaves.

10. The peregrinum, or elder.

11. The eſculentum, or eatable arum.

12. The ſagittifolium, or greateſt Egyptian arum. All theſe ſpecies have mild roots, which are eaten by the inhabitants of the hot countries, where they grow naturally; and ſome of them are cultivated by the inhabitants of the ſugar colonies, where their roots are conſtantly eaten, as alſo the leaves which they call Indian kale; which, in thoſe countries, proves a good ſuccedaneum for European eſculent plants.

13. The arboreſcens, or dumb cane, is a native of the ſugar iſlands and warm parts of America, where it grows chiefly on low grounds.

All the ſpecies of this plant are hardy, except the trilobatum and the arboreſcens. The former muſt be kept conſtantly in a ſtove, and the laſt in a moderate hot bed. The arboreſcens is propagated by cutting off the ſtalks into lengths of three or four joints, which muſt be left to dry ſix weeks or two months; for if the wounded part is not perfectly healed over before the cuttings are planted, they will rot and decay.

The roots of the maculatum and dracunculus are uſed in medicine, and differ in nothing but that the latter is ſomewhat ſtronger than the former.

All the parts of the arum, particularly the root, have an extremely pungent, acrimonious taſte; if the root be but lightly chewed, it continues to burn and vellicate the tongue for ſome hours, occaſioning at the ſame time a conſiderable thirſt: theſe ſymptoms are alleviated by butter, milk, or oily liquors.

This root is a powerful ſtimulant and attenuant. It is reckoned a medicine of great efficacy in ſome cachectic and chlorotic caſes, in weakneſs of the ſtomach occaſioned by a load of viſcid phlegm. Great benefit has been obtained from it in rheumatic pains, particularly thoſe of the fixed kind.

In theſe caſes it may be given from 10 grains to a ſcruple of the freſh root twice or thrice a-day, made into a bolus or emulſion with unctuous and mucilaginous ſubſtances, which cover its pungency, and prevent its making any painful impreſſion on the tongue.

It generally excites a ſlight tingling ſenſation through the whole habit, and, when the patient is kept warm in bed, produces a copious ſweat.

ARUNDEL *Oil*, in the materia medica, is the produce of a tree that grows at Bombay, Gambroon, and Surat, in the Eaſt Indies, incloſed in a rough huſk; and the kernel of the nut yields an oil, which is of a purgative nature. A tea ſpoonful of it is reckoned a doſe.

ARUNDELIAN Marbles, Oxford Marbles, or Parian Chronicle, are ancient ſtones, on which is inſcribed a chronicle of the city of Athens, engraven in capital letters in the iſland of Paros, one of the Cyclades, 264 years before Jeſus Chriſt. They take their firſt name from Thomas Earl of Arundel, who procured them out of the Eaſt, or from Henry his grandſon, who preſented them to the univerſity of Oxford.

The Arundelian Marbles, in their perfect ſtate, contained a chronological detail of the principal events of Greece during a period of 1318 years, beginning with Cecrops, before Chriſt 1582 years, and ending with the archonſhip of Diognetus, before Chriſt 264. But the chronicle of the laſt 90 years is loſt; ſo that the part now remaining ends at the archonſhip of Diotimus, 354 years before the birth of Chriſt: and in this fragment the inſcription is at preſent ſo much corroded and effaced, that the ſenſe can only be diſcovered by very learned and induſtrious antiquaries.

This chronicle, and many other relics of antiquity, real or pretended, were purchaſed in Aſia Minor, in Greece, and in the iſlands of the Archipelago, by Mr. William Petty, who in the year 1624 was ſent by Thomas Earl of Arundel for the purpoſe of making ſuch collection for him in the Eaſt. They were brought into England about the beginning of the year 1627, and placed in the gardens belonging to Arundel-houſe in London.

Soon after their arrival they excited a general curioſity, and were viewed by many learned men; among others by Sir Robert Cotton, who prevailed upon Mr. Seldon to employ his abilities in explaining the Greek inſcriptions. Selden and two of his friends, Patrick Young, and Richard James, immediately commenced their operations, by cleaning and examining the marble containing the Smyrnean and Magneſian league, and afterwards proceeded to the Parian chronicle. The following year Selden publiſhed a ſmall volume in quarto, including about 39 inſcriptions copied from the marbles.

In the turbulent reign of Charles I. and the ſubſequent uſurpation, Arundel-houſe was often deſerted by the illuſtrious owners; and, in their abſence, ſome of the marbles were defaced and broken, and others either ſtolen or uſed for the ordinary purpoſes of architecture. The chronological marble, in particular, was unfortunately broken and defaced. The upper part, containing 31 epochas, is ſaid to have been worked up in repairing a chimney in Arundel-houſe.

In the year 1667, the Hon. Henry Howard, afterwards Duke of Norfolk, the grandſon of the firſt collector, preſented theſe ſuppoſed remains of antiquity to the univerſity of Oxford.

Selden's work becoming very ſcarce, Biſhop Fell engaged Mr. Prideaux to publiſh a new edition of the inſcriptions, which was printed at Oxford in 1676. In 1732 Mr. Maittaire obliged the public with a more comprehenſive view of the marbles than either of his predeceſſors. Laſtly, Dr. Chandler publiſhed a new and improved copy of the marbles in 1763, in which he corrected the miſtakes of the former editors; and in ſome of the inſcriptions, particularly that of the Parian chronicle, ſupplied the *lacunæ* by many ingenious conjectures.

The Arundelian marbles have generally been regarded as a curious monument of antiquity. They were, however, diſcovered in ſome inſtances to be inconſiſtent with the moſt authentic hiſtorical accounts; Sir Iſaac Newton and ſeveral other modern philoſophers paid little or no regard to them; and of late their abſolute authenticity has been ſeverely queſtioned in an expreſs diſſertation upon the ſubject, entitled The Parian Chronicle. In this diſſertation, much ingenuity as well as judgment, and a great extent of ancient learning are diſplayed.

ARUNDO, the Reed, in botany, is a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, Gramina. The calyx conſiſts of two valves, and the floſcules are thick and downy.

There are four ſpecies, viz. 1. The phragmitis, or common marſh-reed, grows by the ſides of the rivers and in ſtanding waters.

2. The donax, or manured reed, is a native of warm countries, but will bear the cold of our moderate winters in the open air. It dies to the ſurface in autumn, but appears again in the ſpring, and, if kept ſupplied with water, will grow 10 or 12 feet high in one ſummer.

3. The verſicolor, or Indian variegated reed, is ſuppoſed to be a variety of the ſecond, differing from it only in having variegated leaves.

4. The bambos, or bamboo, is a native of the Eaſt Indies and ſome parts of America; where it frequently attains the height of 60 feet. The main root is long, thick, jointed, ſpreads horizontally, and ſends out many cylindrical woody fibres, of a whitiſh colour, and many feet long. The flowers are produced in large panicles from the joints of the ſtalks, placed three in a parcel cloſe to their receptacles: they reſemble thoſe of the common reed, and are ſucceeded by ſeeds of the ſame form ſurrounded with down. The pods are pickled, and what are called achian by the Eaſt Indians.

The ſmaller ſtalks are uſed for walking ſticks. The inhabitants of Otaheite make flutes of them, about a foot long, with two holes only, which they ſtop with the firſt finger of the left hand and the middle one of the right, and they blow through their noſtrils.

5. The arborea, with a tree-like ſtalk, differs from the former only in having narrower leaves.

6. The orientalis is what the Turks uſe as writing-pens; it grows in a valley near mount Athos, as alſo on the banks of the river Jordan. None of theſe plants are at preſent to be found in Great Britain.

Arundo *Saccharifera*, or *Sugar-cane*, is the ſame as Saccharum.

ARUSPICES, or Haruspices, in Roman antiquity, were an order of prieſts who pretended to foretel future events by inſpecting the intrails of victims killed in ſacrifice; they were alſo conſulted on occaſion of portents and prodigies.

The Haruſpices were always choſen from the beſt of families; as their employment was of the ſame nature as that of the augurs, they were as much honoured.

Their college, as well as thoſe of the other religious orders, had its particular regiſters and records.

ARVUM, in agriculture, implies all the land which is actually in tillage, thereby contradiſtinguiſhing ſuch land, from meadow, and paſture ground.

ARX, in the ancient military art, ſignifies a town, fort, or caſtle of defence.

Arx alſo denoted a conſecrated place on the Palatine Mount, where the augurs publicly performed their office.

ARYTÆNOIDES, in anatomy, is the name of two cartilages, which, together with others, conſtitute the head of the larynx.

ARYTHMUS, in medicine, ſignifies the want of a juſt modulation in the pulſe. It is oppoſed to *eurythmus*, a pulſe modelated agreeably to nature.

AS, in antiquity, implies a particular weight, conſiſting of 12 ounces; being the ſame with the *libra*, or the Roman pound.

As, was alſo a Roman coin, which was of different weights and different matter in different ages of the commonwealth.

In the time of Tullus Hoſtillius, it was of braſs, and called *as*, *libra*, *libella*, or *pondo*, becauſe actually weighing a pound or 12 ounces. Four hundred and twenty years after, the firſt Punic war having exhauſted the treaſury, they reduced the *as* to two ounces. In the ſecond Punic war, Hannibal preſſing very hard upon them, they reduced the *as* to half its weight, viz. to one ounce. And laſtly, by the Papirian law, they took away half an ounce more, and conſequently reduced the *as* to the diminutive weight of half an ounce: and it is generally thought that it continued the ſame during the commonwealth, and even till the reign of Veſpaſian.

Its original ſtamp was that of a ſheep, ox, or ſow: but from the time of the emperors, it had on one ſide a Janus with two faces, and on the reverſe the roſtrum or prow of a ſhip.

As, alſo denoted any integer or whole. Whence the Engliſh word *ace*. Thus *as* ſignified the whole inheritance; whence *hæres ex aſſe*, the heir to the whole eſtate.

ASA, or Assa, in the materia medica, is a name given to two very different ſubſtances, called *aſa-dulcis* and *aſa-fœtida*.

Asa *Dulcis* is the ſame with Benzoin.

Asa *Fœtida* is the concrete juice of a large embelliferous plant, growing in ſeveral parts of Aſia.

Asa, among naturaliſts, an odoriferous and fragrant gum.

ASAPPES, or Azapes, ſignify an order of ſoldiers in the Turkiſh army, whom they always expoſe to the firſt ſhock of the enemy; to the end that the enemy being thus fatigued, and their ſwords blunted, the ſpahis and janiſaries may fall on and find an eaſy conqueſt.

ASAROTA, ασαρωτα from α and σαιρω, *I ſweep*, were a kind of painted pavements in uſe before the invention of Moſaic work.

The moſt celebrated was that at Pergamus, painted by Seſus, and exhibiting the appearance of crumbs, as if the floor had not been ſwept after dinner, whence, according to Pliny, the denomination. Perault ſuppoſes them to have been a black kind of pavements of a ſpongy matter.

ASARUM, **Asarabacca**, in botany, is a genus of the monogynia order, belonging to the dodecandria claſs of plants. The calyx is trifid or quadrifid, and reſts on the germen; there is no corolla; the capſule is leathery and crowned. There are three ſpecies, viz. the Europeum, the Canadenſe, and Virginicum. The firſt grows naturally in England. It has a thick fleſhy jointed root; the leaves grow ſingly upon ſhort foot ſtalks, which ariſe immediately from the root: the flowers grow cloſe to the ground, ſo are hid under the leaves. They have a bell-ſhaped implement, of a purple colour, which is cut into three parts at the top, where it turns backward. It grows in a moiſt ſhady place, and may be propagated by parting the roots in autumn.

The two other ſpecies have no remarkable properties.

Both the roots and leaves have a nauſeous, bitter, acrimonious, hot taſte; their ſmell ſtrong, and not diſagreeable. Given in ſubſtance from half a dram to a dram, they cauſe the patient to evacuate powerfully both upwards and downwards.

The principal uſe of this plant in medicine is a ſternutatory. The root of which is perhaps the ſtrongeſt of all the vegetable errhines, white hellebore itſelf not excepted. Snuffed up the noſe, in quantity of a grain or two, it occaſions a large evacuation of mucus, and raiſes a plentiful ſpitting. The leaves are conſiderably milder, and may be uſed to the quantity of three, four, or five grains.

The leaves are the principal ingredient in the *pulvis ſternutatorius*, or *pulvis aſari compoſitus*, as it is now called, of the ſhops.

ASASI, in botany, ſignifies a tree or ſhrub, which grows on the coaſt of Guinea in Aſia, being ſo called by the natives, which in their language implies, a tooth healer; for the leaves boiled in water, and applied to the teeth and gums, inſtantly remove the diſagreeable pain called the tooth ach. The tree bears a very great reſemblance to laurel, with this difference, that the branches and leaves have reddiſh ſpots that are protuberant to the touch.

ASBESTINE, in pyrotechny, implies any thing that is incombuſtible, ſuch as the *lapis abeſtos*, and other adamantine ſubſtances that are fire proof.

ABESTOS, in natural hiſtory, is a ſort of native foſſile ſtone, which may be ſplit into threads and filaments, from one inch to ten in length, very fine, brittle, ſomewhat tractable, ſilky, and of a greyiſh colour, not unlike talc of Venice. It is inſipid to the taſte, indiſſoluble in water, and endued with the wonderful property of remaining unconſumed in the fire, which only whitens it.

The abeſtos is found in Crete and Cyprus; in Tartary; at Namur in the Low Countries; in Thuringia among the mines; in the Old Noricum; in Egypt; in the mountains of Arcadia; at Puteoli; in the iſland of Corſica; in the iſland of Angleſey in Wales; in Aberdeenſhire in Scotland; at Montauban in France; and in the kingdom of Siberia.

ASCARIS, or **Ascaides**, in zoology, is a genus of inſects belonging to the order of vermes inteſtina. The body of the aſcaris is cylindrical, filiform, and tapers at both ends.

The ſpecies are two, viz. 1. The vermicularis, with faint annular rugæ, and the mouth tranſverſe, is about a quarter of an inch long, and thicker at one end than the other. It is found in boggy places, in the roots of putrid plants, and very frequently in the rectum of children and horſes. It emaciates children greatly, and is ſometimes vomited up.

2. The lumbricoides is about the ſame length with the lumbricus terreſtris, or common earth worm; but it wants the protuberant ring towards the middle of the body, the only mark by which they can properly be diſtinguiſhed. The body of the lumbricoides is cylindrical, and ſubulated at each extremity; but the tail is ſomewhat triangular. The lumbricoides is the worm which is moſt commonly found in the human inteſtines. It is viviparous, and produces vaſt numbers.

ASCENDANT, in aſtrology, denotes the horoſcope, or degree of the ecliptic which riſes upon the horizon at the time of the birth of any one. This is ſuppoſed to have an influence on the perſon's life and fortune, by giving him a bent and propenſity to one thing more than another.

Ascendant, in a moral ſenſe, implies a certain ſuperiority which one man has over another, from ſome unknown cauſe.

ASCENDANTS, in law, are oppoſed to deſcendants in ſucceſſion; i. e. when a father ſucceeds his ſon, or an uncle his nephew, &c. heritage is ſaid to aſcend, or to go to aſcendants.

ASCENDING, in aſtronomy, is ſaid of ſuch ſtars as are riſing above the horizon in any parallel of the equator.

Ascending *Latitude*, is the latitude of a planet when going towards the north pole.

Ascending *Node*, is that point of a planet's orbit, in which it paſſes the ecliptic, and ſo proceeds northward.

Ascending *Veſſels*, in anatomy, are thoſe which carry the blood upwards; as the aörta aſcendens.

ASCENSION, in aſtronomy, is either right or oblique. Right aſcenſion of the ſun, or a ſtar, is that degree of the equinoctial, counted from the beginning of aries, which riſes with the ſun or ſtar in a right ſphere. Oblique aſcenſion is an arch of the equator intercepted between the firſt point of aries and that point of the equator which riſes together with a ſtar in an oblique ſphere.

Ascension *Day* ſignifies a feſtival of the Chriſtian church, held ten days before Whitſuntide, in memory of our Saviour's aſcenſion into heaven after his reſurrection.

ASCENSIONAL Difference, in aſtronomy, is the difference between the right and oblique aſcenſion of the ſame point to the ſurface of the ſphere.

ASCENT, in a general ſenſe, implies the motion of a body upwards, or the continual receſs of a body from the earth.

Thus Peripatetics attribute the ſpontaneous aſcent of bodies to a principle of levity inherent in them. The modern philoſophers deny any ſuch thing as ſpontaneous levity; and ſhow, that whatever aſcends, does it by virtue of ſome external impulſe or extruſion.

Thus ſmoke and other rare bodies aſcend in the atmoſphere; and oil, light woods, &c. in water; not by any external principle of levity, but by the ſuperior gravity or tendency downwards of the parts of the medium in which they are.

The aſcent of light bodies in heavy mediums is produced after the ſame manner as the aſcent of the lighter ſcale of a balance. It is not that ſuch ſcale has an internal principle by which it immediately tends upwards; but it is impelled upwards by the preponderancy of the other ſcale; the exceſs of the weight of the one having the ſame effect, by augmenting its impetus downwards, as ſo much real levity in the other; the tendencies mutually oppoſing each other, ſo that action and reaction are always equal.

Ascent *of Bodies on Inclined Planes*, are explained under the Syſtem of MECHANICS.

Ascent *of Fluids*, under the article HYDROSTATICS.

Ascent *of Vapours*, under the article EVAPORATION.

ASCESIS, in medical language, properly denotes exerciſe of the body. It is formed from the verb *ασκειν*, uſed by the ancients in ſpeaking of the ſports and combats of the athletæ.

Ascesis is alſo uſed by philoſophers, to denote an exerciſe conducive to virtue, or to acquire a greater degree of virtue.

ASCETERIUM, in eccleſiaſtical hiſtory, frequently implies a monaſtery, or place ſet apart for the exerciſes of virtue and religion. The word is formed from aſceſis, exerciſe; or aſcetra, one who performs exerciſe. Anciently it ſignified a place where the athletæ or gladiators performed their exerciſes.

ASCETIC, is an ancient appellation given to ſuch perſons as, in the primitive times, devoted themſelves more immediately to the exerciſes of piety and virtue, in a retired life; and particularly to prayer, abſtinence, and mortification.

Ascetic is alſo a title of ſeveral books of ſpiritual exerciſes. As, the Aſciatics, or devout exerciſes of St. Baſil, archbiſhop of Cæſarea in Cappadocia, &c.

ASCHARIANS, in the Mahomedan code, imply the followers of a celebrated doctor of that ſect called Aſcharius.

ASCHIA, in ichthyology, is a ſynonyme or trivial name of the Grayling.

ASCIA, in antiquity, ſignifies the axe which the Roman ſculptors uſed to act and hew their tomb ſtones with, generally repreſented on the head ſtone of deceaſed perſons.

Ascia, in ſurgery, implies a crooked or uneven bandage put upon a certain part for ſome particular purpoſe, ſo that all bandages or poultices, uſed in the art of healing, may be ſaid to be, for ſome cauſe or other, Aſciatical applications, as there is a mode of form to be uſed, with proper changes, in every caſe that can poſſibly fall within the caſualties of human nature; for no two diſeaſes or accidents are exactly the ſame, therefore no two applications or cures can be alike.

ASCIDIA, implies a genus of animals belonging to the order of vermes molluſca. The body is cylindrical, and fixed to a ſhell, rock, &c. It has two appertures; one on the ſummit, the other lower, forming a ſheath.

There are ſix ſpecies, viz. the papilloſum, gelatinoſum, inteſtinalis, quadridentata, ruſtica, and echinata, only one of which, viz. the ruſtica, is found in the Britiſh ſeas. Animals of this genus have the faculty of ſquirting out the water they take in. The expanſion and contraction of their bodies occaſion their aſſuming various forms.

ASCII, among geographers, is an appellation given to thoſe inhabitants of the earth who, at certain ſeaſons of the year, have no ſhadow; ſuch are all the inhabitants of the torrid zone, when the ſun is verticle to them.

ASCINIS *Piſcis*, in ichthyology, is a trivial name for the eglifirnes, or haddock, of which it is a ſynonyme.

ASCITÆ, in antiquity, were a ſect of the Montaniſts, who appeared in the ſecond century. They were ſo called, becauſe they introduced a kind of Bacchanals into their aſſemblies, who danced round a bag or ſkin blowed up; ſaying, they were thoſe new bottles filled with new wine, of which our Saviour makes mention, Matth. ix. 17; they are ſometimes alſo called Aſcodrogitæ.

ASCITES, in medicine, ſignifies the dropſy of the abdomen.

ASCLEPIA, in mythology, was a feſtival of Æſculapius the god of phyſic, obſerved particularly at Epidaurus, where it was attended with a conteſt between the poets and muſicians, whence it was likewiſe called Ιερος Αγων, *the ſacred contention.*

ASCLEPIAD, in ancient poetry, implied a verſe compoſed of four feet, the firſt a ſpondee, the ſecond a choriambus, and the two laſt dactyls; or of four feet and a cæſura, the firſt a ſpondee, the ſecond a dactyl, after which the cæſura, then the two dactyls; as, *Mæcenas atavis edite regibus.*

ASCLEPIAS, Swallow-Wort, in botany, is a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, Contortæ. The generic character is taken from five oval, concave, horn-like nectaria which are found in the flower.

There are 19 Species, viz.

1. The alba, or common ſwallow-wort, which has a root compoſed of many ſtrong fibres connected at top like thoſe of aſparagus, from whence ariſe many ſtalks, in number proportional to the ſize of the roots, which grow two feet high, and are very ſlender at the top: the leaves are placed oppoſite by pairs; the flowers white, growing in umbels near the top of the ſtalk, from whence are ſent out ſmaller umbels.

After the flower is paſt, the two germens become long pointed pods, incloſing many compreſſed ſeeds lying imbricatim, which are crowned with a ſoft white down.

It flowers in June, and the ſeeds ripen in September.

It is a native of the ſouth of France, Spain, and Italy.

2. The Syriaca, or greater Syrian dogſbane, is a perennial plant.

3. The curraſſavica, or baſtard ipecacuanha, is a native of the warm parts of America.

The other ſpecies are not worth enumerating, being of little or no value.

The root of the firſt ſpecies is uſed in medicine. The root has a ſtrong ſmell, eſpecially when freſh, approaching to that of valerian, or nard; the taſte is at firſt ſweetiſh and aromatic, but ſoon becomes bitteriſh, ſub-acrid, and nauſeous. It is eſteemed ſudorific, diuretic, and emmenagogue: it is alſo frequently employed by the French and German phyſicians as an alexipharmic, and ſometimes as a ſuccedaneum to contrayerva, whence it has received the name of Contrayerva Germanorum.

ASCODUTÆ, in antiquity, were a ſect of heretics, in the ſecond century, who rejected all uſe of ſymbols and ſacraments, on this principle, that incorporeal things cannot be communicated by things corporeal, nor divine myſteries by any thing viſible.

ASCOLIA, in Grecian antiquity, was a feſtival celebrated by the Athenian huſbandmen in honour of Bacchus, to whom they ſacrifice a he-goat, becauſe it deſtroys the vines; and, to ſhow the greater indignity to an animal hated by Bacchus, the peaſants, after having killed him, made a foot-ball of his ſkin. Virgil has beautifully deſcribed the occaſion of the ſacrifice, and manner of celebrating the feſtival.

ASCRIPTITII, or Adscriptitii, in law, ſignify a kind of aliens or foreigners newly admitted to the freedom of a city or country.

Ascriptitii, in the Roman military laws, ſignify the recruits appointed to ſupply the loſſes of the legions, called alſo *accenſi*.

ASCYRUM, Peter's-wort, in botany, a genus of the polyandria order, belonging to the polydelphia claſs of plants; and in the natural method ranking under the 20th order, Rotaceæ.

The calyx conſiſts of four leaves; the corolla has four petals; the filaments are numerous, and divided into four bundles.

There are three ſpecies, the crux andreæ, the hypericoides, and the villoſum, all natives of the Weſt Indies or America, but poſſeſſing no property worthy of notice.

ASEKI, or Asekai, imply the name which the Turks give to the favourite ſultaneſſes who have brought forth ſons. Theſe are greatly diſtinguiſhed above others in their apartments, attendants, penſions, and honours.

The ſultana who firſt preſents the emperor with a male child, is reckoned the chief favourite, is called *buyuk aſeki*, and ranks as a legitimate wife: though, from the time of Bajazet I. the ſultans are forbid to marry by a public law, which Solyman II. violated in favour of Roxalana.

ASELLUS, in zoology, ſignifies the trivial name of a ſpecies of oniſcus.

ASH, in botany, is the ſame as Fraxinus.

Ash *Hole*, among chemiſts, ſignifies the loweſt part of a furnace; and is intended to receive the aſhes falling from the fire, and to give a paſſage to the air which is to be introduced into the furnace, to keep up the combuſtion.

Ash *Wedneſday*, ſignifies the firſt day of Lent; ſuppoſed to have been ſo called from a cuſtom in the church, of ſprinkling aſhes that day on the heads of penitents then admitted to penance.

ASHES, are the earthy particles of combuſtible ſubſtances after they have been burnt.

If the aſhes are produced from vegetable bodies, they contain a conſiderable quantity of fixed ſalt, blended with the terrene particles: and from theſe aſhes the fixed alkaline ſalts called pot-aſh, pearl-aſh, &c. are extracted.

The aſhes of all vegetables are vitreſiable, and found to contain iron. They are alſo an excellent manure for cold and wet grounds.

Several religious ceremonies depend upon the uſe of aſhes. St. Jerome relates, that the Jews in his time rolled themſelves in aſhes, as a ſign of mourning.

To repent in ſackcloth and aſhes, is a frequent expreſſion in Scripture for mourning and being afflicted for our ſins.

There was a ſort of lye and luſtral water made with the aſhes of an heifer ſacrificed upon the great day of expiation; the aſhes of which were diſtributed to the people, and this water was uſed in purifications as often as any touched a dead body, or was preſent at funerals, Numb. xix. 17. The Pſalmiſt in great ſorrow ſays, that he had eaten aſhes as if it were bread, Pſ. cii. 9.; which, however, is to be conſidered as an hyperbole. He ſat on aſhes, he threw aſhes on his head; his food, his bread, was ſpoiled with the aſhes wherewith he was covered.

The ancient Perſians had a ſort of puniſhment for ſome great criminals, which conſiſted in executing them in aſhes. 2 Mac. xiii. 5, 6.

ASHLAR, is a term uſed among builders; by which they imply free ſtone, as they come out of the quarry of different lengths and thickneſſes.

ASHLERING, among builders, ſignifies quartering, to lath to, in garrets, about two and a half, or three feet high, perpendicular to the floor, up to the under ſide of the rafters.

ASIARCHÆ, in antiquity, termed by St. Paul, Chief of Aſia, Acts xix. 31. were the Pagan Pontifs of Aſia, choſen to ſuperintend and have the care of the public games; which they did at their own expence; upon which account they were always the richeſt and moſt conſiderable men of the towns.

ASIDE, in the drama, implies ſomething ſaid by an actor, which ſome of the other actors preſent, are ſuppoſed not to hear.

ASILUS, or Hornet-fly, in entomology, is a genus of inſects belonging to the order of inſecta diptera. It has two wings; and a horny, ſtrait, two-valved beak. There are 17 ſpecies of this inſect. Many of them wound in a very painful manner, and are particularly troubleſome to cattle in low meadows; others of them are quite harmleſs.

ASLANI, in commerce, is a ſilver coin, worth from 115 to 120 aſpers, and is ſynonymous with Aſper.

ASMODAI, or Asmodeus, was a name given by the Jews to the prince of demons; which, according to ſome, is the ſame with Sammael.

ASMOTUS, in ichthyology, is a ſpecies of the Silenus.

ASORE, or Asker, in zoology, is a ſynonyme of the water newt or eft.

ASP, in natural hiſtory, a ſmall poiſonous kind of ſerpent, whoſe bite gives a ſpeedy but eaſy death. It is ſaid to be thus denominated from the Greek ασπις, *ſhield*, in regard to the manner of its lying convolved in a circle, in the centre of which is the head, which it exerts, or raiſes, like the umbo or umbilicus of a buckler.

This ſpecies of ſerpent is frequently mentioned by authors; but ſo diffuſely deſcribed, that it is not eaſy to determine which of the ſpecies known at preſent may properly be called by this name. It is ſaid to be common in Africa, and on the banks of the Nile.

It is with the aſp that Cleopatra is ſaid to have diſpatched herſelf, and prevented the deſigns of Auguſtus, who intended to have carried her captive to adorn his triumphal entry into Rome. However, the fact is conteſted; which Brown places among vulgar errors.

The indications of that queen's having uſed the miniſtry of the aſp, were only two almoſt inſenſible pricks found in her arm; and Plutarch ſays it is unknown what ſhe died of. At the ſame time, it muſt be obſerved, that the ſlightneſs of the pricks found in her arm furniſhes no preſumption againſt the fact; for no more than the prick of a needle-point dipt in the poiſon was neceſſary for the purpoſe.

Lord Bacon deſcribes the bite of the aſp as the leaſt painful of all the inſtruments of death. He ſuppoſes it to have an affinity to opium, but to be leſs diſagreeable in its operation; which opinion ſeems to correſpond with the accounts of the beſt writers, as well as with the effects deſcribed to have been produced upon Cleopatra.

The ancients had a plaſter called δι Ασπιδων, made of this terrible animal, of great efficacy as a diſcutient of ſtrumæ and other indurations, and uſed likewiſe againſt pains of the gout.

The fleſh and ſkin, or exuviæ, of this creature, had alſo their ſhare in the ancient materia medica.

ASPALATHUS, African Broom, in botany, is a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, Papilionaceæ.

The calyx conſiſts of 5 diviſions; the pod is oval, and contains 2 ſeeds.

There are 19 ſpecies; all of which are natives of warm climates, and muſt be preſerved in ſtoves by thoſe who would cultivate them here.

The roſe-wood is one of the ſpecies, but of which we have yet had no particular deſcription.

It was anciently in much repute as an aſtringent, ſtrengthener, and drier; but it is now diſuſed in internal practice. It affords an oil of an admirable ſcent, reputed one of the beſt perfumes: it is chiefly uſed in ſcenting pomatums and liniments.

ASPARAGUS, Sparagus, Sperage, or Sparrowgrass, in botany, is a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 11th order, Sarmentaceæ.

The calyx is quinquepartite, and erect; the three inferior petals are bent outwards; the berry has three cells, and contains two ſeeds.

There are 10 ſpecies, but the only one cultivated in the gardens is that with an upright herbaceous ſtalk, briſtly leaves, and equal ſtipula, or the common aſparagus. The other ſpecies are kept in the gardens of the curious for the ſake of variety.

The garden aſparagus is with great care cultivated for the uſe of the table. The propagation of this uſeful plant is from ſeed; which muſt be ſown about the beginning of February in a bed of rich earth. They muſt not be ſown too thick, and trod into the ground, the earth raked over them ſmooth: the bed is to be kept clear of weeds all the ſummer; and in October, when the ſtalks are withered and dry, a little rotten dung muſt be ſpread half an inch thick over the whole ſurface of the bed. The ſpring following, the plants will be fit to plant out for uſe; the ground muſt therefore be prepared for them by trenching it well, and burying a large quantity of rotten dung in the trenches, ſo that it may lie at leaſt ſix inches below the ſurface of the ground: when this is done, level the whole plot exactly, taking out all the looſe ſtones. This is to be done juſt at the time when the aſparagus is to be planted out; which muſt be in the beginning of March, if the ſoil is dry and the ſeaſon forward; but in a wet ſoil, it is better to wait till the beginning of April, which is about the ſeaſon that the plants are beginning to ſhoot.

The ſeaſon being come, the roots muſt be carefully taken up with a narrow pronged dung fork, ſhaking them out of the earth, ſeparating them from each other, and obſerving to lay all their heads even, for the more convenient planting them.

Between every four rows a ſpace of two feet and a half ſhould be left for walking in, to cut the aſparagus. When the aſparagus is thus planted, a crop of onions may be ſown on the ground, which will not at all hurt it. A month after this, the aſparagus will come up, when the crop of onions muſt be thinned, and the weeds carefully cleared away. About Auguſt the onions will be fit to fill up.

In October following, cut off the ſhoots of the aſparagus within two inches of the ground, clear well all weeds away, and throw up the earth upon the beds, ſo as to leave them five inches above the level of the alleys. A row of colworts may be planted in the middle of the alleys, but nothing muſt be now ſown on the beds. In the ſpring the weeds muſt be howed up, and all the ſummer the beds kept clear of weeds.

In October they muſt be turned, and earthed again, as the preceding ſeaſon. The ſecond ſpring after planting, ſome of the young aſparagus may be cut for the table. The larger ſhoots ſhould only be taken, and theſe ſhould be cut at two inches under ground, and the beds every year managed as in the ſecond year.

The roots have a bitteriſh mucilaginous taſte, inclining to ſweetneſs; the fruit has much the ſame kind of taſte; the young ſhoots are more agreeable than either. Aſparagus promotes appetite, but affords little nouriſhment. It gives a ſtrong ill ſmell to the urine in a little time after eating it, and for this reaſon chiefly is ſuppoſed to be diuretic: it is likewiſe eſteemed aperient and deobſtruent; the root is one of the five called opening roots.

Aſparagus appears from experience to contribute very little either to the exciting of urine when ſuppreſſed, or increaſing its diſcharge; and in caſes where aperient medicines generally do ſervice, this has little or no effect.

Aspacia, among ancient phyſicians implies a conſtrictive medicine for the *prudenda muliebria*. It conſiſted only of wool, moiſtened with an infuſion of unripe galls.

ASPATICUM, in eccleſiaſtical hiſtory, was a place, or apartment, adjoining to the ancient churches, in which the biſhop and preſbyters ſat, to receive the ſalutations of the perſons who came to viſit them, deſire their bleſſing, or conſult them on buſineſs.

This was alſo called *aſpaticum*, *diaconicum*, *roceptorium*, *metatorium*, or *meſatorium*, and *ſalutatorium*; in Engliſh, greeting-houſe.

ASPECT, in aſtronomy, denotes the ſituation of the planets and ſtars with reſpect to each other.

There are five different aſpects. 1. Sextile aſpect is when the planets or ſtars are 60° diſtant, and marked thus *. 2. The quartile, or quadrate, when they are 90° diſtant, marked □. 3. Trine, when 120° diſtant, marked △. 4. Oppoſition, when 180° diſtant, marked ☍. And, 5. Conjunction, when both in the ſame degree, marked ☌.

It is to be obſerved, that theſe aſpects being firſt introduced by aſtrologers, were diſtinguiſhed into benign, malignant, and indifferent; the quartile and oppoſition being accounted malign; the trine and ſextile, benign or friendly; and the conjunction, indifferent.

ASPEN Tree, in botany, is the ſame as Populus.

ASPER, in grammar, ſignifies an accent peculiar to the Greek language, marked thus (ʽ); and importing, that the letters over which it is placed ought to be ſtrongly aſpirated, or pronounced, as if an *h* were joined with them.

Asper, or *Aſpre*, in commerce, is a Turkiſh coin, three of which make a medine.

ASPERA Arteria, in anatomy, is the ſame with the wind-pipe or trachea.

ASPERIFOLIATE, or Asperifolious, among botaniſts, imply ſuch plants as have rough leaves placed alternately on their ſtalks, and a monopetalous flower divided into five parts.

They conſtitute an order of plants in the *Fragmenta methodi naturalis* of Linnæus, in which are theſe genera, viz. tournefortia, cerinthe, ſymphytum, pulmonaria, anchuſa, lithoſpermum, myoſotis, heliotropium, cynogloſſum, aſperugo, lycopſis, echium, borrago: *magis minuſve oleraceæ, mucilaginoſæ, & glutinoſæ ſunt.* Lin.

In the preſent ſyſtem of nature theſe are among the pentandria monogynia.

ASPERIFOLIÆ Plantæ, in botany, are rough leaved plants. The name of a claſs in Hermanus, Boerhaave, and Ray's methods, conſiſting of plants which have four naked ſeeds, and whoſe leaves are rough to the touch.

In Tournefort's Syſtem, theſe plants conſtitute the third ſection or order of the ſecond claſs; and in Linnæus's Sexual Method, they make a part of the pentandria monogynia.

ASPERITY, implies the inequality of the ſurface of any body, which hinders the hand from paſſing over it freely. From the teſtimony of ſome blind perſons, it has been ſuppoſed that every colour hath its particular degree of aſperity.

ASPERSION, ſignifies the act of ſprinkling with ſome liquid ſubſtance. Hence in the ceremonial of baptiſm ſome contend for aſperſion, whilſt others as ſtrenuouſly oppoſe them, and declare for immerſion.

ASPERUGO, small wild buglos, in botany, is a genus of the petandria monogynia claſs; and in the natural method ranking under the 49th order, Aſperifoliæ.

The calyx of the fruit is compreſſed with folds flatly parallel, and ſinuous.

There are two ſpecies, viz. the procumbens, or wild buglos, a native of Britain; and the Egyptiaca, a native of Egypt.

ASPERULA, Asperjula, or Woodroof, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 47th order, Stellatæ.

The corolla is infundibuliform; and the capſule contains two globular ſeeds.

There are two ſpecies, viz. the cynanchia and the odorata. Both of them grow wild in Britain, ſo are ſeldom admitted into gardens. The fruit is found on chalky hills. The latter in woods and copſes, and flowering in May. It has an exceeding pleaſant ſmell, which is improved by moderate exſiccation; the taſte is ſubſaline, and ſomewhat auſtere. It imparts its flavour to vinous liquors.

Aſperula is ſuppoſed to attenuate viſcid humours, and ſtrengthen the tone of the bowels; it is recommended in obſtructions of the liver and biliary ducts, and by ſome in epilepſies and palſies.

The ſmell of it is ſaid to drive away ticks and other inſects. The roots of the firſt are uſed in Sweden to dye red.

ASPHALITES, in anatomy, ſignifies the 5th vertebra of the loins, being ſo called from its ſituation, as it is conceived to ſupport the whole ſpine of the loins.

The wood is compounded of the privative α, and σφαλλω, I ſupplant.

ASPHALTUM, Bitumen Judaicum, or Jews Pitch, in foſſilogy, is a light ſolid bitumen, of a duſky colour on the outſide, and a deep ſhining black within; of very inſipid taſte; having ſcarcely any ſmell, unleſs heated, when it emits a ſtrong pitchy one. It is found in a ſoft or liquid ſtate on the ſurface of the Dead Sea, and by age grows dry and hard.

The ſame kind of bitumen is found in the earth, in other parts of the world, viz. in China, America, and in ſome parts of Europe, as the Carpathian hills, France, Neuſchatel, &c.

ASPHODELUS, Asphodel, or King's Spear, in botany, is a genus of the monogynia order, belonging to the hexandria claſs of plants. The calyx is divided into ſix parts; and the nectarium conſiſts of ſix valves covering the nectarium.

There are five ſpecies, viz.

1. The luteus, or common yellow aſphodel, hath roots compoſed of many thick fleſhy fibres, which are yellow, and joined into a head at the top; from whence ariſe ſtrong round ſingle ſtalks near three feet high, garniſhed on the upper part with yellow ſtar ſhaped flowers, which appear in June, and the ſeeds ripen in autumn.

2. The ramoſus, or branching aſphodel, hath roots compoſed of fleſhy fibres, to each of which is faſtened on oblong bulb as large as a ſmall potatoe; the leaves are long and flexible, having ſharp edges; between theſe come out the flower ſtalks, which ariſe more than three high, ſending forth many lateral branches. The upper parts of theſe are adorned with white ſtar ſhaped flowers, which grow in long ſpikes flowering gradually upward.

3. The ramoſus, or unbranched aſphodel, hath roots like the ſecond, but the leaves are longer and narrower; the ſtalks are ſingle, never putting out in any ſide branches.

4. The albus, with keel ſhaped leaves, hath roots compoſed of ſmaller fibres than the two laſt, nor are the knobs at bottom half ſo large; the leaves are long, almoſt triangular, and hollow like the keel of a boat.

5. The ſtuloſus, or annual branching ſpiderwort, hath roots compoſed of many yellow fleſhy fibres: the leaves are ſpread out from the crown of the root, cloſe to the ground, in a large cluſter; theſe are convex on their under ſize, but plain above. They produce white ſtarry flowers, with purple lines on the outſide.

The way to increaſe theſe plants is by parting their roots in Auguſt. They may be raiſed from ſeeds ſown in Auguſt, and will produce flowers the ſecond year.

ASPHURELATA, in natural hiſtory, are ſemimetallic foſſils, fuſible by fire, and not malleable in their pureſt ſtate, being in their native ſtate compounded with ſulphur and other adventitious matter, ſo that they are reduced to what are called ores.

Of this ſeries of foſſils there are only five bodies, each of which makes a diſtinct genus, viz. anatomy, biſmuth, cobalt, zinc, and quickſilver.

ASPIRATE, in grammar, denotes words marked with the ſpiritus aſper.

ASPIRATION, among grammarians, is uſed to denote the pronouncing a ſyllable with ſome vehemence.

ASPLENIUM, Ceterach, a genus of the order of filices, belonging to the cryptogamia claſs of plants. The parts of fructification are ſituated in the ſmall ſparſe line under the diſk of the leaves. There are 24 ſpecies; the two moſt remarkable of which, and the only ones worth noticing, are natives of Great Britain, and grow upon old walls or moiſt rocks; one is called ſcolopendrium, or hart's-tongue; the other is, properly, ceterach, alſo called ſpleenwort. It has an herbaceous, ſomewhat mucilaginous, roughiſh taſte: it is recommended as a pectoral, and for promoting urine in nephritic caſes.

ASS, in zoology, is ranked as a ſpecies of equus, or the horſe.

Coronation of the Ass, in antiquity, was a part of the ceremony of the feaſt of Veſta, wherein the bakers put bread crowns on the heads of theſe quadrupeds. This honour, it ſeems, was done the beaſt, becauſe, by its braying, it had ſaved Veſta from being raviſhed by the Lampſacan god. Hence the formula, *Veſtæ delicium eſt aſinus.*

ASSAI, in muſic, according to ſome, ſignifies quick; and, to others, that the motion of the piece be kept in a middle degree of quickneſs or ſlowneſs.

ASSARIUM, in antiquity, denotes a ſmall copper coin, being a part or diminutive of the *as.* We find mention of the aſtarion in the goſpel of St. Matthew, chap. x. verſe 29.

ASSARON, or Omer, a meaſure of capacity, anciently in uſe among the Hebrews, containing five pints. It was the meaſure of manna which God appointed for every Iſraelite.

ASSASIN, or Assassin, a perſon who kills another with the advantage either of an inequality in the weapons, or by means of the ſituation of the place, or by attacking him at unawares.

The word aſſaſſin is ſaid by ſome to have been brought from the Levant, where it took its riſe from a certain prince of the family of the Arſacidæ; popularly called aſſaſſins, living in a caſtle between Antioch and Damaſco, and bringing up a number of young men, ready to pay a blind obedience to his commands; whom he employed in murdering the princes with whom he was at enmity But, according to Mr. Volney, the word Haſſaſſin, (from the root haſs, "to kill, to aſſaſſinate, to liſten, to ſurpriſe,") in the vulgar Arabic, ſignifies "Robbers of the night", perſons who lie in ambuſh to kill the unwary, and plunder them of their property.

ASSASSINS, a tribe or clan in Syria, called alſo Iſmaelians and Bataniſts or Batenians. Theſe people probably owed their origin to the Karmatians, a famous heretical ſect among the Mahometans, who ſettled in Perſia about the year 1090; whence, in proceſs of time, they ſent a colony into Syria, where they became poſſeſſed of a conſiderable track of land among the mountains of Lebanon, extending itſelf from the neighbourhood of Antioch to Damaſcus.

Moſt ſovereigns paid ſecretly a penſion to the ſcheik, however ſcandalous and derogatory it might be to the luſtre of majeſty, for the ſafety of their perſons.

Theſe people reigned a long time in Perſia, and on Mount Lebanon. Hulaku, a khan of the Mogul Tartars, in the year 655 of the Hegira, or 1254 of the Chriſtian æra, entered their country and diſpoſſeſſed them of ſeveral places; but it was not till the year 1272 that they were totally conquered. This atchievement was owing to the conduct and intrepidity of the Egyptian forces ſent againſt them by the ſultan Bibaris. It has, however, been thought that the Druſes, who ſtill reſide among the eminences of Mount Lebanon, and whoſe religion and cuſtoms are ſo little known, are a remnant of thoſe barbarians.

ASSAULT, in law, is an attempt or offer to beat another, without touching him: as if one lifts up his cane or his fiſt in a threatening manner at another; or ſtrikes at him, but miſſes him; this is an aſſault, *inſultus*, which Finch deſcribes to be "an unlawful ſetting upon one's perſon." This alſo is an inchoate violence, amounting conſiderably higher than bare threats; and, therefore, though no actual ſuffering is proved, yet the party injured may have redreſs by action of treſpaſs, *vi et armis*, wherein he may recover damages as a compenſation for the injury.

Assault, in the military art, a furious effort made to carry a fortified poſt, camp, or fortreſs, wherein the aſſailants do not ſcreen themſelves by any works: while the aſſault continues, the batteries ceaſe, for fear of killing their own men.

ASSAY, Essay, or Say, in metallurgy, the proof or trial of the goodneſs, purity, value, &c. of metals and metalline ſubſtances. The method ſtill in uſe, of aſſaying gold and ſilver, was firſt eſtabliſhed by an act of the Engliſh parliament 1354.

Assaying, *ars docimaſtica*, in its extent, comprehends particular manners of examining every ore, or mixed metal, according to its nature, with the beſt adapted fluxes; ſo as to diſcover, not only what metals, and what proportions of metal, are contained in ores; but likewiſe how much ſulphur, vitriol, allum, arſenic, ſmelt, &c. may be obtained from every one reſpectively.

Aſſaying is more particularly uſed by moneyers and goldſmiths, for the making a proof or trial by the cuppel, or teſt, of the fineneſs or purity of the gold and ſilver to be uſed in the coining of money, and manufacture of plate, &c. or that have been already uſed therein.

There are two kinds of aſſaying; the one before metals are melted, in order to bring them to their proper fineneſs; the other after they are ſtruck, to ſee that the ſpecies be ſtandard. For the firſt aſſay, the aſſayers take 14 or 15 grains of gold, and half a drachm of ſilver, if it be for money; and 18 grains of the one, and a drachm of the other, if for other occaſions.

As to the ſecond aſſay, it is made of one of the pieces of money already coined, which they cut in four parts. The quantity of gold for an aſſay, among us, is ſix grains; in France, nearly the ſame; and in Germany, about three times as much.

Assay *Balance*, or *Eſſay Balance*, the flat pieces of glaſs often placed under the ſcales of an aſſay-balance, which ſeem, by their power of electricity, capable of attracting, and thereby making the lighter ſcale preponderate, where the whole matter weighed is ſo very ſmall.

The electricity of a flat ſurface, of about three inches ſquare, has been known to hold down one ſcale, when there were about 200 grains weight in the other.

Assay *Maſter* or *Eſſay-Maſter*, an officer under certain corporations entruſted with the care of making true touch, or aſſay, of the gold and ſilver brought to him; and giving a juſt report of the goodneſs or badneſs thereof. Such is the aſſay-maſter of the mint in the Tower, called alſo aſſayer of the king.

The aſſay-maſter of the goldſmiths company, is a ſort of aſſiſtant warden, called alſo a touch-warden, appointed to ſurvey, aſſay, and mark all the ſilver-work, &c. committed to him.

There are alſo aſſay-maſters appointed by ſtatute, at York, Exeter, Briſtol, Cheſter, Norwich, Newcaſtle, and Birmingham, for aſſaying wrought plate. The aſſay-maſter is to retain eight grains of every pound Troy of ſilver brought to him; four whereof are to be put in the pix, or box of deal, to be re-aſſayed the next year, and the other four to be allowed him for his waſte and ſpillings.

Note, The number of pennyweights ſet down in the aſſay-maſter's report, is to be accounted as per pound, or ſo much in every pound of 12 ounces Troy. For every 20 pennyweight, or ounce Troy, the ſilver is found by the aſſay to be worſe than ſtandard, or ſterling, ſixpence is to be deducted; becauſe every ounce will coſt ſo much to reduce it to ſtandard goodneſs, or to change it for ſterling.

In gold, for every carat it is ſet down to be worſe than ſtandard, you muſt account that in the ounce Troy it is worſe by ſo many times 3s. 8d.; and for every grain it is ſet down worſe, you muſt account it worſe by ſo many times 11d. in the ounce Troy; and for every half grain 5½d.: for ſo much it will coſt to make it of ſtandard goodneſs, &c.

ASSEMBLAGE, the uniting or joining of things together; or the things themſelves ſo united or joined. It is alſo uſed, in a more general ſenſe, for a collection of various things ſo diſpoſed and diverſified, that the whole produces ſome agreeable effect.

ASSEMBLY, the meeting of ſeveral perſons, in the ſame place, upon the ſame occaſion.

Assembly, in the beau monde, an appointed meeting of faſhionable perſons of both ſexes, for the ſake of play, dancing, gallantry, converſation, &c.

Assembly, in the military art, the ſecond beating of a drum before a march; at which the ſoldiers ſtrike their tents, roll them up, and ſtand to arms.

Assemblies of the clergy are called convocations, ſynods, councils. The annual meeting of the church of Scotland is called a General Aſſembly: in this aſſembly His Majeſty is repreſented by his commiſſioner, who diſſolves one meeting, and calls another, in the name of the King, while the moderator does the ſame in the name of the Lord Jeſus Chriſt.

Assemblies of the ſtates of kingdoms are called parliaments; ſuch as thoſe of Great Britain, France, Sweden and Poland.

ASSENT, in a general ſenſe, implies an agreement to ſomething propoſed or affirmed by another.

Royal Assent, the approbation given by the king to a bill in parliament, after which it becomes a law.

ASSERTION, in the language of the ſchools, a propoſition advanced by the aſſertor, who avows the truth of it, and is ready to defend it.

ASSESSOR, an inferior officer of juſtice, appointed chiefly to aſſiſt the ordinary judge with his opinion and advice.

Assessor, is alſo one who aſſeſſes, or ſettles taxes and other public dues.

ASSETS, in law, ſignifies goods enough to diſcharge that burthen which is caſt upon the executor or heir, in ſatisfying the debts and legacies of the teſtator or anceſtor. Aſſets are real or perſonal. Where a man hath lands in fee ſimple, and dies ſeiſed thereof, the lands which come to his heir are aſſets real; and where he dies poſſeſſed of any perſonal eſtate, the goods which come to the executors are aſſets perſonal.

Aſſets are alſo divided into aſſets per deſcent, and aſſets inter maines. Aſſets by deſcent is where a perſon is bound in an obligation, and dies ſeiſed of lands which deſcend to the heir, the land ſhall be aſſets, and the heir ſhall be charged as far as the land to him deſcended will extend. Aſſets inter maines, is when a man indebted makes executors, and leaves them ſufficient to pay his debts and legacies; or where ſome commodity or profit ariſeth to them in the right of the teſtator, which are called aſſets in their hands.

ASSEVERATION, a poſitive and vehement affirmation of ſomething.

ASSIDENT Signs, in medicine, are ſymptoms which uſually attend a diſeaſe, but not always; hence differing from pathognomic ſigns, which are inſeparable from the diſeaſe: e. gr. In the pleuriſy, a pungent pain in the ſide; in an acute fever, difficulty of breathing, &c. collectively taken, are pathognomic ſigns; but that the pain extends to the hypochondrium or clavicle, or that the patient lies with more eaſe on one ſide than on the other, are aſſident ſigns.

ASSIDUUS, or Adsiduus, among the Romans, denoted a rich or wealthy perſon.

ASSIENTO, a Spaniſh word ſignifying a farm, in commerce, is uſed for a bargain between the king of Spain and other powers, for importing negroes into the Spaniſh dominions in America, and particularly to Buenos Ayres. The firſt aſſiento was made with the French Guinea company; and, by the treaty of Utrecht, transferred to the Engliſh, who were to furniſh 4800 negroes annually.

ASSIGN, in common law, a perſon to whom a thing is aſſigned or made over.

ASSIGNATION, an appointment to meet. The word is generally underſtood of love-meetings.

ASSIGNEE, in law, a perſon appointed by another to do an act, tranſact ſome buſineſs, or enjoy a particular commodity.

ASSIGNING, in a general ſenſe, implies making over the right of one perſon to another. In a particular ſenſe, it ſignifies pointing out ſomething; as, an error, falſe judgment, or waſte.

ASSIGNMENT, transferring the intereſt one has in a leaſe, or other thing, to another perſon.

ASSIMILATION, in phyſics, is that motion by which bodies convert other bodies related to them, or at leaſt ſuch as are prepared to be converted, into their own ſubſtance and nature. Thus, flame multiplies itſelf upon oily bodies, and generates new flame; air upon water, and produces new air; and all the parts, as well ſimilar as organical, in vegetables and animals, firſt attrack with ſome election or choice, nearly the ſame common or not very different juices for aliment, and afterwards aſſimilate or convert them to their own nature.

ASSINARII, in heathen Rome, was a name given to both Jews and Chriſtians by the Pagans, intimating that they might with equal propriety worſhip an aſs, as a deity they could neither hear, ſee, or converſe with.

ASSISE, in old Engliſh law-books, is defined to be an aſſembly of knights, and other ſubſtantial men, together with a juſtice, in a certain place, and at a certain time: but the word, in its preſent acceptation, implies a court, place, or time, when and where the writs and proceſſes, whether civil or criminal, are decided by judge and jury.

The counties of England are divided into ſix circuits; and two judges are aſſigned by the king's commiſſion, who hold their aſſiſes twice a-year in every county, except London and Middleſex, where courts of *niſi prius* are holden in and after every term, before the chief or other judge of the ſeveral ſuperior courts; and except the four northern counties, where the aſſiſes are taken only once a-year, to try by a jury of the reſpective counties the truth of ſuch matters of fact as are then under diſpute in the courts of Weſtminſter Hall.

The judges upon their circuits ſit by virtue of five ſeveral authorities. 1. The commiſſion of the peace, in every county of the circuits; and all juſtices of the peace of the county are bound to be preſent at the aſſiſes; and ſheriffs are alſo to give their attendance on the judges, or they ſhall be fined. 2. A commiſſion of oyer and terminer, directed to them and many other gentlemen of the county, by which they are empowered to try treaſons, felonies, &c. and this is the largeſt commiſſion they have. 3. A commiſſion of general gaol-delivery, directed to the judges and the clerk of aſſiſe aſſociate, which gives them power to try every priſoner in the gaol committed for any offence whatſoever, but none but priſoners in the gaol; ſo that one way or other they rid the gaol of all the priſoners in it. 4. A commiſſion of aſſiſe, directed to the judges and clerk of aſſiſe, to take aſſiſes; that is, to take the verdict of a peculiar ſpecies of jury called an aſſiſe, and ſummoned for the trial of landed diſputes. The other authority is, 5. That of *niſi prius*, which is a conſequence of the commiſſion of aſſiſe, being annexed to the office of thoſe juſtices by the ſtatute of Weſtm. 2. 13 Edw. I. c. 30. And it empowers them to try all queſtions of fact iſſuing out of the courts of Weſtminſter, that are then ripe for trial by jury.

ASSOCIATION, the act of aſſociating, or conſtituting a ſociety, or partnerſhip, in order to carry on ſome ſcheme or affair with more advantage.

Association *of Ideas*, is where two or more ideas conſtantly and immediately follow or ſucceed one another in the mind, ſo that one ſhall almoſt infallibly produce the other whether there be any natural relation between them or not.

ASSOILZIE, in law, to abſolve or free.

ASSONANCE, in rhetoric and poetry, a term uſed where the words of a phraſe or a verſe have the ſame ſound or termination, and yet make no proper rhyme.

ASSUMPSIT, in the law of England, a voluntary or verbal promiſe, whereby a perſon aſſumes, or takes upon him to perform or pay any thing to another.

ASSUMPTION, a feſtival in the Romiſh church, in honour of the miraculous aſcent of the Virgin Mary into heaven: the Greek church, who alſo obſerve this feſtival, celebrate it on the 15th of Auguſt with great ceremony.

Assumption, in logic, is the minor or ſecond propoſition in a categorical ſyllogiſm.

Assumption is alſo uſed for a conſequence drawn from the the propoſitions whereof an argument is compoſed.

ASSUMPTIVE Arms, in heraldry, are ſuch as a perſon has a right to aſſume, with the approbation of his ſovereign, and of the heralds: thus, if a perſon, who has no right by blood, and has no coat of arms, ſhall captivate, in any lawful war, any gentleman, nobleman, or prince, he is, in that caſe, intitled to bear the ſhield of that priſoner, and enjoy it to him and his heirs for ever.

ASSUROR, a merchant, or other perſon, who makes out a policy of aſſurance, and thereby inſures a ſhip, houſe, or the like.

ASTANDA, in antiquity, a royal courier or meſſenger.

ASTARTE, in Pagan mythology, a Phœnician goddeſs, called the queen of heaven, and the goddeſs of the Sidonians.

ASTER, Star-wort, a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ diſcoides. The receptacle is naked; the pappus is ſimple; the rays of the corolla are 10; and the calyx is imbricated. There are above 30 ſpecies, all of which may be raiſed from ſeed ſown either in autumn or ſpring: but the greateſt part being perennial plants, and increaſing greatly at the roots, are generally propagated by parting their roots early in the ſpring, and they will grow in almoſt any ſoil or ſituation; and the larger ſorts increaſe ſo faſt, that, if not prevented, they will in a little time run over a large ſpace of ground. They grow beſt in the ſhade: the lower kinds do not run ſo much at the root, but ſhould be taken up and tranſplanted every other year; which will make them produce much fairer flowers. Some few ſorts, which are natives of warm climates, will require artificial heat to raiſe them, if not to preſerve them.

ASTERIA, in zoology, a name by which ſome authors have called the *falco palumbarius*, or *goſhawk*.

Asteria is alſo the name of a gem, uſually called the *cat's eye*, or *oculus cati*. It is a very ſingular and very beautiful ſtone, and ſomewhat approaches to the nature of the opal, in having a bright included colour, which ſeems to be lodged deep in the body of the ſtone, and ſhifts about, as it is moved, in various directions: but it differs from the opal in all other particulars, eſpecially in its want of the great variety of colours ſeen in that gem, and in its ſuperior hardneſs. It is uſually found between the ſize of a pea and the breadth of a ſixpence; is almoſt always of a ſemicircular form, broad and flat at the bottom, and rounded and convex at the top; and is naturally ſmooth and poliſhed. It has only two colours, a pale brown and a white; the brown ſeeming the ground, and the white playing about in it, as the fire colour in the opal. It is conſiderably hard, and will take a fine poliſh, but is uſually worn with its native ſhape and ſmoothneſs. It is found in the Eaſt and Weſt Indies, and in different parts of Europe.

Asteria is alſo the name of an extraneous foſſil, called in Engliſh the *ſtar-ſtone*. Theſe foſſils are ſmall, ſhort, angular, or ſulcated columns, between one and two inches long, and ſeldom above a third of an inch in diameter: compoſed of ſeveral regular joints; when ſeparated, each reſembles a radiated ſtar. They are, not without reaſon, ſuppoſed to be a part of ſome ſea-fiſh petrified, probably the aſterias or ſea-ſtar. The aſteria is alſo called aſtrites, aſtroites, and aſteriſcus. They may be reduced to two kinds: thoſe whoſe whole bodies make the form of a ſtar; and thoſe which in the whole are irregular, but adorned as it were with conſtellations in the parts. The curious frequently meet with theſe ſtones in many parts of England, particularly at Cleydon in Oxfordſhire.

ASTERIAS, Star-fish, or Sea-star, in zoology, a genus of the order of vermes molluſca. It has a depreſſed body, covered with a coriaceous coat; is compoſed of five or more ſegments, running out from a central part, furniſhed with numerous tentacula; and has the mouth in the centre.

Among the various ſpecies of the aſterias, the following are found in the Britiſh ſeas. 1. The glacialis, with five rays, depreſſed, broad at the baſe, yellow, and having a round ſtriated operculum on the back, is the moſt common; it feeds on oyſters, and is very deſtructive to the beds. 2. The clathatra, or cancellated ſea-ſtar, with five ſhort thick rays, hirſute beneath, cancellated above, is found with the former, but more rare. 3. The oculata, with five ſmooth rays, dotted or punctured, is of a fine purple colour, and is found about Angleſea. 4. The hiſpida, with five rays, broad, angulated at top, and rough with ſhort briſtles, is of a brown colour, and likewiſe found about Angleſea. 5. The placenta, with five very broad and membranaceous rays, extremely thin and flat, is found about Weymouth. 6. The ſpherulata, with a pentagonal indented body; a ſmall globular bead between the baſe of each ray; the rays ſlender, jointed, taper, and hirſute on their ſides; found off Angleſea. 7. The caput meduſæ, or arboreſcent ſea-ſtar, with five rays iſſuing from an angular body; the rays dividing into innumerable branches, growing ſlender as they recede from the baſe. Theſe the animal, in ſwimming, ſpreads like a net to their full length; and when he perceives any prey within them, draws them in again, thus catching it with all the dexterity of a fiſherman. It is an inhabitant of every ſea; and is called by ſome the *Magellanic ſtar-fiſh* and *baſket fiſh*. When it extends its rays fully, it forms a circle of near three feet in diameter. The fragments of theſe rays furniſh the foſſile entrochi. There are ſeveral other ſpecies mentioned by authors; ſome of them 10, 12, 13, or even 14 rays.

Asterias likewiſe ſignifies the ancient name of the bittern.

ASTERISK, a mark in form of a ſtar (*), placed over a word or ſentence, to refer the reader to the margin, or elſewhere, for a quotation, explanation, or the like.

ASTERN, a ſea-phraſe, uſed to ſignify any thing at ſome diſtance behind the ſhip.

ASTEROPODIUM, a kind of extraneous foſſil, of the ſame ſubſtance with the aſteriæ or ſtar-ſtones, to which they ſerve as a baſe.

ASTRAL, that which belongs, or relates to the ſtars. Aſtral year, is the time the earth takes to make its revolution round the ſun.

ASTRÆA, in aſtronomy, a name which ſome give to the ſign Virgo, by others called Erigone, and ſometimes Iſis.

ASTRAGAL, in architecture, a little round moulding, which in the orders ſurrounds the top of the ſhaft or body of the column. It is alſo called the talon and tondino; it is uſed at the bottoms as well as tops of columns, and on other occaſions; it properly repreſents a ring, on whatever part of a column it is placed. It is often cut into beads and berries, and is uſed in the ornamented entablatures to ſeparate the ſeveral faces of the architrave.

Astragal, in gunnery, a round moulding, encompaſſing a cannon, about half a foot from its mouth.

ASTRAGALUS, Mik-vetch, or Liquorice-vetch, a genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, Papilionaceæ. The pod is gibbous and bilocular. Of this genus there are 39 ſpecies. The common ſort grows wild upon dry uncultivated places, and is recommended by Mr. Anderſon to be cultivated as proper food for cattle. The other ſpecies deſerving notice is the tragagantha, a thorny buſh growing in Crete, Aſia, and Greece, which yields the gum tragacanth. This is of ſo ſtrong a body, that a dram of it will give a pint of water the conſiſtence of a ſyrup, which a whole ounce of gum Arabic is ſcarce ſufficient to do. Hence its uſe for forming troches, and the like purpoſes, in preference to the other gums.

ASTRANTIA, Masterwort, a genus of the dyginia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, Umbellatæ. The involucrum is lanceolated, open, equal, and coloured. The ſpecies are two, the major and minor, both natives of the Alps, but poſſeſſing no remarkable properties.

Astriction, among phyſicians, denotes the operation of aſtringent medicines.

ASTRINGENTS, in the materia medica, ſubſtances diſtinguiſhed by a rough auſtere taſte, and changing ſolutions of iron, eſpecially thoſe made in the vitriolic acid, into a dark purple or black colour; ſuch are galls, tormentil root, biſtort root, balauſtines, terra japanica, acacia, &c.

ASTROGNOSIA, the ſcience of the fixed ſtars, or the knowledge of their names, conſtellations, magnitudes, &c.

ASTROITES, or Star-stone, in natural hiſtory. See the article Asteria and Star-stone.

ASTROLABE, the name for a ſtereographic projection of the ſphere, either upon the plane of the equator, the eye being ſuppoſed to be in the pole of the world; or upon the plane of the meridian, when the eye is ſuppoſed in the point of the interſection of the equinoctial and horizon.

Astrolabe is alſo the name of an inſtrument formerly uſed for taking the altitude of the ſun or ſtars at ſea.

ASTROLOGY, a conjectural ſcience, which teaches to judge of the effects and influences of the ſtars, and to foretel future events by the ſituation and different aſpects of the heavenly bodies. This ſcience has been divided into two branches, natural and judiciary. To the former belongs the prediction of natural effects; as, the changes of weather, winds, ſtorms, hurricanes, thunder, floods, earthquakes, &c. This art properly belongs to natural philoſophy; and is only to be deduced, *à poſteriori*, from phenomena and obſervations. Judiciary or judicial aſtrology, is that which pretends to foretel moral events; i. e. ſuch as have a dependence on the free will and agency of man; as if they were directed by the ſtars. This art, which owed its origin to the practices of knavery on credulity, is now univerſally exploded by the intelligent part of mankind. The chief province of it that remain to the modern profeſſors, is the making of calendars or almanacks.

Judicial aſtrology is commonly ſaid to have been invented in Chaldea, and thence tranſmitted to the Egyptians, Greeks, and Romans; though ſome will have it of Egyptian origin, and aſcribe the invention to Cham. But it is to the Arabs that we owe it. At Rome the people were ſo infatuated with it, that the aſtrologers, or, as they were then called, the mathematicians, maintained their ground in ſpite of all the edicts of the emperors to expel them out of the city.

The Bramins, who introduced and practiſed this art among the Indians, have hereby made themſelves the arbiters of good and evil hours, which gives them great authority: they are conſulted as oracles; and they have taken care never to ſell their anſwers but at good rates.

The ſame ſuperſtition has prevailed in more modern ages and nations. The French hiſtorians remark, that in the time of queen Catharine de Medicis, aſtrology was in ſo much vogue, that the moſt inconſiderable thing was not to be done without conſulting the ſtars. And in the reigns of king Henry III. and IV. of France, the predictions of aſtrologers were the common theme of the court converſation. This predominant humour in that court was well rallied by Barclay, in his Argenis, lib. ii. on occaſion of an aſtrologer, who had undertaken to inſtruct king Henry in the event of a war then threatened by the fraction of the Guiſes.

ASTRONIUM, in botany, a genus of the pentandria order, belonging to the diœcia claſs of plants. The male calyx conſiſts of five leaves, and the corolla is quinquepetalous; of the female the calyx and corolla are the ſame as in the male; the ſtyli are three, and the ſeed is ſingle. There is but one ſpecies, the graveolens, a native of Jamaica.

ASTRONOMICAL, ſomething relating to Astronomy.

Astronomical *Calender*, an inſtrument engraved on copper plates, printed on paper, and paſted on a board, with a braſs ſlider carrying a hair: it ſhows by inſpection the ſun's meridian altitude, right aſcenſion, declination, riſing, ſetting, amplitude, &c. to a greater degree of exactneſs than the common globes.

ASTRONOMY, ſignifies a knowledge of the heavenly bodies, with regard to their magnitudes, motions, diſtances, &c. real or apparent; and of the natural cauſes whereon; the whole of which the reader will find diſplayed in the Syſtem on this ſubject.

The following Syſtem of Aſtronomy is compiled and arranged by the Rev. T. Bankes, of St. Mary Hall, Oxon, and Vicar of Dixton, in Monmouthſhire, for whoſe liberal contribution to this Work I am conſiderably indebted, for which I return my public acknowledgements.

C. COOKE.

In the following Syſtem I have carefully conſulted the beſt authors, and it has been my ſtudy to expunge every thing that appeared frivolous, and to retain all that is eſſential to the attainment of a competent underſtanding of this Science, as far as the extent of the Work will permit.

To this end, the Reader will find I have given a variety of Problems of the Sphere, with the different modes of projection, and the methods of computation; ſubjects which have been wholly neglected in every work of this kind, even in that voluminous, and expenſive Edition, entitled the "Encyclopædia Britannica," publiſhed in Scotland.

I have alſo ſhewn, how to aſcertain the Elements of the Sun, Moon, and Planets, by Obſervation; and have been particularly attentive to the New Diſcoveries made by that excellent Aſtronomer, Dr. Herſchell.

As for Aſtronomical Tables, for calculating the Planets' Places, Lunations, Eclipſes, &c. there are ſuch perpetual alterations and amendments neceſſary to be made therein, ſo as to adjuſt them to the planetary motions, that I rather choſe to leave the Reader to procure (if wanted) ſuch a ſet as he may judge the moſt correct, than ſacrifice ſo many pages as they would have taken to ſo vague a purpoſe, and to the excluſion of thoſe eſſential articles, which are conſtantly the ſame, and which ſhould not be diſpenſed with.

But indeed the following Syſtem is ſo comprehenſive, that the Reader will be enabled to make Tables for himſelf, provided he is furniſhed with proper obſervations, on which he may found his calculations; and, I truſt, that nothing is omitted which can tend to give a clear, comprehenſive, and practical knowledge in this delightful Science.

T. BANKES.

SYSTEM OF ASTRONOMY.

SECTION I.

HISTORY OF ASTRONOMY.

THAT Aſtronomy was ſtudied in the very firſt ages of the world is beyond a doubt, as it muſt have been a neceſſary reſearch to form ſome judgment of the elapſe of time; for without that there could be no way of communicating ideas of paſt events, much leſs any intelligible records made of them.

And this could only be done by duly obſerving the motions and revolutions of the ſun and moon, which the All-wiſe Creator has appointed as indexes for that purpoſe. From this it ſhould appear that even Adam was not deſtitute of ſome knowledge in Aſtronomy; for, otherwiſe, how could an account of his age at the birth of Seth, or the number of years that he lived, have been preſerved?

Beſides, it ſeems extremely probable, that he, whom the Almighty had made Lord over the Creation, by placing every creature in ſubordination, and to whom he committed the naming of every thing, ſhould know ſomething of the nature of each, and their ſeveral uſes.

Joſephus, however, writes that Seth or his nephews firſt obſerved the order of the heavens, and the courſes of the ſtars; and ſuppoſes that longevity was beſtowed upon the Antediluvians for the very purpoſe of improving the ſciences of Geometry and Aſtronomy; adding, that the latter could not be learned in leſs than 600 years, the extremity of that period being the grand year. It is ſuppoſed Joſephus meant the period in which the ſun and moon came again into the ſame ſituation, with regard to the moons, nodes, apogee, &c. as at the beginning.

If this was a fixed period of the Antediluvians, they muſt have known more of Aſtronomy than was known many ages after the flood.

Among the nations who firſt made any conſiderable figure in hiſtory, the Chaldeans and Egyptians were the moſt remarkable for their Aſtronomical knowledge. They diſputed with each other the honour of having the firſt cultivators of Aſtronomy. The Chaldeans boaſted of their temple of Belus, and of Zoroaſter, who, as they pretended, flouriſhed 5000 years before the deſtruction of Troy; though, it is pretty certain, that he lived within a thouſand years of that event. The Egyptians on the other hand exulted in their ancient colleges of prieſts, where Aſtronomy was taught, and of the monument of Oſymandyas; in which it is ſaid, there was a golden circle of 365 cubits in circumference, and one cubit thick. It is recorded that the upper face was divided into 365 equal parts, correſponding to the days in a year; and that on each diviſion was written the name of the day, the heliacal riſing of the ſeveral ſtars for ſuch day, with prognoſtications, &c.

It is farther ſaid, that the Babylonians had obſervations for 700 years engraven upon bricks; and that when Alexander took Babylon, he carried away obſervations for almoſt 2000 years; but as they fell into the hands of ignorant and careleſs people, the greateſt part of them were loſt; which is ſuch a period of time, and fund of obſervations, as we have not to ſhew at this day. So arts and ſciences, as well as the ſtars, have their periods, ſtations, and retrogradations.

However, according to the beſt accounts, the Chaldeans derived the chief of their knowledge in Aſtronomy from the Egyptians who fled to Babylon, when Egypt was invaded by the Ethiopians.

The riſe of Aſtronomy, among the Greeks, is unknown; though many are of opinion that they, as well as the Phœnicians, derived their knowledge in this ſcience from the Egyptians.

After Aſtronomy was carried into Greece, Thales, the Mileſian, went thither for inſtruction. He flouriſhed about 580 years before Chriſt, and delighting himſelf in the ſcience, made conſiderable improvements. He is ſaid to have obſerved the exact time of the ſolſtices, and equinoctial points, to have taught the obliquity of the ecliptic, and to have been the firſt who foretold eclipſes.

He predicted a total eclipſe of the ſun, which happened on the 28th of May, 585 years before Chriſt, and alſo another of the moon.

After Thales, Anaximander, Anaximanes, Anaxagoras, and Pythagoras, contributed conſiderably to the advancement of Aſtronomy. Pythagoras made great improvements both in Aſtronomy and Geometry, and deſcribed the order of the univerſe agreeable to the preſent Newtonian ſyſtem.

Then followed Philolaus, Hicetas, Meton, Euctemon, Plato, Ariſtotle, Eudoxus, Calippus, &c. all of whom were men of conſiderable renown, and aſſiduous in promoting the progreſs of this and other ſciences; though Plato and Ariſtotle inſtead of advancing, rather clouded Aſtronomy, by embracing an erroneous ſyſtem, which was afterwards rigidly taught by Ptolemy, and from thence it was called the Ptolemaic ſyſtem.

Ariſtarchus, who lived about 270 years before Chriſt, diligently ſtrove to reſcue Aſtronomy from the obſcurity into which it was brought by Plato and Ariſtotle, ſtrenuouſly aſſerting and defending the Pythagorean ſyſtem.

He gave a method of determining the diſtance of the ſun by the moon's dichotomy.

The celebrated Archimedes, about 220 years before Chriſt, was no leſs ſkilful in Aſtronomy than Geometry. He invented a planetarium, or orrery, for repreſenting the phænomena and motions of the heavenly bodies; he alſo determined the diſtance of the moon from the earth, of Mercury from the moon, of Venus from Mercury, of the ſun from Venus, of Mars from the ſun, of Jupiter from Mars, and of Saturn from Jupiter; as likewiſe the diſtance of the fixed ſtars from the orbit of Saturn.

Hipparchus, who flouriſhed about 140 years before Chriſt, was a diligent obſerver of the ſtars. He was the firſt who diſcovered the orbits of the moon and planets to be excentric, and the anticipation of the moon's nodes. He alſo determined the length of the year with great accuracy; conſtructed tables of the motions of the ſun and moon; and gave a catalogue of the latitudes, longitudes, and apparent magnitudes of 1022 ſtars.

In ſhort, he is reputed to have been the firſt who applied his ſtudy to every part of Aſtronomy; and ſo indefatigable was he in his purſuits, that he is ſaid to have calculated all the eclipſes that were to happen for the ſpace of 600 years after his time.

From the time of Hipparchus to that of Ptolemy, who flouriſhed about A. D. 70, Aſtronomy made but little progreſs, and then it became inveloped in miſt and obſcurity, through Ptolemy's reviving the erroneous notions of Plato and Ariſtotle, as was before obſerved.

From this period, till the 16th century, the Pythagorean Syſtem was intirely laid aſide; when it was reſtored again by Nicholaus Copernicus, who wrote a treatiſe dedicated to Pope Paul III. in the preface of which he attempted to apologize as much as poſſible for the extraordinary doctrines it appeared to contain. He died, however, within a few hours of its publication. But although, from the time of Ptolemy to that of Copernicus, the true ſyſtem was exploded, yet there were ſome who in other reſpects improved the ſcience.

Among the Arabians, the Caliph Al Mamun, who aſcended the throne in A. D. 814, was a great encourager of the Sciences. He made many aſtronomical obſervations himſelf, and determined the obliquity of the ecliptic to be 23° 35′. Alſo Albategnius, about A. D. 880, greatly reformed Aſtronomy, he determined the preceſſion of the Equinoxes to be 1 degree in 70 years, and with Al Mamun fixed the Sun's greateſt declination, at 23° 35′.

Uleg Beg, grandſon of the famous Tamerlane, was a great proficient in practical Aſtronomy. He compoſed Aſtronomical Tables from his own obſervations ſo exact as to differ very little from thoſe afterwards conſtructed by Tycho Brache. He alſo gave a Catalogue of the fixed Stars made from his own obſervations in A. D. 1437; and determined the latitude of Samarcand, his capital, to be 39° 37′ 23″. This ſhews how accurate he was in his obſervations. Likewiſe, previous to the time of Copernicus, John De Sacro Boſco (an Engliſhman), Purbach, John Muller of Monteregio, in Franconia, generally named Regiomontanus, and John Werner, a clergyman, at Nuremberg, were great ſtudents in aſtronomy. The laſt of whom determined the preceſſion of the equinoctial points to be 1 degree and 10 minutes in 100 years; and the obliquity of the ecliptic to be 23° 28′, which numbers nearly agree with modern obſervations.

After the death of Copernicus, which was on the 23d of May, 1543, Aſtronomy was much improved by Schoner, Nonius, Apian, and Gemma Friſius; though Schoner only ſurvived Copernicus four years. Gemma Friſius was the firſt who propoſed a time-keeper for aſcertaining the longitude at ſea.

About A. D. 1561, William the IVth, Langrave of Heſſe Caſſel, applied himſelf to the ſtudy of this Science, and erected an obſervatory on the top of his palace, and afterwards gave a catalogue of the latitudes and longitudes of 400 ſtars from his own obſervations.

Tycho Brache was cotemporary with the Landgrave of Heſſe beforementioned; he made a vaſt number of obſervations, and publiſhed a catalogue of 770 ſtars.

He invented a new Syſtem of the World, which he vainly endeavoured to eſtabliſh on the ruins of that of Copernicus; but the conſonancy and ſimplicity of the Copernican Syſtem ſoon prevailed over the unnatural and complicated Syſtem of Tycho.

But, notwithſtanding his odd notion of the Univerſe, his works diſcover him to have been a man of vaſt abilities.

The famous John Kepler, was for ſome time under the tuition of Tycho Brache; but he ſoon diſcovered the error of Tycho's Syſtem, and alſo found that his predeceſſors had been wrong in ſuppoſing the orbits of the Planets to be circular; for from his own obſervations he found them to be eliptical, and the Sun to be placed in one of the foci; he alſo diſcovered that all the Planets deſcribe equal areas in equal times,and that the ſquares of the periodical times round the ſun are as the cubes of their mean diſtances.

He likewiſe diſcovered ſomething of the principle of gravity; for he ſignified that gravity is a mutual power betwixt two bodies; that the moon and earth tend towards each other, and would meet in a point nearer to the earth than the moon in the proportion of the ſuperior magnitude of the former; provided they were not hindered by their projectile motions. He further added, that the tides ariſe from the gravitation of the waters towards the moon.

But though Keplar, from the obſervations he made, went thus far, yet the true theory of the planetary motions, as reſulting from the principles of mechanics, and the doctrine of centripetal forces, he was an utter ſtranger to; and therefore it is not to be wondered at that he afterwards did not ſteadily adhere to thoſe principles, but in lieu thereof ſubſtituted others as the cauſes of the planetary motions.

The buſineſs of adjuſting and demonſtrating theſe matters; of determining the true figures of the planets' orbits, and ſhewing that the irregular motions of the Satellites, &c. are perfectly conformable to the laws of motion and gravity, was reſerved for the immortal Engliſh philoſopher Sir Iſaac Newton, to whom aſtronomy, philoſophy, and the various branches of the mathematical ſciences, are indebted for almoſt every thing that is truly valuable.

Galileus, an Italian, in the beginning of the 17th century, by the help of teleſcopes, diſcovered the Satellites of Jupiter, and Saturn, the ring of Saturn, &c.

In 1636, Mr. Jeremiah Horrox foretold a tranſit of Venus that would happen on November 24th, 1639; he alſo formed a new theory of the moon, ſo ingenious as to attract the notice of Sir Iſaac Newton; but the hopes of Aſtronomers, from the abilities of this excellent young man, were blaſted, by his death in January 1640, he being then only about 22 years of age.

Mr. John Flamſtead, the firſt Aſtronomer Royal in this kingdom, made many obſervations on the Sun, Moon, Planets, and Comets; and on the ſtars alſo; publiſhing a catalogue of 3000. He likewiſe publiſhed new ſolar tables, and a theory of the moon, according to Horrox,; and it was from his obſervations that Dr. Halley's tables and Sir Iſaac Newton's theory of the moon were conſtructed.

Mr. Flamſtead died A. D. 1719, and was ſucceeded by Dr. Halley, a moſt excellent Aſtronomer and Mathematician, as appears clearly by his writings in the Philoſophical Tranſactions. He was the firſt who diſcovered the acceleration of the Moon; and gave a very ingenious method of finding her parallax by three obſerved phaſes of a Solar Eclipſe. He compoſed a complete ſet of tables of the ſun, moon, and all the planets, except the Georgium Sidus, ſince diſcovered; and, in the courſe of nine years ſpent at the Obſervatory, he made near 1500 obſervations of the Moon.

Dr. Halley dying, A. D. 1742, was ſucceeded by Dr. Bradley, who was a moſt accurate obſerver, and who diſcovered the aberration of light, and the mutation of the earth's axis. He alſo obſerved the places and computed the elements of the comets which appeared in the years 1723, 1736, 1743, and 1757.

He made new and accurate tables of Jupiter's Sallellites, and accompliſhed various other improvements in aſtronomy too tedious to mention.

Dr. Bradley died A. D. 1762, and was ſucceeded by Mr. Bliſs, Savilian Profeſſor of Aſtronomy at Oxford, who died ſoon after, and was ſucceeded by Nevile Maſkelyne, D. D. the preſent Aſtronomer Royal.

The moſt remarkable foreign Aſtronomers ſince Mr. Flamſtead's time are M. De la Caille, Clairault, Euler, Mayer, Wargentine, and M. De la Lande, all of whom have ſhewn great genius and induſtry in improving aſtronomical tables.

M. De la Lande's planetary tables, Mayer's lunar tables, as improved by Maſon, and Wargentine's tables of the Satellites are ſuppoſed the moſt correct, and are uſed by our preſent Aſtronomer Royal in calculating the Nautical Ephemeris for the uſe of the navy.

But, perhaps, the greateſt aſtronomer of the preſent time is Dr. Herſchel, who, through his wonderful improvement of teleſcopes, has explored the celeſtial regions far beyond whatever had been done; and has diſcovered the new planet Georgium Sidus, and an immenſe number of ſtars that were totally unknown before. By his diſcoveries among the fixed ſtars he has greatly enlarged our ideas of the univerſe. In ſhort, if I may venture to judge of his abilities from the ſpecimens which I have ſeen, I think him a man in every reſpect qualified to perfect all that the Great Newton left unfiniſhed.

SECT. II.

ON THE SOLAR SYSTEM.

MANY hypotheſes have been formed for explaining the motions and appearances of the ſun and planets, &c. but none, except the following, could account for all the phænomena of theſe celeſtial bodies.

This hypotheſis, as has been obſerved, was firſt advanced by Pythagoras; revived ſince by Copernicus and Keplar; and then fully eſtabliſhed and demonſtrated by the immortal Newton.

In this ſyſtem the ſun is placed nearly immoveable in the centre of the orbits of all the planets, or more properly ſpeaking in one of the foci of their reſpective orbits, for the orbits are not circular but eliptical. And though the ſun always keeps nearly in the ſame place, yet he is obſerved to move round his own axis in about 25 days 15 hours and 16 minutes. The orbits of the planets are not all in one plane, but interſect one another in lines that paſs through the centre of the ſun; and the places of the orbits where they interſect are called the Nodes.

The number of planets (including the Earth) are 7; namely Mercury, Venus, the Earth, Mars, Jupiter, Saturn, and the *new diſcovered planet* GEORGIUM SIDUS. Theſe all move round the ſun in the manner above deſcribed, and in the order they are inſerted, Mercury being ſtationed the neareſt to the ſun, and the Georgium Sidus, at the moſt remote diſtance from him. Alſo ſome of theſe planets have attendants called Secondary Planets, or Satellites, moving round them. Thus our ſatellite the MOON revolves round the earth; alſo four moons or ſatellites revolve round Jupiter; five round Saturn; and two round the Georgium Sidus. Theſe likewiſe revolve from Weſt to Eaſt; but none of them, except the Moon, were obſerved before the invention of teleſcopes. The diſtances, magnitudes, revolutions, &c. of the planets and ſatellites will be ſhewn hereafter.

But beſides the planets and their ſatellites, there is another ſort of bodies revolving round the ſun, called wandering Stars or Comets. Theſe move in eliptical orbits, which extend to almoſt an immenſe diſtance from the ſun, or it may be that the orbits of ſome of them are of the parabolic kind, in which caſe, after they diſappear, they are never more ſeen, as they muſt, according to the laws of gravitation, proceed on to eternity through open ſpace without returning to perform a revolution.

The comets move round the ſun in all manner of directions, and cut the plane of the earth's orbit in all ſorts of angles, ſome of them proceeding the ſame way as the planets, and others the contrary way.

Plate III. *Fig*. 1, is a repreſentation of the ſolar ſyſtem. The fixed ſtars do not belong to this ſyſtem; but, it is probable, are as ſo many ſuns to other ſyſtems. The diſtance of the neareſt of them is aſtoniſhingly great; for let the earth be in what part of its orbit ſoever, they ſtill appear to be in the ſame places; and therefore a globe, whoſe diameter is equal to the earth's orbit, if viewed from a fixed ſtar, at the diſtance of the earth, would appear as a point.

The characters of the Sun and Planets are as follow: the Sun, ☉; Mercury, ☿; Venus, ♀; the Earth, ⊕; Mars, ♂; Jupiter, ♃; Saturn, ♄; and the Moon, ☾.

Other Syſtems of the Univerſe, as I have before obſerved, have been propoſed at different times, as

THE PTOLEMAIC SYSTEM, which ſuppoſes the earth at reſt in the centre of the world, and the planets moving round him in circles; as firſt the Moon, then Mercury, next Venus; then the Sun, and above him Mars; then Jupiter; and next Saturn; and laſtly the ſphere of the fixed ſtars; the planets and ſtars being all ſuppoſed to move round the earth in the ſpace of 24 hours.

THE TYCHONIC SYSTEM ſuppoſes the earth abſolutely at reſt; that the moon and ſun revolve about the earth, the moon in a month, and the ſun in a year; and that the reſt of the planets, Mercury, Venus, Mars, Jupiter, and Saturn, revolve round the ſun, the three laſt encompaſſing the earth. Moreover both the planets and ſtars are all ſuppoſed to have a diurnal motion round the earth.

THE SEMI-TYCHONIC SYSTEM ſuppoſes the planets to revolve round the ſun, while the ſun and moon revolve round the earth as their centre of motion, and it ſuppoſes the earth to move about its axis from Weſt to Eaſt in 24 hours. This differs from the *Tychonic Syſtem*, only in this, that it ſuppoſes a diurnal motion of the earth, though, like the *Tychonic*, it denies an annual one.

But none of theſe latter mentioned ſyſtems can account for all the phænomena, and therefore are juſtly exploded; while, on the other hand, the ſyſtem which I have firſt deſcribed, will ſolve every appearance in nature; and its truth is demonſtrable with mathematical certainty.

SECT. III.

AN EXPLANATION OF THE RISING AND SETTING OF THE SUN, MOON, AND STARS; THE CAUSE OF DAY AND NIGHT, &c.

THE phænomena of the apparent motion of the ſun, occaſioned by the real diurnal motion of the earth, is explained thus. See Plate III. *fig*. 2.

Let FGHI be the earth; O, its centre; and let it revolve about an axis perpendicular to the plane of the figure, in the order IFGH, that is, from Weſt to Eaſt.

Let A be the ſun; draw AFOHG and GOI perpendicular to it; alſo ſuppoſe a ſpectator placed at I; then ſince A is at an immenſe diſtance, a ray of light iſſuing therefrom will nearly reach the point I; or, which is the ſame, a line drawn from A as a tangent to the earth's ſurface will nearly touch the earth in the point I, and therefore the ſun at A will be riſing in the horizon at I. As the earth moves round, the ſpectator is carried towards F, and the ſun at A ſeems to riſe gradually higher, till the ſpectator is arrived at F, when the ſun is at the higheſt. When the ſpectator comes towards G, the ſun appears to deſcend, as if it moved towards D; and when the ſpectator is arrived at G, then the ſun appears in the tangent or horizon at G, and therefore the ſun is then ſetting. While the ſpectator is moved through GHI, the ſun is inviſible, being under the horizon, till the ſpectator arrives at I, when it ſeems to riſe again.

Now, it is evident, that while that part of the earth on which the ſpectator is ſituate, is illuminated, that it is day-light; and whilſt he is carried through the dark hemiſphere, GHI, it is night; the points F and H, being noon and midnight. And thus the viciſſitude of day and night appears by the rotation of the earth round its axis.

What has been ſaid of the ſun, is equally true of the moon; or any ſtar placed at A; and therefore all the celeſtial bodies ſeem to riſe and ſet by turns one after another, according to their various ſituations. For let A, B, C, D, be four ſtars; when the ſpectator is at I, the ſtar A riſes, and when at G, it ſets; when at F, the ſtar B riſes, and when at H, it ſets. And when the ſpectator is at G, the ſtar C riſes, and when at I, it ſets; alſo when the ſpectator comes to H, D riſes, and when at F, it ſets. And thus for others, according to their particular poſitions.

The Earth's Diurnal Motion may be proved thus:

It is clear that either the earth muſt move round its axis once in 24 hours, or elſe the heavens, with all their furniture, muſt revolve round the earth in the ſame time.

Now if any body revolve round another as its centre, it is evident, from the laws of motion and the doctrine of centripetal forces, that the central body muſt always be in the plane in which the revolving body moves, let the curve deſcribed be what it may. Wherefore, if the ſun moves round the earth in a day, the earth muſt be in a plane deſcribed by the ſun in a day: but this does not happen, except on two days in the year, viz. at the equinoxes, for at all other times the ſun is vertical to, and apparently moves round, parallel circles, which have not the earth for their centre; conſequently the ſun in ſuch caſe can no more be ſaid to revolve about the earth, than a body moving round the baſe of a cone can be ſaid to revolve about the vertex. On the other hand, allowing the earth's diurnal and annual motion, the ſun is always in the plane of the earth's orbit, which is agreeable to the laws of nature, and is obſerved by the other planets and by all the ſatellites. Wherefore the diurnal motion belongs to the earth, and not to the ſun.

SECT. IV.

See Plate III. *Fig.* 3.

AN EXPLANATION OF THE DIFFERENT SEASONS OF THE YEAR, WITH THE REASON OF THE LENGTHNING AND SHORTNING OF DAYS, &c.

The orbit of the earth extended to the heavens is called the ecliptic, and is divided by Aſtronomers into 12 equal parts, called ſigns, as will be afterwards more fully explained. Now this orbit is ſo ſmall in reſpect to the diſtance of the fixed ſtars, that the ſame aſpect of the heavens will appear whether a ſpectator is placed on the earth or on the ſun. Therefore, if the earth be at ♈, a ſpectator will ſee the ſun in ♎, and when the earth comes to ♉ he will ſee the ſun in ♏, and the ſun will appear to have moved through ♎ ♏. Again, whilſt the earth is moving to ♊, the ſun will ſeem to paſs through ♏ ♐; and, hence, a perſon on the earth obſerves the ſun to go through the ſame ſpace in the heavens, as the earth would appear to go through to a ſpectator at the ſun. And becauſe a ſpectator at the earth is not ſenſible of the earth's motion, he aſcribes that motion to the ſun which in reality belongs to the earth.

Let NEAQ be the earth, and let NA be its axis; N, the north pole; A, the ſouth pole; and EQ, the equinoctial. Alſo let PR be a parallel of latitude, paſſing through any place; and let a plane G♈I be drawn perpendicular to ♑S♋, dividing the illuminated hemiſphere from the dark one. Now the axis NA is inclined to the plane of the ecliptic, or earth's orbit, in an angle of about 66°½; and during the earth's motion in its orbit the axis always remains in a parallel poſition, or pointing to the ſame ſtar. Moreover the earth moves uniformly round its axis, and therefore deſcribes equal diurnal arcs in equal times. Now let the earth be at ♎, then the circle dividing the light and dark hemiſpheres paſſes through the poles N and A; and conſequently by the nature of the ſphere, divides all the parallels, as PR into two equal parts, and therefore any point in that parallel will ſtay as long in the light, as in the dark hemiſphere; that is, the days and nights will be equal. Then, as it moves to ♏, the pole N, comes into the light hemiſphere, by reaſon of the oblique poſition and parallel motion of the axis NA; and as it proceeds to ♐ and ♑, the light hemiſphere reaches gradually farther beyond N; till coming to ♑, it is at the fartheſt, reaching to G, and making the arc NG = 23°½, the complement of N♑S, or 66°½; at which time the oppoſite pole A is as far involved in the dark hemiſphere. Whence, in north latitudes, or in the hemiſphere ENQ, the days have been increaſing from ♎ to ♑, where they are at the longeſt, for the greater part of the parallel PDR, as PD, is in the illuminated, and only the part DR in the dark hemiſphere: but in the oppoſite or ſouthern hemiſphere the days have been decreaſing, and are at their ſhorteſt at ♑; for all the parallels to EQ have their greater part in the dark hemiſphere.

If, through the point G, a parallel be deſcribed, this parallel is called the *Arctic Circle*, and all the ſpace contained therein is illuminated, and therefore there is no night there, whilſt the Earth is at ♑; and, for the ſame reaſon, all the ſpace within the parallel drawn through I, will be dark; and, therefore, all will be night there. Likewiſe, if a parallel be drawn through B, where S ♑ cuts the arc NE, that parallel is called the *Tropic of Cancer*, and the ſun will then ſhine perpendicularly upon the inhabitants of that parallel.

This is the ſummer ſeaſon to thoſe who are in the hemiſphere ENQ, and winter to thoſe who live in EAQ; and ſince EQ is equally divided by the circle of light and darkneſs, GI; therefore the days and nights are always equal under the equinoctial.

Moreover, whilſt the earth moves through ♒, and ♓ to ♈, the circle of light and darkneſs comes gradually nearer to the pole N; and the angle N ♑ G, and conſequently that of B ♑ E, become leſs and leſs, till they vaniſh in ♈; when the circle of light and darkneſs paſſes again through the poles, N and A, and, therefore, biſects all the parallels, as PR; and, conſequently, the days and nights are again equal all over the earth.

Whilſt the earth moves through ♈, ♉, ♊, to ♋, the ſun will ſeem to go through ♎, ♏, ♐, to ♑; when the circle of light and darkneſs will fall ſhort, more and more, of the north pole, N; and will go further and further beyond the ſouth pole A; whence the parallels cut by that circle will have the greater part of the north hemiſphere, PD, in the dark; but, of the ſouthern hemiſphere, the greater part will be illuminated. Therefore 'tis winter to the northern hemiſphere, ENQ, the days being at ſhorteſt, but ſummer to the ſouthern hemiſphere, EAQ, the days there being at the longeſt.

Alſo, within the parallel drawn through G, there will be no day whilſt the earth is at ♋, and, in the parallel drawn through I, there will be no night. At the pole A it will be day for ſix months; and, at the pole N, it will be night for ſix months; being juſt the contrary of what happens when the earth is at ♑. In this poſition, if a parallel be drawn through B, the ſun will ſhine perpendicularly to the earth in that parallel, and it is called the Tropic of Capricorn; alſo a parallel drawn through I is called the Antarctic Circle.

Furthermore, let the earth move from ♋ through ♌ and ♍ to ♎ again, in which caſe it is evident that the circle of light and darkneſs draws gradually nearer to the poles N and A, by which the light and dark parts of the parallels become nearer to an equality, and ſo alſo do the days and nights. Therefore, in the north hemiſphere, ENQ, the days are increaſing; and, in the ſouth hemiſphere, they are decreaſing; and, when the earth arrives at ♎, the days and nights become equal in every place.

Thus it appears, that the different ſeaſons are occaſioned by the obliquity of the earth's axis of rotation to the plane of the earth's orbit; for, if that axis was perpendicular to the plane of the earth's orbit, there could be no variety of ſeaſons, or in the length of days, in whatever part of the orbit the earth was; for there would be a perpetual uniformity, and it would be difficult to determine the length of the year without obſervations of the ſtars.

Scholium. For the ſame reaſons the inhabitants of all the other planets will obſerve the like motions in the ſun, as we do from our earth. For example, an inhabitant of Jupiter would imagine that the ſun turns round him, making a revolution once in twelve years; and, to a ſpectator in Saturn, the ſun would appear to finiſh his period in thirty years.

Since, therefore, it is impoſſible that the ſun can have all theſe motions really in itſelf, and there can be no reaſon aſſigned why any one of them ſhould belong to the ſun more than the reſt, we may ſafely affirm, that there are none of them real, but apparent only, and ariſe from the real motions of the ſeveral planets.

The annual Motion of the Earth may be proved thus:

All obſervations teſtify, that either the earth turns round the ſun, or the ſun round the earth, in ſuch a manner, as that equal areas are deſcribed in equal times; and Sir Iſaac Newton has demonſtrated, that, when two bodies revolve round each other, according to ſuch law, the one muſt of neceſſity gravitate to the other; and, therefore, if the ſun in its motion does gravitate to the earth, action and re-action being equal and contrary, the earth muſt, likewiſe, gravitate to the ſun.

Alſo, Sir Iſaac has demonſtrated, that when two bodies gravitate to one another, without approaching each other in right lines, they muſt both of them turn round their common centre of gravity. The ſun and earth do therefore turn round their common centre of gravity. But the ſun is ſo great a body in reſpect of the earth, that the common centre of gravity of the earth and ſun lies within the body of the ſun, and not far from its centre Wherefore, the earth turns round a point which is within the body of the ſun, and, conſequently, revolves round the ſun; and the ſun turns round a point within himſelf; which obſervations prove to be the caſe.

He has alſo demonſtrated, that if ſeveral bodies gravitate round another, the ſquares of their periodical times will be as the cubes of their mean diſtances from the centre of their orbits: and, by comparing the periods of the planets, with their diſtances from the ſun, as determined from the niceſt obſervations, we find them all in the moſt exact harmony to this law; whereas, on the contrary ſuppoſition, of the ſun and planets revolving round the earth, the whole is deſtitute of any order, being inharmonious, and full of confuſion; for, according to the ſaid law, (which Sir Iſaac has demonſtrated, muſt neceſſarily, without an utter ſubverſion of the laws of nature, obtain in bodies revolving round another) if the ſun moved round the earth, the ſun, in order to harmonize with the motion of the moon, would be above 54700 years in performing one revolution, whereas its *apparent* revolution is but one year. Hence the abſurdity of ſuch a ſyſtem is manifeſt, and the proof of the contrary unanſwerably eſtabliſhed.

SECT. V.

OF THE DIFFERENT PHASES OF THE MOON.

THAT the moon moves round the earth, has been already ſignified in the deſcription of the Solar Syſtem. Her revolution ſhe performs in about twenty-ſeven days and ſeven hours, during which ſhe puts on different phaſes and appearances: for the moon, (like the earth, being a dark, opake, body, and nearly ſpherical, and ſhining by the borrowed light of the ſun) we ſometimes ſee to increaſe and become bigger, and at length appearing with a full globular face, and afterwards, by a gradual diminution, become leſs, till ſhe loſes all her luſtre and diſappears.

Alſo, ſometimes ſhe enlightens us the whole night, and at other times ſhe does not appear till late at night: ſometimes ſhe keeps in the ſouthern hemiſphere, and at other times ſhe riſes high, and viſits the northern hemiſphere.

To illuſtrate her different phaſes as ſeen from the earth, ſee Plate III. *fig.* 4 and 5, where S repreſents the ſun, T the earth, RTS, a portion of the earth's orbit, which it deſcribes in the annual courſe round the ſun. Let ABCDEFG be the orbit of the moon, in which ſhe turns round the earth in the ſpace of a month, from the weſt towards the eaſt.

This motion of the moon is evident to our ſenſes; for, if the moon be obſerved to arrive at the meridian any night with a fixed ſtar, the next night ſhe will be 52 minutes later in coming to the meridian, or in ſouthing, than the ſtar, ſhe having receded from the ſtar about 13 degrees towards the eaſt. Join the centres of the ſun and moon with the right line SL, and, through the centre of the moon, imagine a plane MNL to paſs, to which the line SL is perpendicular: the ſection of that plane with the ſurface of the moon, will produce the circle which bounds light and darkneſs in her, and ſeparates the enlightened face from the dark and obſcure ſide. In the ſame manner let the centres of the earth and moon be joined by the right line TL, which is perpendicular to a plane PLO, paſſing through the centre of the moon; that plane will make on the ſurface of the moon, the circle which diſtinguiſheth the viſible hemiſphere, or that which is towards us, from the inviſible, which is turned from us; which circle may therefore be termed the Circle of Viſion.

Hence it is manifeſt, that whenever the moon is in the poſition A, in the point of its orbit oppoſite to the ſun, that then the circle bounding light and darkneſs, and the circle of viſion, do coincide, and that all the illuminated face of the moon will be turned towards the earth, and be viſible by its inhabitants; and then the moon is ſaid to be full, and ſhe ſhines all night long; and in reſpect to the ſun, ſhe is ſaid to be in oppoſition: for the ſun and moon are ſeen in oppoſite parts of the heavens, the one riſing where the other ſets. When the moon comes to B, the whole illuminated diſk, MPN, is not turned towards the earth, there being a part of it, MP, not to be ſeen by us; and then the viſible illumination will be deficient from a circle, and the moon will have a gibbous or humped form, ſuch as is marked in B. The moon arriving at C, where the angle CTS is nearly right, there only one half of the illuminated diſk is turned towards the earth, and to be ſeen from thence; and then we obſerve a half moon, as in C, and ſhe is ſaid then to be biſected or dichotomized, that is, cut in halves. In this ſituation, the ſun and moon are a fourth part of a circle removed from each other, and the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature. The moon going forward to D, the illuminated face, MPN, has but a ſmall portion of itſelf turned towards the earth, and the ſide of the moon turned towards the earth is, for the greateſt part, in darkneſs; and therefore, of the ſpherical figure of the moon, which appears to us to be plain, that ſmall part which ſhines upon us, will ſeem to be bended into narrow points or angles, and will look like what we call horns; for there the circle, bounding light and darkneſs with the circle of viſion, doth form two ſmall angles at their interſections, and the phaſis ſeen from the earth will appear as in D. The moon at laſt coming to E, will ſhew no part of its illuminated face to the earth. but all the dark ſide of the moon will be turned towards it; and then the moon diſappears, and ſhe is ſaid to be in conjunction with the ſun, the ſun and ſhe being in the ſame point of the ecliptic. This poſition we call New Moon. When the moon advances further to F, ſhe again aſſumes an horned or crooked figure; and, as before the New Moon the horns were turned weſtward, ſo now, after the time of New Moon, they change their poſitions and look eaſtward. When the moon has proceeded to G, and is again in a quadrate aſpect with the ſun, ſhe will appear biſected, and like a half-moon. In H ſhe will be bigger, but will ſtill be deficient from a whole circle, and be ſeen gibbous: but in A ſhe will again appear circular, and in her full ſplendour.

The arch EL, or the angle STL, contained under lines drawn from the centres of the ſun and moon to the centre of the earth, is called the Elongation of the moon from the ſun. And the arc MO, which is that portion of the illuminated circle MON which is turned towards the earth, and which is the meaſure of the angle that the circle bounding light and darkneſs, and the circle of viſion make with one another, is every where nearly ſimilar to the arc of Elongation EL, or which is the ſame thing, the angle STL is nearly equal to the angle MLO, which I thus demonſtrate. Produce SL at pleaſure unto X, and the angles TLP and MLS will be equal, they being both right angles: but the angles OLS and PLX are alſo equal, becauſe they are vertical to each other; therefore taking away thoſe equal angles, the angle MLO will remain equal to the angle TLX; but the angle TLX is the external angle of the triangle STL, and is therefore equal to both the inward and oppoſite angles STL and TSL, by the 32d Propoſition of Book I. of Euclid. But the angle TSL is exceeding ſmall, and next to nothing; for when biggeſt in the quadratures, it does ſcarce exceed ten minutes of a degree; the diſtance of the moon from the earth in compariſon of that of the ſun being ſo ſmall, that the angle which it ſubtends at the ſun vaniſhes. And therefore the angle STL by itſelf, is nearly equal to the angle MLO; whence the arc MO will be ſimilar, or like to the arc EL.

The ſemicircle OMP, ſince its plane paſſes through the eye, will be projected into a right line, or appear like a right line on the diſk of the moon; but the circle bounding light and darkneſs in the moon, ſince it is ſeen obliquely from the earth, will be projected into an ellipſe, in which form it will appear.

As the moon by reflected light from the ſun illuminates the earth, ſo the earth does more than repay her kindneſs, in enlightening the ſurface of the moon.

In new moons, the illuſtrated ſide of the earth, is fully turned towards the moon, and will therefore at that time illuminate the dark ſide of the moon; and then the Lunarians will have a full earth, as we in a ſimilar poſition have a full moon. And from thence ariſes the dim light which is obſerved in the old and new moons, whereby, beſides the bright and ſhining horns, we can perceive the reſt of her body behind them, though but dark and obſcure. Now when the moon comes to be in oppoſition to the ſun, the earth ſeen from the moon will appear in conjunction with him, and its dark ſide will be turned towards the moon, in which poſition the earth will diſappear; after the ſame manner as the moon does diſappear to us in the time of new moon, or in her conjunction with the ſun: in ſhort the earth will ſhew all the ſame appearances to a ſpectator in the moon, as the moon does to us.

SECT. VI.

OF THE STATIONS AND RETROGRADATIONS OF THE PLANETS.

IF an obſerver was ſituate in the ſun, all the planets would appear to move in due order about him from weſt to eaſt: but to a ſpectator on the earth their motions appear very irregular; ſometimes they appear to move *directly* from weſt to eaſt, according to their true motions, at other times to loſe all their motion and become ſtationary; and by turns they ſeem to move backward, or become retrograde. The cauſe of theſe phænomena will be manifeſt from what follows.

1ſt. With reſpect to the inferior planets ☿ and ♀.

Let ABC, (Plate III. *fig.* 6) repreſent an arc of the celeſtial ſphere; EOP, the earth's orbit; LNIG, the orbit of an inferior planet, as of ♀; and S, the ſun: let the earth at firſt be ſuppoſed to ſtand ſtill in its orbit at E: now, it is evident, that the ſun will appear at the point B, and the planet always within the arc AC. Whilſt the planet moves in its orbit from 1 through Q to N, it will ſeem to move from B to A agreeably to the order of the ſigns, viz. from weſt to eaſt, or as Aſtronomers term it in *conſequentia*: but paſſing from N to L, it will ſeem to an eye at E, to return back from A to B, or be retrograde.

While the planet is at or near the point N, being betwixt moving from B to A, and returning from A to B, and moving as it were in a right line towards the earth, it will for ſometime ſeem to ſtand ſtill near A, that is to be ſtationary. When the planet is in that part of her orbit, N or G, which is contiguous to the tangent EA or EC, ſhe will then appear at A or C, her greateſt diſtance from the ſun, and is ſaid to be in her greateſt ELONGATION. This elongation is meaſured by the angle SEG. The more diſtant a planet is from the ſun, the greater will its angle of elongation be; that of ♀ is about 48°, and of ☿ about 28°.

In the ſpace of a revolution, an inferior planet will, with reſpect to the earth, undergo two conjunctions, one which is beyond the ſun at 1; the other when it is at L, between the ſun and the earth; the former is called the ſuperior, and the latter the inferior conjunction.

Whilſt ♀ goes from her ſuperior conjunction, ſhe appears in the arc AB, always to the eaſtward of the ſun, and therefore ſets ſometime after the ſun, and is called the Evening Star: but during the time ſhe is going from her inferior to her ſuperior conjunction, ſhe will be ſeen ſomewhere in the arc BC to the weſtward of the ſun, and ſo will ſet before him in the evening, and riſe before him in the morning: hence, ſhe is called the Morning Star.

Hitherto the planet has been ſuppoſed to move while the earth ſtood ſtill: but when both move the phœnomina will be much the ſame, only the planet will be more direct in the fartheſt part of the orbit and leſs retrograde; the former ariſing from the ſum of their motions, and the latter from the difference.

2dly. With reſpect to the phœnomina of the ſuperior planets, viz. ♂, ♃, ♄, &c. the *direct*, *ſtationary*, and *retrograde* motions are explained much in the ſame manner as thoſe of the inferior planets, but with theſe differences.

1ſt. The retrograde motions of the ſuperior planets happen oftener, the ſlower their motions are; as the retrogradations of the inferior planets happen oftener, the ſwifter their angular motions are; becauſe the retrograde motions of the ſuperior planets depend upon the motions of the earth, but thoſe of the inferior on their own angular motions.

A ſuperior planet is retrograde once in each revolution of the earth; an inferior one, in every revolution of its own.

2d. The ſuperior planets do not always accompany the ſun, as the inferior do, but are often in oppoſition, which neceſſarily follows from the earth's orbit, being included within the orbits of the ſuperior planets.

SECT. VII.

METHODS OF DETERMINING BY OBSERVATION THE PERIODICAL TIMES OF THE EARTH AND PLANETS, TOGETHER WITH THE MAGNITUDES AND SITUATIONS OF THEIR RESPECTIVE ORBITS, THE PLACES OF THE STARS, &c.

Definitions.

I. THE **Orbit** of a Planet N is the curve line, which it deſcribes about the Sun, as ABPDA, Plate III. *fig.* 7. The orbits of the earth and all the planets are ellipſis, having the ſun in one of the foci, as at S.

II. **The Apsides**, are the two extreme points of the orbit, as A and P. The point A, which is the fartheſt from the ſun, is called the **Aphelion**, or *higher apſis*; and the point P, which is the neareſt to the ſun, is named the **Perihelion**, or *lower apſis*. Alſo the tranſverſe axis AP, is called the **Line of Apsides**.

III. **The Eccentricity** is the diſtance of SC, from the focus to the centre.

IV. **The Mean Distance** of a planet is the line SB drawn from the focus S, to the end B or D of the conjugate axis BD. This line SB is equal to half the tranſverſe axis AC or CP.

The Periodical Time, is the time of a planet's deſcribing its orbit, or of returning to the ſame point in its orbit.

V. **The Nodes** of any orbit are the points where its plane cuts the plane of the earth's orbit, ſuppoſing them both produced to the fixed ſtars, for the planets move in orbits whoſe planes are all different from that of the earth, and from one another. And the ſun being in all theſe planes, they conſequently cut one another in lines paſſing through the ſun.

If ECFD, Plate III. *fig.* 8. be the earth's orbit, and GCHD, the orbit of a planet cutting the earth's orbit in the line CD, then C and D are nodes; and CD the line of the nodes.

That node through which a planet paſſes towards the north pole, is called the **Ascending Node**; and that through which it moves towards the ſouth pole, is named the **Descending Node**.

VII. **The Inclination of a Planet's Orbit** is the angle which the plane of it makes with the earth's orbit or ecliptic, as EDG. This is meaſured by the arc of a circle EG, at a quadrant's diſtance from the nodes.

VIII. **Elongation of a Planet**, is the angle between the ſun and the planet, as taken at the earth; or angle between the ſun and place of a planet reduced to the ecliptic, of which I have ſpoken in Sect. VI.

IX. **Parallax**, is the difference between the real and apparent place of a planet, or the difference of its apparent places, as viewed from the earth's centre, and from ſome given point on its ſurface.

X. **The Annual Parallax**, or Parallax of the earth's orbit, is the difference between the places of a ſtar, as ſeen from oppoſite points of the earth's orbit.

XI. **The Moon's Apogee** is that point in her orbit, which is fartheſt from the earth. This correſponds with the aphelion of a planet.

XII. **The Moon's Perigee** is that point in her orbit, which is the neareſt to the earth. This is the ſame as the perihelion of a planet.

XIII. **The Moon's Synodic Revolution**, is the time that elapſes between her being in conjunction with the ſun, and her coming into conjunction with him again.

XIV. **The Syziges** of the moon's orbit, are the points where a line drawn through the earth and ſun cuts it. Theſe are the points of conjunction and oppoſition.

XV. **The Quadratures** are the points of the moon's orbit, which are at a quadrant's diſtance from the ſyziges; and the **Octants**, are alike diſtant from the ſyziges and quadratures.

Theſe things premiſed, I proceed to the following Problems.

Problem I. *To find the Latitude of a Place.* (See Sect. IX. Definition 43.)

With a good quadrant, or other proper inſtrument, take the altitude of the pole ſtar when it is at the higheſt, which is known by continuing your obſervations till it begins to deſcend. Alſo about 12 hours after, take its altitude when it is at the loweſt; then half the ſum of the two altitudes is the height of the pole, or latitude required.

N. B. Inſtead of the pole ſtar, any other ſtar may be choſen that is out of the power of refraction.

Or thus. If the ſun's declination be known at that time, take his meridian altitude, which you may know by continuing the obſervation till he begins to deſcend. Then if the declination be towards the elevated pole, add it to the complement of the altitude; but, if the declination be contrary, take the difference between the declination and the complement of the altitude, and the reſult in either caſe will be the latitude required.

Problem II. *To draw a Meridian Line in any Place.*

See Plate III. *Fig.* 9.

Upon a plain board placed parallel to the horizon deſcribe a circle ABF; and on the centre C, erect a ſtile or gnomon perpendicular to it, and ſo high that the top of its ſhadow may fall upon the circumference of the circle, about the middle of the forenoon. Mark exactly the point B, where the top of the ſhadow falls in the forenoon. Likewiſe mark the point F, where the top of the ſhadow falls again, on the circumference in the middle of the afternoon. Then through the centre C, draw the line ACD biſecting the arc BF, ſo will AD be the meridian required.

Scholium. It will be proper to draw ſeveral concentric circles, and to make obſervation with them all, that they may confirm each other. It will alſo be beſt to make the obſervations at or near the time of the ſolſtices, when the ſun does not ſenſibly alter his declination; and the ſummer ſolſtice is to be preferred.

Problem III. *To find the Obliquity of the Ecliptic.* (See Sect. IX. Definition 21.)

Take the ſun's meridian altitude at both ſolſtices; ſubtract the leſs from the greater, and take half the difference, and it will be the obliquity required. This is on the ſuppoſition, that the ſun is on the ſame ſide of the zenith at both obſervations; but, if the reverſe is the caſe, add the complements of the two altitudes together, and half the ſum will be the obliquity of the ecliptic. If the obſervations are made when the ſun is low, regard muſt be had to refraction, and the altitude muſt be diminiſhed by a quantity equal to the refraction.

Or thus. If you have the latitude of the place, take the meridian altitude of the ſun at the ſummer ſolſtice, ſubtract its complement from the latitude, and the remainder will be the obliquity ſought.

Scholium. By comparing the obſervations of the ancients with thoſe of modern aſtronomers, it appears that the obliquity of the ecliptic has been continually decreaſing; and is now found to be ſcarce 23° : 28′.

Prob. IV. *To find the Time when the Sun is in the Equinoctial.*

Having the latitude of the place, and conſequently the height of the equator, (or co-latitude) by careful obſervation, take the ſun's meridian altitude on thoſe days when it is equal to the height of the equator, or nearly ſo.

If it ſhould happen to be exactly equal to the co-latitude, the ſuns is at that inſtant in the equinoctial, or on the equator. But if it is greater or leſs than the co-latitude, you muſt obſerve till you get the meridian altitudes on two ſucceſſive days, one greater than it and the other leſs; then the time of his being in the equinox is evidently between the times of theſe obſervations. And to determine the time exactly, the 24 hours elapſed between one obſervation and the other muſt be divided in proportion to the exceſs, and defect of the altitudes; taking the required time nearer to the noon of that day on which there was the leaſt difference between the altitude and co-latitude.

Problem V. *To find the Length of the Year.*

Find by the laſt Problem the time of the ſun's being in the equinoctial, either at the vernal or autumnal equinox. Alſo find the time of his being in the ſame equinox, the year following. Then the intermediate time is the length of the year. This is called the *tropical year*, and is ſomething leſs than the Sydereal year, or the earth's periodical time, on account of the preceſſion of the equinoxes; or it will be more exact, if the time of the ſun's entering into the ſame equinox be taken at ſeveral years diſtance; for if the whole time between the obſervations be divided by the number of years, it will give the length of the tropical year exactly. By this means the length of the tropical year is found to be 365 days, 5 hours, 48 minutes, 57 ſeconds.

In like manner the length of the Sydereal year is found by taking the time between the ſun's leaving any fixed ſtar, and returning to it again, after a great many years, and dividing it by the number of years; or it may be found by comparing the place of a fixed ſtar according as it was obſerved many years ſince with its preſent place; for the difference divided by the number of years, will give the annual preceſſion of the equinoxes, which reduced into time, and added to the *tropical year*, you will have the length of the Sydereal year. This preceſſion of the equinoxes is about

$50'$ yearly, and therefore the Sydereal year is 365 days, 6 hours, 9 minutes, 14 ſeconds.

N. B. By obſervations it is found that the time from the vernal to the autumnal equinox is 186 days, 12 hours, 29 minutes, 30 ſeconds; and from the autumnal to the vernal equinox only 178 days, 17 hours, 19 minutes, 30 ſeconds, ſo that the ſummer half year exceeds the winter by 7 days, 19 hours, and 10 minutes.

PROBLEM VI. *To find the Eccentricity of the Earth's Orbit and its Form.*

Make ſeveral obſervations of the ſun about the time when he is in the aphelion, and continue to take his apparent diameter, till you find it at the leaſt.

At half a year's diſtance, when he is about the perihelion, obſerve his apparent diameter till you find it at its greateſt; then through any point as S (Plate III. *fig.* 10.) draw a line PSA, and from S take SP to SA as the ſun's leaſt apparent to his greateſt apparent diameter, ſo will A and P be the aphelion and perihelion of its orbit. Alſo make SC and CF equal to half the difference between SA and SP; and F will be the other focus and C the centre. Then the ellipſis ABPD whoſe foci are S and F will be the form of the orbit; for the diſtance is reciprocally as the apparent diameter.

Or thus. Obſerve with a teleſcope and micrometer what the apparent motion of the ſun is when ſloweſt, and (half a year after) how much his apparent motion is when ſwifteſt. Take SA to SP as the ſquare root of the ſwifteſt motion to the ſquare root of the ſloweſt, ſo will A and P be the aphelion and perihelion; and the reſt will be found as before. By theſe methods the earth's excentricity is found to be 168; ſuppoſing the mean diſtance, or half the tranſverſe axis to be 10000.

PROBLEM VII. *To find the Place of the Earth's Aphelion, or the Poſition of the Apſides, together with the Time when it is in the Aphelion.*

Obſerve two places of the ſun at a good diſtance from each other, and where the apparent motion is the ſame, or where the apparent magnitude is the ſame. Let theſe places be C and B (Plate III. *fig.* 11). Biſect the arc BC by the line AF; ſo will A be the aphelion if the magnitude or motion was decreaſing towards A; otherwiſe it is the perihelion. Whence the place of the aphelion is had; and the poſition of the apſides AP. Alſo, if the times be noted when the earth is in C and B, then the mean time between them will be the time when the earth is in the aphelion A.

SCHOLIUM. If the difference between the place of the earth's aphelion ſeveral years paſt, and its preſent place, be divided by the number of years, the quotient will ſhew the annual motion of the aphelion, which is $1' 0'' 37'''$ in a year.

Note alſo, the time of the earth's revolving from aphelion to aphelion is called the ANOMALISTIC YEAR; and, according to Dr. Halley, is 365 days, 6 hours, 13 minutes, 32 ſeconds.

PROBLEM VIII. *To find the Declination of a Star.*

The obſerver being furniſhed with a large quadrant fixed in the plane of the meridian, with an index moving round its centre, and teleſcopic ſights, he muſt wait the ſtar's coming upon the meridian, and take its meridian altitude. If the ſtar be towards the equinoctial, and on the North ſide of it, take the difference between the altitude, and colatitude of the place, and the remainder will be the declination North: But if the ſtar be on the South ſide of the equinoctial, then the remainder is the declination South.

Again, if the ſtar be towards the Pole, take the difference between its altitude and the latitude of the place, and it will be the complement of the ſtars declination, which will be North, or South, according as the ſtar and place ſhall be towards the North or South Pole.

PROBLEM IX. *To find the right Aſcenſion of a Star.*

Having a good time piece with minutes and ſeconds, let it be ſo adjuſted that the hand may go through the 24 hours in a Sydereal day, viz. in 23 hours, 56 minutes, 4 ſeconds; then obſerve when the ſun, of known ſtar, is in the meridian, and ſet the clock at that inſtant to the time of the ſun or ſtar's right aſcenſion, and obſerve alſo when the unknown ſtar comes to the meridian; and mark the time exactly, as ſhewn by the time piece, and it will be that ſtar's right aſcenſion in time, which may be reduced into degrees and minutes, by proportioning 15° to 1 hour.

PROBLEM X. *To find the periodic Time of a Planet.*

The planet muſt be obſerved ſeveral times, till it be found to have no latitude, and is therefore in its node. Alſo it muſt be obſerved in like manner when it returns again into the ſame part of its orbit; then the time elapſed between its being in its node, and returning to the ſame again, is the periodic time of the planet. But it will be more exact if the planet be obſerved in its node, at the diſtance of ſeveral revolutions; for the elapſed time, divided by the number of revolutions, will give the periodic time required; and the more the revolutions, the more exact will be the reſult.

PROBLEM XI. *To find the Nodes of a Planet's Orbit, and the Planet's Diſtance from the Sun at that Time.*

Let ABD (Plate III. *fig.* 12) be the earth's orbit; FNQ, that of a ſuperior planet; S the ſun; NSQ, the line of nodes.

Take two obſervations when the planet is in the node N; and let the places of the earth, at theſe times, (ſuppoſed to be given) be A and B. Then, in the triangle ASB, there is given the ſides BS and AS, and the included ∠ ASB, to find the ſide AB, and angles at A and B.

Alſo, the angles, SAN and NBS, being known by obſervation, we have the angles NAB and NBA.

Likewiſe, in the triangle ABN, there are given the angles and the ſide AB to find NA, the planet's place from the earth.

Laſtly, in the triangle NAS, we have the ſides NA and AS, with the angle NAS, to find NS, the diſtance of the planet from the ſun, when it is in the node at N, and the angle ASN, which determines the place of the node, and the poſition of the line of nodes, NSQ.

The calculation will be the ſame for an inferior planet, *mutatis mutandis.*

PROBLEM XII. *To find the Inclination of a Planet's Orbit.*

Let the orbit of the planet be PDG, (Plate III. *fig.* 13) that of the earth, BEQ, and N*n*, the line of the nodes.

At the time when the earth is at Q, in the line of the nodes, obſerve accurately the longitude of the planet at P from the ſun, or the angle OQS, and alſo its latitude PQO. Then it will be, as the ſine of the angle, SQO : radius : : tangent of latitude, PQO : tangent of the inclination of the orbit. For PO being perpendicular to the plane of the ecliptic, and PQ and OQ being drawn, as alſo OB, perpendicular to N*n*, the angle BPO will be the inclination of the orbit. Now, in the right-angled triangles, QPO and BPO, we have, OB : ſine OQB : : QO : radius : : PO : tangent PQO. And, alternately, As ſine OQB : tangent PQO : : OB : PO : : radius : tangent PBO.

PROBLEM XIII. *To find a Planet's Orbit, Place of Aphelion, and the Time of its being in its Perihelion.*

Let *n*PN, in the foregoing figure, be the planet's orbit; AEQ, the earth's; S, the ſun; and N*n*, the line of nodes.

Alſo, (the earth's motion in its orbit, and the inclination of the planet's orbit, being ſuppoſed to be known) let the planet be at P in oppoſition to the ſun, the earth being at E. Then draw PO perpendicular to the ecliptic; likewiſe draw SEO; O being the planet's place reduced to the ecliptic. Obſerve the quantity of the angle PEO, the planet's latitude ſeen from the earth.

Then, ſince the ſun's place is known, the planet's place, being oppoſite to it, is known; and, conſequently, its diſtance from the node O*n*, is alſo known. Therefore, in the ſpherical triangle, *n*PO, the ſide O*n*, and the angle O*n*P are known; and hence the ſide P*n* will be known, as alſo PO, which is the meaſure of the angle PSO, the latitude of the planet ſeen from the ſun.

Likewiſe, SE is known, being the earth's diſtance from the ſun. Therefore, in the triangle PSE, having all the angles and the ſide SE, the planet's diſtance, SP, from the ſun, becomes known. Conſequently, we have the planet's place in its own orbit.

And, by taking in this manner two more obſervations of the ſame planet, in a poſition oppoſite the ſun, we ſhall have two more places, D and G, of the planet's orbit.

Hence we have the magnitude and poſition of three lines, SP, SD, and SG, drawn from the focus of an ellipſis; and, conſequently, the curve may be deſcribed, which will be the orbit of the planet, and from thence every requiſite may be determined.

The application of this method is confined to the ſuperior planets.

The following Method is applicable to an inferior Planet.

Let GHI be the earth's orbit, (Plate III. *fig.* 14) APE, the planet's orbit; S, the ſun; and DSN, the line of the nodes. Let the planet be at P, whilſt the earth is in any place T. Draw PB perpendicular to the plane of the ecliptic, and TB to meet the line of the nodes in N. Alſo, draw SB and TC parallel to BP, and make TD perpendicular to DN, and join CD, then the ∠ TDC is the inclination of the orbit. Therefore, the ∠ BTP, the planet's latitude at the earth, and the ∠ BTS, its diſtance from the ſun in the ecliptic, being obſerved, there are given in the triangle NTS, ST, the ſide or diſtance of the earth and ſun; the ∠ TSN, or the earth's diſtance from the node; and the ∠ NTS, or BTS, to find NT; and, in the right-angled triangle, TSD, we have TS, and ∠ TSD, to find TD. Alſo, in the right-angled triangle, TDE, we have TD and ∠ TDC, to find TC; and, in the right-angled triangle, TCN, there are TC and NT to find ∠ TNC.

Likewiſe, in the triangle NTP, we have the ∠ NTP or BTP, and PNT or CNT, together with the ſide NT, to find TP; and, in the right-angled triangle, PTB, we have TP, and ∠ PTB, to find BT and BP.

Furthermore, in the triangle TSB there will be given TB and TS, and ∠ BTS, to find SB and ∠ TSB, which is the place of the planet reduced to the ecliptic: then, in the right-angled triangle PBS, there are had the ſides PB and BS, to find SP, the planet's diſtance from the ſun, and ∠ PSB, the planet's latitude ſeen from the ſun.

Again, in the right-angled ſpherical triangle, APB, we have PB and ∠ PAB, to find AB and AP. Conſequently, the planet's place in his orbit is known, and alſo his diſtance from the ſun.

And, if by this method two more places of the planet are found, and its diſtances from the ſun, there will be three lines drawn from the focus of an ellipſis given in magnitude and poſition, to deſcribe the ellipſis, (for the performance of which ſee CONIC SECTIONS) which ellipſis will be a juſt deſcription of the planet's orbit.

PROBLEM XIV. *To find the greateſt Elongation of an inferior Planet.*

Let ABD (Plate III. *fig.* 14) be the orbit of the planet; E, a point in the earth's orbit, and S, the ſun. Then, from the point E, draw the line EB to touch the orbit, ABD, of the inferior planet, and the angle SEB will be the planet's greateſt elongation. Draw, therefore, SB to the point of contact B, and it will be perpendicular to the tangent EB: whence, in the right-angled triangle ESB, there are given ES and SB, the diſtances of the earth and planet from the ſun, to find the angle SEB, the elongation.

But, to do this experimentally, the greateſt elongation, SEB, muſt be repeatedly taken by an inſtrument when it is about the extremity of its orbit, and the greateſt angle contained between the ſun and planet, is that ſought.

But, in elliptical orbits, the ſame ſhould be repeated ſeveral times, when the earth and planets are in different parts of their orbits, and the greateſt obſerved angle is the elongation required.

PROBLEM XV. *To find the Parallax of a Planet.*

Let AD (Plate III. *fig.* 15) be the earth; C, its centre; P, the planet; and let the planet's diſtance, CP, from the centre of the earth, be given. Then the angle ZAP is the complement of the apparent altitude, and ZCP, the complement of the true altitude. And it will be, as CP : earth's radius AC : : ſine $\angle$ ZAP : ſine $\angle$ CPA = the parallax.

Or thus: If the diſtances of two planets or ſtars, having the ſame apparent altitude, and alſo the parallax of one of them be known, and if P and G be the planets in the line APG, then $\angle$ APC is the parallax of P, and $\angle$ AGC the parallax of G. Hence, in the triangle, CPG, there are had CP, CG, and an angle oppoſite, (as G) to find the other oppoſite angle. Conſequently, as diſtance CP : diſtance CG : : ſine $\angle$ CGP : ſine $\angle$ CPG or CPA: that is, the ſines of the parallaxes are reciprocally as the diſtances from the earth's centre.

COR. I. The parallaxes of two planets are as the coſines of the apparent altitudes directly, and their diſtances from the earth's centre reciprocally.

COR. II. The horizontal parallax of one body ſeen from another, is equal to the apparent ſemi-diameter of that other ſeen from the firſt.

PROBLEM XVI. *Having the Parallax of a Planet, and its Poſition in reſpect of the Ecliptic and Circles of Longitude, &c. to find the Parallax of Latitude and Longitude; or the Parallax of Right Aſcenſion and Declination.*

Let HO (Plate III. *fig.* 16) be the horizon; EC, the ecliptic; Z, the zenith; P, the pole of EC; S, the apparent place of a planet; ZSB, a vertical circle drawn through the planet; A, the true place of the planet; PAL and PSI, circles of longitude. Draw AD parallel to EC: then AS is the parallax of altitude, SD, the parallax of latitude, and LI, the parallax of longitude; L being the true place of the planet reduced to the ecliptic, and I the apparent place. Therefore, having AS and $\angle$ ASD in the ſmall right-angled triangle ASD, the parallax of latitude, SD, will be had, and the ſide AD.

Wherefore, in the triangles PAD and PLI, it will be, as ſine PD : radius : : AD : LI, the parallax of longitude.

Alſo, whether it is to be added to, or ſubtracted from the longitude at L, will eaſily appear, by the poſition of the circles EC, ZB, and PL.

But if EC be the equinoctial, and P its pole, then SD will be the parallax of declination, and LI the parallax of right aſcenſion.

COR. I. If the circles PS and ZS coincide, SD will be equal to AS, and $AD = 0$. That is, the parallax of longitude or right aſcenſion is nothing, and the parallax of latitude or declination is equal to the parallax of altitude.

COR. II. If the circles EC and ZS coincide, then $AS = LI$, and $SD = 0$. That is, the parallax of longitude or right aſcenſion (as the caſe is) is equal to the parallax of altitude: and the parallax of latitude or declination is nothing.

PROBLEM XVII. *To find the Moon's Periodical Time, Orbit, and Parallax.*

I. The moon's periodic time is known by obſerving the diſtance of time between her conjunction with any fixed ſtar, and her next returning to the ſame ſtar again. But this being different at different times, it will be proper to take the time between her conjunction with any known ſtar, as obſerved ſeveral years ſince, and her preſent conjunction with the ſame ſtar, and divide it by the number of her revolutions, within that period, and it will give her mean periodic time, which is 27 days, 7 hours, 43 minutes, 12 ſeconds, being ſomething more than the time of her return to the ſame point of the ecliptic, which is 27 d. 7 h. 43 m. 5″.

II. The time of the moon's ſynodic revolution, or the time of her revolving from conjunction to conjunction with the ſun, is found in the ſame manner by two obſervations, made at a conſiderable diſtance of time from each other, and has been determined at 29 d. 12 h. 44 m. 3″.

III. To find the parallax, proceed as in Problem XV. or as follows:

In an eclipſe of the moon, obſerve when the horns of the moon are in the ſame vertical circle, and at that moment take the altitude of both the horns: then half the ſum is the apparent altitude of the moon's centre.

Now the place of the ſun in the ecliptic is known, and conſequently the place of the centre of the earth's ſhadow, which is oppoſite to it is alſo known; and the altitude of the moon, at that time, is equal to the altitude of the centre of the ſhadow, becauſe they are both in a line parallel to the horizon. Hence find the altitude of that point of the ecliptic in which the centre of the ſhadow is, from which ſubtract the apparent altitude of the moon, and the remainder is her parallax: and thus her mean horizontal parallax is found to be about 57′ 12″.

IV. To find her diſtance. Let AD (Plate III. *fig.* 17) be the earth, whoſe centre is C, and A the place of obſervation; and let F be the place of the moon. Find her parallax, as above directed, and her apparent diameter; then in the triangle AFC, we have the angle F, or parallax, and the angle CAF, (the ſupplement of ZAF) her apparent zenith diſtance, to find her apparent diſtance AF.

Now if G be another place of the moon whoſe diſtance is ſought, then the moon's apparent diameter at G muſt be obſerved, and her altitude BAG; and it will be, as her apparent diameter at G : her apparent diameter at F : : AF : AG.

Now in the triangle CAG, having the ſides AG, AC, and CAG, (= right-angle CAB + altitude BAG) the ſide CG will be found, or her mean diſtance from the earth's centre = 60.3 of the earth's radius at her mean diſtance.

V. *To find the tranſverſe Axis of her Orbit and Eccentricity.*

Find her diſtance from the earth's centre by a great number of obſervations, continued through her period (as in Art. IV.) Out of theſe ſelect the greateſt and leaſt, and the ſum of them is the greater axis of her orbit; and half the difference is the eccentricity. After this manner it is found, that the moon's mean eccentricity is about 55 of ſuch parts as her mean diſtance contains 1000.

VI. *To find the Place of the Moon's Apogee.*

Obſerve two places of the moon when ſhe has the ſame apparent diameter, and the ſame altitude; biſect that arc to find the intermediate place, for the apſis of her orbit paſſes through it, and conſequently the poſition of the apſis is known. Alſo, that point where the apparent diameter is the leaſt, is the apogee; and, by comparing two ſucceſſive revolutions, the motion of the apogee will be known. Or it may be more exactly determined by dividing the whole ſpace gone through in a long time by the number of revolutions.

By this method it has been found, that the apogee makes a revolution, *in conſequentia*, to the ſame point of the cliptic in 8 years, 309 days, 8 hours, 20 minutes.

VII. To find the place of her nodes; obſerve the latitude of the moon ſeveral times, till you find it to be nothing, allowing for the parallax, and that is the place of her node. If the moon be advancing northward, it is the aſcending node; but if ſouthward, it is the deſcending node.

The motion of the moon's nodes may be found by comparing their places at a diſtant period with the preſent time. By obſervation it is found, that the motion of the nodes is retrograde, and makes a revolution to the ſame point of the ecliptic in about 18 years, 224 days, 5 hours.

VIII. To find the inclination of the moon's orbit; obſerve her latitude ſeveral times when ſhe is near a quadrant from her node, and the greateſt latitude is the inclination of her orbit, allowing for the parallax. By obſervation it is found, that the inclination of her orbit is different at different times, but never leſs than 5°, nor greater than 5° 18′.

PROBLEM XVIII. *To find the Refraction of a Star.*

The earth being ſurrounded with a body of air, named the atmoſphere, through which the rays of light paſs to the eye from all the celeſtial bodies; and theſe rays paſſing through a vacuum, and falling obliquely upon the atmoſphere, they will, by the laws of optics, be refracted in lines approaching nearer to the perpendicular of the refracting ſurface.

Therefore, let AD (Plate III. *fig.* 18) be the earth ſurrounded by the atmoſphere, PQR; and let F be a ſtar, whoſe rays paſs through the atmoſphere QA to the obſerver at A.

Now, ſince the atmoſphere is denſer near the earth, and becomes rarer by degrees, as the height increaſes, therefore, at the top, Q, the refraction, is but ſmall; but the nearer a ray approaches the earth, the air being denſer it will be the more refracted, and gradually bent into a curve, QA. By this means the ſtar comes to the eye in the direction GA, which is a tangent to the curve at A; and ſo the ſtar, inſtead of being ſeen at F, where it really is, appears to be at G, ſituated in the line AG.

And ſince the refraction is made in a plane which is perpendicular to the ſurface of the atmoſphere, or to the ſurface of the earth, and which conſequently paſſes through the centre of the earth, therefore, both the true and apparent place, F and G, are in the ſame vertical circle, whoſe plane paſſes through A, the place of the obſerver, and the centre of the earth C.

It is evident alſo, that the refraction will be the ſame at all diſtances from the earth, when the altitude is the ſame, for from whatever part of the line FQ the rays proceed, they will be refracted along the curve QA to A.

Likewiſe we know from the principles of optics, that if a ray of light paſs through ſeveral refracting mediums it will only ſuffer the ſame refraction as if it paſſed immediately out of the firſt into the laſt. Now it has been confirmed by experiments, that light falling upon a medium of air of a mean denſity, and at a very ſmall angle of inclination, will make the refracted angle about 33′. Now to find the refraction at any other altitude, it will by the laws of dioptrics be as radius : coſine 33′ :: coſine of the true altitude of a ſtar : coſine of the apparent altitude by refraction. Then the true altitude, ſubtracted from the apparent altitude, leaves the refracted angle, which is the refraction of the ſtar.

N. B. The refraction will vary a little, as the denſity of the air either increaſes or decreaſes.

To find the refraction by obſervation, take the altitude of a fixed ſtar when it is at the loweſt point under the pole; and again at about 12 hours diſtance, take its altitude when it is at its higheſt, and clear of refraction, or nearly ſo. Then having the latitude of the place, you will find the diſtance of the ſtar from the pole at each obſervation, and by taking the leſs diſtance from the greater, you will have the refraction of the ſtar at the leſs altitude.

In this obſervation a ſtar ſhould be choſen which comes near the zenith, either northward or ſouthward, and ſo its refraction at the greateſt altitude will be inſenſible. If, however, you ſuſpect that it has ſome ſmall refraction when it is at the higheſt, it may be determined thus. As tangent of greater zenith diſtance : tangent of leſs zenith diſtance, :: the refraction at the lower altitude : the refraction at the higher. The lower refraction muſt be corrected, by ſubtracting this from it; and the remainder will be the proper refraction, provided the lower altitude is not leſs than 8° or 10°.

The refraction at 10° altitude is about 5′, and in the horizon from 30′ to 37′.

Note, Refraction makes an object appear higher than it really is, but parallax makes it appear lower. And hence on account of the variableneſs of refraction, it comes to paſs that the top of a mountain may, perhaps, be ſeen in the morning or at night, and be inviſible at noon in the ſame place. Alſo if a teleſcope be placed in a fixed horizontal poſition a whole day, it will ſometimes happen that the ſights will preſent you with the lower part of a tower at one hour of the day, and with the higher part thereof at another hour of the day.

PROBLEM XIX. *To determine the Sun's Parallax and Diſtance.*

This is done by finding firſt the parallax of ſome of the planets, which being known, the ſun's parallax will become known, for the parallaxes of two celeſtial bodies are reciprocally as their diſtances; and the proportional diſtances of the planets from the ſun and from one another are known, and therefore the parallax of one being determined, the parallaxes of the reſt may be determined alſo.

For this purpoſe the planet Mars, when in oppoſition to the ſun, will be the fitteſt to be made uſe of, becauſe at that time he comes neareſt the earth, and his parallax is then the greateſt. The parallax of Mars will be determined by Problem XV.

Mr. Flamſtead found the parallax of Mars leſs than 30″, and thence determines the ſun's parallax not to be above 10″.

PROBLEM XX. *To find the Diſtance of the fixed Stars.*

See Plate III. *Fig.* 19.

Chooſe two ſtars S and D as near together as may be, or if poſſible in one line AST, obſerving alſo to have one a large ſtar and the other a very ſmall one, and that the difference between the longitude of the ſtars, and that of the earth or ſun, be about a quadrant or 90°. Now let ADB be the earth's orbit, and let the earth be ſuppoſed at A, then being furniſhed with as good a teleſcope as can be had, for otherwiſe the attempt will be in vain, obſerve diligently the ſtars S and T, in or near the line AST, and take their diſtance (if it is determinable that they have any) as near as poſſible. And at the diſtance of about half a year, when the earth is in the oppoſite point of its orbit, obſerve the ſame ſtars again, with the ſame inſtrument, which then will appear further diſtant from each other, and will be ſeen under the angle SBT, which muſt be accurately taken. But if you can obſerve no difference between this angle and that of the former obſervation, then the earth has no ſenſible parallax, and therefore no certain concluſions can be drawn.

If a difference can be aſcertained between the angle at A (if any) and the angle at B, that difference will be nearly equal to the parallax of the annual orbit ADB, or ∠ ASB, and hence the ratio of AB to AS will be known.

If the ſtars S and T are taken near the pole of the ecliptic, then in order to find what alteration appears in the two ſtars; obſervations may be made in any two oppoſite points of the ecliptic, or in as many places as ſhall appear requiſite.

If the ſtars are not very different in magnitude, the angles at B and T may be eſtimated by the diſtances BS and ST, and theſe alſo will be expounded by the magnitude of the ſtars. However, theſe angles are ſo exceeding ſmall, that they can ſcarcely be aſcertained by any inſtrument whatever, and hence the aſtoniſhing diſtance of the neareſt fixed ſtars is evident; for if any fixed ſtar, when viewed through a teleſcope that magnifies 100 times, ſhould appear under an angle of half a minute, the true apparent diameter would not exceed 18 thirds, which is leſs than the 6000 part of the ſun's apparent diameter, and therefore ſuppoſing ſuch ſtar to be of the ſame magnitude as the ſun, its diſtance muſt be at leaſt 6000 times more than that of the ſun.

For the following accurate method of determining the parallax of the fixed ſtars, we are beholden to that excellent Aſtronomer Dr. Herſchel.

The doctor firſt premiſes, that the fixed ſtars one with another may well be ſuppoſed to be of a magnitude nearly equal to that of the ſun; and ſecondly, that the difference of their apparent magnitudes is owing to their different diſtances; ſo that the ſtar of the ſecond, third, or fourth magnitude, is two, three, or four times as far off as one of the firſt. Theſe principles which he premiſes as poſtulata, have ſo great a probability in their favour, that they will hardly be objected to by thoſe who are in the leaſt acquainted with the doctrine of chances. Accordingly, let OE, Plate III. *fig.* 20, be the whole diameter of the earth's annual orbit; and let *a*, *b*, *c*, be three ſtars ſituated in the ecliptic, in ſuch a manner that they may be ſeen all in one line O *a*, *b*, *c*, when the earth is at O. Let the line O *a b c*, be perpendicular to OE, and draw PE parallel to *c*O: then, if O *a*, *a b*, *b c*, are equal to each other, *a* will be a ſtar of the firſt magnitude, *b* of the ſecond, and *c* of the third. Let us now ſuppoſe the angle O *a* E, or parallax of the whole orbit of the earth, to be 1′ of a degree; then we have $PEa = OaE = 1''$: and becauſe very ſmall angles, having the ſame ſubtenſe OE, may be taken to be in the inverſe ratio of the lines O *a*, O *b*, O *c*, &c. we ſhall have $ObE = \frac{1}{2}''$, $OcE = \frac{1}{3}''$, &c. Now when the earth is removed to E, we ſhall have $PEb = Ebc = \frac{1}{2}''$, and $PEa - PEb = aEb = \frac{1}{2}''$: i. e. the ſtars *a*, *b*, will appear to be $\frac{1}{2}''$ diſtant. We alſo have $PEc = EcO = \frac{1}{3}''$, and $PEa - PEc = aEc = \frac{2}{3}''$; i. e. the ſtars, *a*, *c*, will appear to be $\frac{2}{3}''$ diſtant when the earth is at E. Now, ſince we have $bEP = \frac{1}{2}''$, and $cEP = \frac{1}{3}''$, therefore $bEP - cEP = bEc = \frac{1}{2}'' - \frac{1}{3}'' = \frac{1}{6}''$; i. e. the ſtars *b*, *c*, will appear to be only $\frac{1}{6}''$ removed from each other when the earth is at E. Whence we may deduce the following expreſſion, to denote the parallax that will become viſible in the change of diſtance between the two ſtars, by the removal of the earth from one extreme of its orbit to the other. Let P expreſs the total parallax of a fixed ſtar of the firſt magnitude, M the magnitude of the largeſt of the two ſtairs, *m* the magnitude of the ſmalleſt, and *p* the partial parallal to be obſerved by the change in the diſtance of a double ſtar; then will $p = \frac{m - M}{Mm}P$; and *p*, being found by obſervation, will give us $P = \frac{pMm}{m - M}$. E. G. Suppoſe a ſtar of the firſt magnitude ſhould have a ſmall ſtar of the twelfth magnitude near it; then will the partial parallax we are to expect to ſee be $\frac{12\times 1P}{12-1}$, or $\frac{11}{12}$ of the total parallax of a fixed ſtar of the firſt magnitude; and if we ſhould, by obſervation, find the partial parallax between two ſuch ſtars to amount to 1″, we ſhall have the total parallax $P = \frac{1\times 1\times 12}{12-1} = 1''.0909$. If the ſtars are of the third and twenty-fourth magnitude, the partial parallax will be $\frac{24-3}{3\times 24} = \frac{21}{72}P$; and if, by obſervation, *p* is found to be a tenth of a ſecond, the whole parallax will come out $\frac{1\times 3\times 24}{24-3} = 0''.3428$.

Farther, ſuppoſe the ſtars being ſtill in the ecliptic, to appear in one line, when the earth is in any other part of its orbit between O and E; then will the parallax ſtill be expreſſed by the ſame algebraic formula, and one of the maxima will ſtill lie at O, the other at E; but the whole effect will be divided into two parts, which will be in proportion to each other as radius — ſine to radius + ſine of the ſtars diſtance from the neareſt conjunction or oppoſition.

When the ſtars are any where out of the ecliptic, ſituated ſo as to appear in one line O *a b c*, perpendicular to O E, the maximum of parallax will ſtill be expreſſed by $\frac{m - M}{Mm}P$; but there will ariſe another addititional parallax in the conjunction and oppoſition, which will be to that which is found 90° before or after the ſun, as the ſine (S) of the latitude of the ſtars ſeen at O is to the radius (R); and the effect of this parallax will be divided into two parts; half of it lying on one ſide of the large ſtar, the other half on the other ſide of it. This latter parallax, moreover, will be compounded with the former, ſo that the diſtance of the ſtars in the conjunction and oppoſition will then be repreſented by the diagonal of a parallelogram, whereof the two ſemiparallaxes are the ſides; a general expreſſion for which will be $\sqrt{\left.\frac{m-P}{2mP}P\right|^{2}\times\frac{SS}{RR}+1}$; for the ſtars will apparently deſcribe two ellipſes in the heavens, whoſe tranſverſe axis will be to each other in the ratio of M to *m* (*fig.* 21), and A *a*, B *b*, C *c*, D *d*, will be the cotemporary ſituations. Now, if *b* Q be drawn parallel to A C, and the parallelogram *b q* B Q be completed, we ſhall have $b\,Q = \frac{1}{2}\,CA - \frac{1}{2}\,ca = \frac{1}{2}\,Cc = \frac{1}{2}\,p$, or ſemiparallax 90° before or after the ſun, and B *b* may be reſolved into, or is compounded of, *b* Q and *b q*; but $b\,q = \frac{1}{2}\,BD - \frac{1}{2}\,bd =$ the ſemiparallax in the conjunction or oppoſition. We alſo have R : S :: *b* Q : $bq = \frac{pS}{2R}$; therefore the diſtance B *b* (or D *d*) $= \sqrt{\overline{\frac{p}{2}}\Big|^2 + \overline{\frac{pS}{2R}}\Big|^2}$; and by ſubſtituting the value of *p* into this expreſſion, we obtain $\sqrt{\overline{\frac{m-M}{2Mm}P}\Big|^2 \times \frac{SS}{RR} + 1}$, as above. When the ſtars are in the pole of the ecliptic, *b q* will become equal to *b* Q, and B *b* will be $7071\ P\,\frac{m-M}{Mm}$. Again, let the ſtars be at ſome diſtance, *e. g.* 5″ from each other, and let them both be in the ecliptic. This caſe is reſolvable into the firſt; for imagine the ſtar *a* (*fig.* 22.) to ſtand at *x*, and in that ſituation the ſtars *x*, *b*, *c*, will be in one line, and their parallax expreſſed by $\frac{m-M}{Mm}P$. But the angle *a* E *x* may be taken to equal to *a* O *x*; and as the foregoing formula gives us the angles *x* E *b*, *x* E *c*, we are to add *a* E *x* or 5′ to *x* E *b*, and we ſhall have *a* E *b*. In general, let the diſtance of the ſtars be *d*, and let the obſerved diſtance at E be D, then will $D = d + p$, and the whole parallax of the annual orbit will be expreſſed by $\frac{DMm - dMm}{m-M} = P$.

Suppoſe the two ſtars now to differ only in latitude, one being in the ecliptic, the other, *e. g.* 5′ north, when ſeen at O. This caſe may alſo be reſolved by the former; for imagine the ſtars, *b*, *c*, (*fig.* 23.) to be elevated at right angles above the plane of the figure, ſo that *a* O *b*, or *a* O *c*, may make an angle of 5″ at O; then, inſtead of the lines O *a b c*, E *a*, E *b*, E *c*, E P, imagine them all to be planes at right angles to the figure; and it will appear that the parallax of the ſtars in longitude muſt be the ſame as if the ſmall ſtar had been without latitude. And ſince the ſtars *b*, *c*, by the motion of the earth from O to E, will not change their latitude, we ſhall have the following conſtruction for finding the diſtance of the ſtars *a b*, *a c*, at E, and from thence the parallax P. Let the triangle *a b* β (*fig.* 24.) repreſent the ſituation of the ſtars; *ab* is the ſubtenſe of 5′, the angle under which they are ſuppoſed to be ſeen at O. The quantity *b*β by the former theorem is found, $\frac{m-M}{Mm}P$, which is the partial parallax that would have been ſeen by the earth's moving from O to E, if both ſtars had been in the ecliptic; but on account of the difference in latitude, it will be now repreſented by *a*β, the hypotheneuſe of the triangle *ab*β: therefore, in general, putting $ab = d$, and $a\beta = D$, we have $\sqrt{\frac{\overline{DD - dd} \times Mm}{m-M}} = P$. Hence D being taken by obſervation, and *d*, M, and *m*, given, we obtain the total parallax.

If the ſituation of the ſtars differs in longitude as well as latitude, we may reſolve this caſe by the following method. Let the triangle *ab*β (*fig.* 25.) repreſent the ſituation of the ſtars, $ab = d$ being their diſtance ſeen at O, $a\beta = D$, their diſtance ſeen at E. That the change *b*β, which is produced by the earth's motion will be truly expreſſed by $\frac{m-M}{Mm}P$ may be proved as before, by ſuppoſing the ſtar *a* to have been placed at α. Now let the angle of poſition *b a* α be taken by a micrometer, or by any other method ſufficiently exact; then, by ſolving the triangle *ab*α, we ſhall have the longitudinal and latitudinal differences *a*α and *b*α of the two ſtars. Put $a\alpha = x$, $b\alpha = y$, and it will be $x + b\beta = \alpha q$, whence $D = \sqrt{\overline{x + \frac{m-M}{Mm}P}\Big|^2 + yy}$; and $\sqrt{\frac{\overline{D^2 - y^2} \times M^2 m - xMm}{m-M}} = P$.

If neither of the ſtars ſhould be in the ecliptic, nor have the ſame longitude or latitude, the laſt theorem will ſtill ſerve to calculate the total parallax whoſe maximum will lie in E. There will, moreover, ariſe another parallax, whoſe maximum will be in the conjunction and oppoſition, which will be divided, and lie on different ſides of the large ſtar; but as we know the whole parallax to be exceedingly ſmall, it will not be neceſſary to inveſtigate every particular caſe of this kind; for by reaſon of the diviſion of the parallax, which renders obſervations taken at any other time, except where it is greateſt, very unfavourable, the formulæ would be of little uſe.

SECT. VIII.

A MORE PARTICULAR DESCRIPTION OF THE PLANETS, &c.

Mercury is a ſmall ſtar, but emits a very bright white light; though on account of his keeping always near the ſun he is ſeldom to be ſeen, and when he does appear, his motion towards the ſun is ſo very ſwift, that he can only be diſcerned for a ſhort time. He appears a little after ſun-ſet; and again a little before ſun-riſe. When this planet is viewed through a good teleſcope he appears equally luminous throughout his whole ſurface. He has different phaſes like the moon, being ſometimes horned, ſometimes gibbous, and ſometimes ſhining almoſt with a round face, though not entirely full, becauſe his enlightened ſide is never turned directly towards us; however at all times he appears bright and well defined, and without a ragged edge.

The diameter of Mercury is computed at about .367 of the Earth's diameters, and its mean diſtance from the ſun at about .3871 of the Earth's diſtance from him; alſo at a mean rate it makes a revolution through its orbit, to the ſame point of the ecliptic, in 87 days, 23 hours, 14 minutes, 34 ſeconds; the inclination of its orbit to the plane of the ecliptic, is 6° 59′ 20″; but the inclination of the axis of Mercury to the axis of the ecliptic is not determined.

Its apparent diameter at a mean diſtance from the earth is 20″, which is about 1″ leſs than it would appear if ſeen from the ſun, the place of its aſcending node at the beginning of the preſent year, 1789 (according to Doctor Halley's tables) is 16° 1′ 30″ in ♉; and of its aphelion 14° 1′ 24″ ♐. The nodes of this planet move forward 50″ per year, and the place of the aphelion moves in like manner 52″ 34‴ per year.

Alſo ſuppoſing the ſemi-tranſverſe diameter of its orbit to be 1, its eccentricity is .20589.

Venus is the moſt beautiful ſtar in the firmament, and is known by the names of the morning and evening ſtar; ſhe likewiſe keeps near the ſun, though ſhe recedes from him almoſt double the diſtance of Mercury. She is never ſeen in the eaſtern quarter of the heavens, when the Sun is in the weſtern; but always ſeems to attend him in the evening, or to give notice of his approach in the morning. This planet alſo has the like phaſes as the moon.

Some aſtronomers have thought that they have ſeen a Satellite moving round Venus, particularly Mr. Montaigne on the 3d and 11th May 1761, who from the obſervations that he made, concluded that its ſynodic revolution was about 12 days. But nothing further has been diſcovered to confirm this matter; and it is generally thought that Mr. Montaigne was miſtaken.

Mr. Dunn of Chelſea, and other gentlemen, in obſerving the tranſit of Venus in A. D. 1761, ſaw a penumbra or ſmall diminution of light, which grew darker and darker for the ſpace of about 5 ſeconds before the internal contact preceding the egreſs; and from thence Mr. Dunn concluded, that Venus is ſurrounded with an atmoſphere of about 50 Geographical miles high.

The diameter of Venus is eſtimated at 1.0275 of the earth's diameter, and its mean diſtance from the ſun at .72333 of the earth's diſtance from the ſun; alſo it turns round its axis in 23 hours and 20 minutes, and makes a revolution in its orbit to the ſame point of the ecliptic in 224 days, 16 hours, 41 minutes, 30 ſeconds. The inclination of its axis to the axis of the ecliptic is about 75° and its orbit to the plane of the ecliptic 2° 23′ 5″.

It is apparent diameter at a mean diſtance from the earth is 1′ 20″, and as viewed from the ſun at a mean diſtance 30″. Alſo the eccentricity of its orbit is .0069813 parts of its ſemi-tranſverſe axis.

The place of its node from the equinox, at the commencement of the preſent year (1789) 14° 43′ 52″ ♊, and of its aphelion 7° 55′ 15″ ♒. The nodes move forward 31″ per year.

OF THE EARTH.

The Earth, or planet which we inhabit, is about 7940 miles in diameter, and, at a mean rate, about 81 millions of miles diſtance from the ſun. It performs a revolution through its orbit to the ſame point of the ecliptic in 365 days, 5 hours, 48 minutes, 57 ſeconds, and revolves round its axis in 23 hours, 56 minutes, 4 ſeconds.

Sir Iſaac Newton, from philoſophical principles, demonſtrated that the figure of the Earth could not be that of a perfect ſphere, but that its equatorial diameter is to its diameter from pole to pole as 230 to 229, which has likewiſe been confirmed by experiments.

The eccentricity of the Earth's orbit is .0168 parts of the ſemi-tranſverſe axis, and the inclination of its axis to the plane of its orbit is 23° 28′. Its apparent diameter, as ſeen from the ſun, is about 21″, and the place of its aphelion, at the commencement of the preſent year, (according to Dr. Halley) is ♑ 9° 8′ 9″, which moves forwards 1º 23′ 20″ in 100 years.

OF THE MOON.

The Earth has one Satellite, namely, the Moon, revolving in an orbit at the diſtance of about 60 of the earth's ſemi-diameters. The diameter of the Moon to that of the earth is as .274 to 1.

The Moon performs a revolution to the ſame point of the ecliptic in 27 days, 7 hours, 43 minutes, 5 ſeconds: in which time alſo ſhe makes a rotation round her axis, the time of her ſynodic revolution, or the mean perion between New Moon and New Moon, is 29 days, 12 hours, 44 minutes, 3 ſeconds, the apparent diameter of the Moon at a mean diſtance from the earth, is 31′ 16½″, and as viewed from the ſun at a mean diſtance 6″.

The inclination of her axis to the axis of the ecliptic is about 2° 10′, and of her orbit to the ecliptic, from 5° to 5° 18′; the mean eccentricity of her orbit is .055, the greateſt .0667, and the leaſt .0433 parts of the ſemi-tranſverſe axis.

The greateſt equation of the Moon's apogee is 12° 18′, and of her node, 1° 29′ 40″. Her mean horizontal parallax is 57′ 5″, and the ratio of the moon's parallax to her diameter, is as 167 to 90.

That there are many inequalities in the Moon's ſurface is allowed by all; ſome of which, it is ſuppoſed, are deep cavities and others, prominences or mountains.

Many aſtronomers have attempted to aſcertain the heights of the lunar mountains, but their concluſions have differed ſo much from each other as muſt prevent any reliance on what they have done. The method, however, purſued by Dr. Herſchel in this buſineſs, is by far the moſt ſcientific and mathematical, and, allowing the caſe to be poſſible, it bids the faireſt to come at truth.

His method ſuppoſes the obſervations to be made when the Moon is not in her quadratures, and is as follows: (ſee Plate III. *fig.* 26.

"Let SLM, ſays he, or *slm*, be a line drawn from the ſun to the mountain, touching the Moon at L or *l*, and the mountain at M or *m*. Then, to an obſerver at E or *e*, the lines L M, *l m*, will not appear of the ſame length, though the mountains ſhould be of an equal height; for L M will be projected into *o n*, and *l m* into O N. But theſe are the quantities that are taken by the micrometer when we obſerve a mountain to project from the line of illumination.

From the obſerved quantity *o n*, when the Moon is not in her quadrature, to find L M, we have the following analogy:

The triangles *o* O L, *r* M L, are ſimilar; therefore, L *o* : L O :: L *r* : L M, or $\frac{LO \times on}{Lo} = LM$: but L O is the radius of the Moon, and L *r* or *o n* is the obſerved diſtance of the mountain's projection; and L *o* is the ſine of the angle ROL $=$ *o*LS; which we may take to be the diſtance of the ſun from the moon without any material error, and which therefore we may find at any given time from an ephemeris.

"The teleſcope uſed in theſe obſervations was a Newtonian reflector, of ſix feet eight inches focal length, to which a micrometer was adopted, conſiſting of two parallel hairs, one of which was moveable by means of a fine ſcrew. The value of the parts ſhown by the index was determined by a trigonometrical obſervation of a known object at a known diſtance, and was verified by ſeveral trials. The power was always 222, excepting where another is expreſsly mentioned; and this was alſo determined by experiment, which frequently differs from theory on account of ſome ſmall errors in the data, hardly to be avoided. The moon having ſufficient light, an aperture of no more than four inches was made uſe of; and, ſays Dr. Herſchel, I believe, that, for diſtinctneſs of viſion, this inſtrument is perhaps equal to any that ever was made."

With this inſtrument he obſerved a prominence, which he calls a rock, ſituated near the Lacus Niger of Hevelius, and found that it projected 41.56″. To reduce this into miles, put R for the ſemidiameter of the moon in ſeconds, as given by the nautical almanack at the time of obſervation, and Q for the obſerved quantity, alſo in ſeconds andounteſimals; then it will be in general, R : 1090 (the moon's ſemidiameter in miles) :: Q : $\frac{1090\,Q}{R} = on$ in miles. Thus it is found, that 41.56″ is 46.79 miles. The diſtance of the ſun from the moon at that time was, by the nautical almanack, about 93° 57½′; the ſine of which to the radius 1 is .9985, &c. $\frac{on}{Lo}$ in this caſe is LM $=$ 46.85 miles.

Then, $\sqrt{\overline{46.85}|^{2} + \overline{1090}|^{2}} = 1091$ miles $=$ OM; and 1091 $-$ 1090 $=$ 1 mile $=$ MP, the height of the mountain.

As the moon has on its ſurface mountains and vallies, in common with the earth, ſome modern aſtronomers have diſcovered a ſtill greater ſimilarity, viz. that ſome of theſe are volcanoes, emitting fire as thoſe on earth do.

Dr. Herſchell has particularly obſerved ſeveral eruptions of the lunar volcanoes, the laſt of which he gives an account of in the Philoſophical Tranſactions for 1787.

"April 19, 10 h. 36′ ſidereal time. I perceive (ſays he) three volcanoes in different places of the dark part of the new moon. Two of them are either already nearly extinct, or otherwiſe in a ſtate of going to break out; which perhaps may be decided next lunation. The third ſhews an actual eruption of fire or luminous matter. I meaſured the diſtance of the crater from the northern limb of the moon, and found it 3′ 57.3″; its light is much brighter than the nucleus of the comet which M. Mechain diſcovered at Paris the 10th of this month.

"April 20, 10 h. 2′, ſidereal time. The volcano burns with greater violence than laſt night. Its diameter cannot be leſs than 3″, by comparing it with that of the Georgian planet: as Jupiter was near at hand, I turned the teleſcope to his third ſatellite, and eſtimated the diameter of the burning part of the volcano to be equal to at leaſt twice that of the ſatellite; whence we may compute, that the ſhining or burning matter muſt be above three miles in diameter. It is of an irregular round figure, and very ſharply defined on the edges. The other two volcanoes are much farther towards the centre of the moon, and reſemble large, pretty faint nebulæ, that are gradually much brighter in the middle; but no well-defined luminous ſpot can be diſcerned in them. Theſe three ſpots are plainly to be diſtinguiſhed from the reſt of the marks upon the moon; for the reflection of the ſun's rays from the earth is, in its preſent ſituation, ſufficiently bright, with a ten-feet reflector, to ſhew the moon's ſpots, even the darkeſt of them; nor did I perceive any ſimilar phænomena laſt lunation, though I then viewed the ſame places with the ſame inſtrument.

"The appearance of what I have called the *actual fire*, or eruption of a volcano, exactly reſembled a ſmall piece of burning charcoal when it is covered by a very thin coat of white aſhes, which frequently adhere to it when it has been ſome time ignited; and it had a degree of brightneſs about as ſtrong as that with which ſuch a coal would be ſeen to glow in faint daylight.

"All the adjacent parts of the volcanic mountain ſeemed to be faintly illuminated by the eruption, and were gradually more obſcure as they lay at a greater diſtance from the crater. This eruption reſembled much that which I ſaw on the 4th of May, in the year 1783, but differed conſiderably in magnitude and brightneſs; for the volcano of the year 1783, though much brighter than that which is now burning, was not nearly ſo large in the dimenſions of its eruption: the former ſeen in the teleſcope reſembled a ſtar of the fourth magnitude as it appears to the naked eye; this, on the contrary, ſhews a viſible diſk of luminous matter, very different from the ſparkling brightneſs of ſtar-light."

OF MARS.

Mars is of a red fiery colour, and always gives a much duller light than Venus, though ſometimes he equals her in ſize. He is not ſubject to the ſame limitations in his motions as Mercury or Venus, but appears ſometimes very near the ſun, and at other times at a great diſtance from him.

The diameter of Mars is to that of the earth as .5229 to 1, and its mean diſtance from the ſun is 152369 of ſuch parts as the diſtance of the earth from the ſun contain 100000; and the eccentricity of its orbit is .09263936 parts of the ſemidiameter. Its apparent diameter, as viewed at a mean diſtance from the earth, is 30″, and as ſeen from the ſun 12″. It makes a rotation round its axis in about 24 hours, 40 minutes, and performs a revolution through its orbit to the ſame point of the ecliptic in one common year, 321 days, 22 hours, 18 minutes, 19 ſeconds: alſo its ſynodic revolution, or time of returning to the ſame fixed ſtar, is 1 year, 321 days, 23 hours, 29 minutes, and 2 ſeconds.

The inclination of the axis of Mars, with reſpect to its own orbit, is about 61° 18′; and conſequently the obliquity of the ecliptic is 28° 42′; the place of the node of the axis is in 19° 28′ ♓: alſo, the inclination of its orbit to the ecliptic is 1° 51′; the place of its aphelion ♍ 1° 18′; and of its node ♉ 21° 4′. Its aphelion moves forward 1° 56′ 40″, in 100 years, and its node 1° 3′ 20″ in 100 years.

From the beſt obſervations the form of Mars is that of a ſpheroid, its equatorial diameter being to its polar diameter in the proportion of about 131 to 127; and there is little doubt but the forms of all the planets are ſpheroids, at leaſt if they may be all ſuppoſed to revolve round their axis, as a motion of that kind cannot be thought to fail of producing ſuch effects: for it was on this principle that Sir Iſaac Newton determined the figure of the earth, and the ratio of equatorial and polar diameters, which has ſince been confirmed by actual menſuration.

It has been commonly related by aſtronomers, that the atmoſphere of this planet is poſſeſſed of ſuch ſtrong refractive powers, as to render the ſmall fixed ſtars near which it paſſes inviſible. Dr. Smith relates an obſervation of Caſſini, where a ſtar in the water of Aquarius, at the diſtance of ſix minutes from the diſk of Mars, became ſo faint before its occultation, that it could not be ſeen by the naked eye, nor with a three-feet teleſcope. This would indicate an atmoſphere of very extraordinary ſize and denſity; but the obſervations of Dr. Herſchel ſhow, that it is of much ſmaller dimenſions: however, after relating what obſervations he has made, he concludes, "that this planet is not without a conſiderable atmoſphere; for, beſides the permanent ſpots on its ſurface, he has often noticed occaſional changes of partial bright belts, and alſo, once a darkiſh one in a pretty high latitude; and theſe alterations can hardly be aſcribed to any other cauſe than the variable diſpoſition of clouds and vapours floating in the atmoſphere of the planet."

OF JUPITER.

Jupiter often appears at a great diſtance from the ſun, and ſhines with a bright white light, and has the ſame general appearance with Mars, only that the belts on his ſurface are much larger, and more permanent; but they are not to be obſerved without an excellent teleſcope. Fontana and two other Italians are ſaid to be the firſt who diſcovered them; but Caſſini was the firſt who gave any tolerable account of them.

Their number is very variable, as ſometimes only one, and at others no fewer than eight, may be perceived. They are generally parallel to one another, but not always ſo; and their breadth is likewiſe variable, one belt having been obſerved to grow narrow, while another in its neighbourhood has increaſed in breadth, as if the one had flowed into the other.

The time of their continuance is very uncertain, ſometimes remaining unchanged for three months; at others, new belts have been formed in an hour or two. In ſome of theſe belts large black ſpots have appeared, which moved ſwiftly over the diſk from eaſt to weſt, and returned in a ſhort time to the ſame place; from whence the rotation of this planet about its axis has been determined.

The time of its rotation is about 9 h. 56 min. and it makes a revolution in its orbit to the ſame point of the ecliptic in 11 years, 313 days, 8 hours, 35 minutes, 4 ſeconds; and the time of its ſynodic revolution is 4332 days, 12 hours, 20 min. 9 ſeconds.

Its apparent diameter, as ſeen at a mean diſtance from the earth, is 39″, and as viewed from the ſun 37″: its real diameter is 9.1468 of the earth's diameter. The denſity of this planet is to that of the earth as .23625 to 1. The proportion of light and heat on its ſurface, to that on the earth, is as .0369 to 1, and the ratio of its polar and equatorial diameters are as 12 to 13. The eccentricity of its orbit is .0482192 parts of its ſemi-tranſverſe axis; its mean diſtance from the ſun 520096 of ſuch parts, as the earth's diſtance contains 100000.

The place of its aphelion at the commencement of the preſent year was ♎ 11° 20′ 36″, and of its node ♋ 8° 48′ 20″. Alſo, its aphelion moves forwards 2° in 100 years, and its node moves 1° 23′ 20″ in 100 years.

The inclination of the axis of Jupiter to the ecliptic is undetermined, but the inclination of his orbit to that of the ecliptic is 2° 33½′. It is, however, ſaid, that the plane of his equator is nearly coincident with that of his orbit; and if ſo, there can be very little difference of ſeaſons on Jupiter's ſurface.

OF JUPITER's SATELLITES.

The moſt remarkable circumſtance attending Jupiter, is his having four moons, which conſtantly revolve round him at different diſtances. Theſe are all ſuppoſed to move in ellipſes; though the eccentricities of all of them are too ſmall to be meaſured, excepting that of the fourth; and even this amounts to no more than 0.007 of its mean diſtance from the primary. The orbits of theſe ſecondary planets were thought by Galileo to be in the ſame plane with that of their primary: but Mr. Caſſini found that their orbits make a ſmall angle with it; and that their nodes are nearly in the ſame plane.

The firſt of theſe ſatellites revolves at the diſtance of 5.697 of Jupiter's ſemidiameters, or 1′ 51″ as meaſured by proper inſtruments; its periodical time is 1 d. 18 h. 27′ 34″. The next ſatellite revolves at the diſtance of 9.017 ſemidiameters, or 2′ 56″, in 3 d. 13 h. 13′ 42″; the third at the diſtance of 14.384 ſemidiameters, or 4′ 42″, in 7 d. 3 h. 42′ 36″; and the fourth at the diſtance of 25.266, or 8′ 16″, in 16 d. 16 h. 32′ 09″.

When a ſatellite is in its ſuperior ſemicircle, or that half of its orbit which is more diſtant from the earth than Jupiter is, its motion appears to us direct, according to the order of the ſigns; but in its inferior ſemicircle, when it is nearer to us than Jupiter, its motion appears retrograde; and both theſe motions ſeem quicker the nearer the ſatellites are to the centre of the primary, ſlower the more diſtant they are, and at the greateſt diſtance of all they appear for a ſhort time to be ſtationary.

From this account of the ſyſtem of Jupiter and his ſatellites, it is evident, that occultations of them muſt frequently happen by their going behind their primary, or by coming in betwixt us and it. The former takes place when they proceed towards the middle of their upper ſemicircle; the latter, when they paſs through the ſame part of their inferior ſemicircle. Occultations of the former kind happen to the firſt and ſecond ſatellite; at every revolution, the third very rarely eſcapes an occultation, but the fourth more frequently by reaſon of its greater diſtance. It is ſeldom that a ſatellite can be diſcovered upon the diſk of Jupiter, even by the beſt teleſcopes, excepting at its firſt entrance, when by reaſon of its being more directly illuminated by the rays of the ſun than the planet itſelf, it appears like a lucid ſpot upon it. Sometimes, however, a ſatellite in paſſing over the diſk, appears like a dark ſpot, and is eaſily to be diſtinguiſhed. This is ſuppoſed to be owing to ſpots on the body of the ſecondary planets; and it is remarkable, that the ſame ſatellite has been known to paſs over the diſk at one time as a dark ſpot, and at another ſo luminous that it could not be diſtinguiſhed from Jupiter himſelf, except at its coming on and going off. To account for this, we muſt ſay, that either the ſpots are ſubject to change; or if they be permanent, like thoſe of our moon, that the ſatellites at different times turn different parts of their globes towards us. Poſſibly both theſe cauſes may contribute to produce the phænomena juſt mentioned.

When the ſatellites paſs through their inferior ſemicircles, they may caſt a ſhadow upon their primary, and thus cauſe an eclipſe of the ſun to his inhabitants if there are any; and in ſome ſituations this ſhadow may be obſerved going before or following the ſatellite. On the other hand, in paſſing through their ſuperior ſemicircles, the ſatellites may be eclipſed in the ſame manner as our moon by paſſing through the ſhadow of Jupiter: and this is actually the caſe with the firſt, ſecond, and third of theſe bodies; but the fourth, by reaſon of the largeneſs of its orbit, paſſes ſometimes above or below the ſhadow, as is the caſe with our moon. The beginnings and endings of theſe eclipſes are eaſily ſeen by a teleſcope when the earth is in a proper ſituation with regard to Jupiter and the ſun; but when this or any other planet is in conjunction with the ſun, the ſuperior brightneſs of that luminary renders both it and the ſatellites inviſible. From the time of its firſt appearing after a conjunction until near the oppoſition, only the immerſions of the ſatellites into his ſhadow, or the beginnings of the eclipſes, are viſible; at the oppoſition, only the occultations of the ſatellites, by going behind or coming before their primary, are obſervable; and from the oppoſition to the conjunction, only the emerſions, or end of the eclipſes, are to be ſeen. This is exactly true in the firſt ſatellite, of which we can never ſee an immerſion with its immediately ſubſequent emerſion: and it is but rarely that they can be both ſeen in the ſecond; as in order to their being ſo, that ſatellite muſt be near one of its limits, at the ſame time that the planet is near his perihelion and quadrature with the ſun. With regard to the third, when Jupiter is more than 46 degrees from conjunction with, or oppoſition to, the ſun, both its immerſions and immediately ſubſequent emerſions are viſible; as they likewiſe are in the fourth, when the diſtance of Jupiter from conjunction or oppoſition is 24 degrees.

OF SATURN.

Saturn is alſo frequently ſeen at a great diſtance from the ſun, and ſhines with a pale faint light, and when viewed through a good teleſcope makes a more remarkable appearance than any of the other planets.

Galileo firſt diſcovered his uncommon ſhape, which he thought to be like two ſmall globes, one on each ſide of a large one: and he publiſhed his diſcovery in a Latin ſentence; the meaning of which was, that he had ſeen him appear with three bodies; though, in order to keep the diſcovery a ſecret, the letters were tranſpoſed. Having viewed him for two years, he was ſurpriſed to ſee him become quite round without theſe appendages, and then after ſome time to aſſume them as before. Theſe adjoining globes were what are now called the *anſæ* of his ring, the true ſhape of which was firſt diſcovered by Huygens about 40 years after Galileo. From the diſcoveries made by him and other aſtronomers, it appears that this planet is ſurrounded by a broad thin ring, the edge of which reflects little or none of the ſun's light to us, but the planes of the ring reflect the light in the ſame manner that the planet itſelf does; and if we ſuppoſe the diameter of Saturn to be divided into three equal parts, the diameter of the ring is about ſeven of theſe parts. The ring is detached from the body of Saturn in ſuch a manner, that the diſtance between the innermoſt part of the ring and the body is equal to its breadth. Being commonly viewed at an oblique angle, appears of an oval form, and through very good teleſcopes double, as repreſented Plate III. *Fig.* 27. Both the outward and inward rim is projected into an illipſis, more or leſs oblong according to the different degrees of obliquity with which it is viewed. Sometimes our eye is in the plane of the ring, and then it becomes inviſible; either becauſe the outward edge is not fitted to reflect the ſun's light, or more probably becauſe it is too thin to be ſeen at ſuch a diſtance. As the plane of this ring keeps always parallel to itſelf, that is, its ſituation in one part of the orbit is always parallel to that in any other part, it diſappears twice in every revolution of the planet, that is, about once in 15 years; and he ſometimes appears quite round for nine months together. At other times, the diſtance betwixt the body of the planet and the ring is very perceptible.

When Saturn appears round, if our eye be in the plane of the ring, it will appear as a dark line acroſs the middle of the planet's diſk; and if our eye be elevated above the plane of the ring, a ſhadowy belt will be viſible, cauſed by the ſhadow of the ring, as well as by the interpoſition of part of it betwixt the eye and the planet. When it appears double, the ring next the body of the planet appears brighteſt. He has alſo two belts, diſcovered with very long teleſcopes, which appear parallel to that formed by the edge of the ring abovementioned; but theſe are rectilinear when the ring appears elliptic, and ſeem to be permanent. In 1683, however, Dom. Caſſini and Fatio perceived a bright ſtreak upon Saturn, which was not permanent like the dark belts, but was viſible one day, and diſappeared the next, when another came into view near the edge of his diſk. This induced Caſſini to ſuppoſe, that Saturn might have a rotation round his axis; but the diſtance of this planet is ſo great, that we can ſcarce hope to determine his revolution ſo accurately as that of the others.

The aſtronomer-royal, Dr. Maſkelyne, informs us, the phænomena of diſappearance and reappearance may be expected to take place as follows:

"May 2d, 1789, Saturn's ring will diſappear; the earth being about to paſs from its northern ſide, which is enlightened, to its ſouthern ſide, which is obſcure.

"Auguſt 27th, the earth having repaſſed to the northern or enlightened ſide, the ring will reappear.

"October 8th, the ring will diſappear; its plane being near paſſing through the ſun, when it will change its enlightened ſide from the northern to the ſouthern one, conſequently the dark ſide will be then turned to the earth.

"January 30th, 1790, the earth having paſſed from the northern or dark ſide of the ring, to the ſouthern or enlightened one, the ring will become viſible, to continue ſo until the year 1803."

The diameter of Saturn is to the earth's diameter as 7.2661 to 1.; and its mean diſtance from the ſun 954006 of ſuch parts, as the earth's diſtance contains 100000: alſo the eccentricity of its orbit is .05700322 parts of the ſemi-tranverſe axis.

Its apparent diameter, as ſeen at a mean diſtance from the earth, is 16", which is much about the ſame as when ſeen at a mean diſtance from the ſun. The time of its rotation round its axis, is undetermined. But its periodical revolution to the ſame point of the ecliptic is 10750 days, 13 hours, 14 minutes, 42 ſeconds; and its ſynodic revolution 10759 days, 6 hours, 36 minutes.

The inclination of its orbit to the ecliptic is 2° 33′ ½; but the inclination of its axis to the ecliptic is not determined. The proportion of its light and heat to that of the earth is as .010987 to 1. The place of Saturn's aphelion at the commencement of the preſent year was ♑ 0° 31′, and of its node ♋ 21° 31′ 48″. The aphelion moves forward 2° 13′ 20″ in 100 years, and the node 0° 30′ in the ſame.

THE SATELLITES OF SATURN.

Saturn is ſtill better attended than Jupiter; having, beſides the ring before mentioned, no fewer than five moons continually circulating round him. The firſt at the diſtance of 2.097 ſemidiameters of his ring, and 4.893 of the planet itſelf, performs its revolution in 1 d. 21 h. 18′ 22″; the ſecond, at 2.686 ſemi-diameters of the ring, and 6.268 of Saturn, revolves in 2 days, 17 hours, 41′ 22″; the third, at the diſtance of 8.754 ſemidiameters of Saturn, and 3.752 of the ring, in 4 days, 12 hours, 25′ 12″; the fourth, called the Huygenian Satellite, at 8.698 ſemi-diameters of the ring, and 20.295 of Saturn, revolves in 15 d. 22 h. 4′ 12″; while the fifth, placed at the vaſt diſtance of 59.154 ſemidiameters of Saturn, or 25.348 of his ring, does not perform its revolution in leſs than 79 d. 7 h. 47′. The orbits of all theſe Satellites, except the fifth, are nearly in the ſame plane, which makes an angle with the plane of Saturn's orbit of about 31°; and by reaſon of their being inclined at ſuch large angles, they cannot paſs either acroſs their primary or behind it with reſpect to the earth, except when very near their nodes; ſo that eclipſes of them happen much more ſeldom than of the ſatellites of Jupiter.

THE NEW PLANET, or GEORGIUM SIDUS.

The new Planet, called the Georgium Sidus, was firſt obſerved by Dr. Herſchel on the 13th of March 1781, near the foot of Caſtor, and his attention was drawn by its ſteady light. On applying an high magnifying power to his teleſcope, it appeared manifeſtly to increaſe in diameter; and two days after, he obſerved that its place was changed. From theſe circumſtances he concluded, that it was a comet; and ſent an account of it as ſuch to the aſtronomer-royal, which very ſoon ſpread all over Europe. It was not long, however, before it was known, eſpecially by the Engliſh aſtronomers, to be a planet. The circumſtances which led to this diſcovery were, its vicinity to the ecliptic, the direction of its motion, and its being nearly ſtationary at the time, in ſuch a manner as correſponds with the like appearances of the other planets. The French aſtronomers, however, ſtill imagined it to be a comet, although it had not that faint train of light which uſually accompanies theſe bodies, nor would its ſucceſſive appearances correſpond with ſuch an hypotheſis: ſo that they were at laſt obliged to own that it went round the ſun in an orbit nearly circular. Its motion was firſt computed on this principle by Mr. Lexel profeſſor of aſtronomy at St. Peterſburgh; who ſhowed, that a circular orbit, whoſe radius is about 19 times the diſtance of the earth from the ſun, would agree very well with all the obſervations which had been made during the year 1781. On the 1ſt of December that year it was in oppoſition with the ſun; whence one of its ſtations was certainly determined.

Before the end of the year 1782, it was found, that the angular motion of the planet was increaſing; which ſhowed, that it was not moving in a circle, but in an eccentric orbit, and was approaching towards the ſun. Aſtronomers, therefore, began to inveſtigate the inequality of this angular heliocentric motion, in order to diſcover the form and poſition of the ellipſis deſcribed. This was a very difficult taſk, as the ſmall inequality of motion ſhowed that the orbit was nearly circular, and the arch already deſcribed was no more than one-fiftieth of the whole circumference.

From the obſervations made on this planet in the year 1781, M. De La Lande, calculated its courſe for 1782, and found its diſtance from the ſun to be nineteen times greater than that of the earth, agreeable to the computation of Mr. Lexel. He alſo determined its magnitude to be about eighty-nine times greater than the earth, or its diameter to that of the earth to be as 4.454 to 1; and that it revolves round the ſun in an orbit, which is nearly circular, in about 82 years.

The inclination of its orbit is 43′ 35″, and its apparent diameter only about 4″; ſo that it can ſeldom be ſeen plainly by the naked eye, but may eaſily be diſcovered in a clear night when above the horizon, by a good teleſcope, its ſituation with reſpect to the fixed ſtars being previouſly known.

At the commencement of the preſent year, its heliocentric longitude was ♌ 2½°, and its heliocentric latitude about 36′. Alſo its geocentric longitude was ♌ 4°, and its geocentric latitude 37′. The annual motion of its heliocentric longitude is about 4° 38′.

The light of this planet is of a bluiſh white colour, and its brilliancy between that of the Moon and Venus.

Whether it was attended by any ſatellites, was at firſt only a matter of conjecture, but Dr. Herſchel has ſince diſcovered two; and, from the remote ſituation of the planet, it is probable there are ſeveral others. He has not ſeen them long enough to aſcertain their periodical times with great accuracy, but is led to ſuppoſe that the firſt performs its revolution in about 8¾ days, and the other 13½ days nearly.

As a mark of reſpect to his preſent Majeſty, and to convey to poſterity an idea of the time and place of diſcovery, Dr. Herſchel has diſtinguiſhed this planet by the name of Georgium Sidus.

His Majeſty has ſince taken Dr. Herſchel under his patronage, and granted him an annual ſalary.

OF THE SUN.

The Sun, about which all the planets and comets move, though to human eyes ſo extremely bright and ſplendid, is yet frequently obſerved, even through a teleſcope of but very ſmall powers, to have dark ſpots on his ſurface.

There is great variety in the magnitude of the ſolar ſpots; the difference is chiefly in ſuperficial extent of length and breadth; their depth or thickneſs is very ſmall; ſome have been ſo large as, by computation, to be capable of covering the continents of Aſia and Africa; nay, the whole ſurface of the earth, or even five times the ſurface.

The diameter of a ſpot, when near the middle of the diſk, is meaſured by comparing the time it takes in paſſing over a croſs hair in a teleſcope, with the time wherein the whole diſk of the ſun paſſes over the ſame hair; it may alſo be meaſured by the micrometer; and by either of theſe methods we may judge how many times the diameter of the ſpot is contained in the diameter of the ſun. Spots are ſubject to increaſe and diminution of magnitude, and ſeldom continue in the ſame ſtate. They are of various ſhapes; moſt of them having a deep black nucleus ſurrounded by a duſky cloud, whereof the inner parts near the black are a little brighter than the outſkirts. They change their ſhapes, ſomething in the manner that our clouds do; though not often ſo ſuddenly: thus, what is of a certain figure to-day, ſhall to-morrow, or perhaps in a few hours, be of a different one; what is now but one ſpot, ſhall in a little time be broken into two or three; and ſometimes two or three ſpots ſhall coaleſce, and be united into one.

Dr. Long, many years ſince, while he was viewing the image of the Sun through a teleſcope caſt upon white paper, ſaw one roundiſh ſpot, by eſtimation not much leſs than the diameter of our earth, break into two, which receded from one another with prodigious velocity.

From theſe phænomena it is evident, that the ſpots are not endowed with any permanency, nor are they at all regular in their ſhape, magnitude, number, or in the time of their appearance or continuance. Hevelius obſerved one that aroſe and vaniſhed in 16 or 17 hours; nor has any been obſerved to continue longer than 70 days, which was the duration of one in the year 1676: thoſe ſpots that are formed gradually, are gradually diſſolved; while thoſe that ariſe ſuddenly, are for the moſt part ſuddenly diſſolved. When a ſpot diſappears, that part where it was generally, becomes brighter than the reſt of the ſun, and continues ſo for ſeveral days; on the other hand, thoſe bright parts (called faculæ, as the others are called maculæ) ſometimes turn to ſpots.

The ſolar ſpots appear to have a motion which carries them acroſs the ſun's diſk. Every ſpot, if it continues long enough without being diſſolved, appears to enter the ſun's diſk on the eaſt ſide, to go from thence with a velocity continually increaſing, till it has gone half its way; and then to move ſlower and ſlower, till it goes off at the weſt ſide, after which it diſappears for about the ſame ſpace of time that it ſpent in croſſing the diſk, and then enters upon the eaſt ſide again, nearly in the ſame place, and croſſes it in the ſame tract, and with the ſame unequal motion as before.

This apparent inequality in the motion of the ſpots, is purely optical, and is in ſuch proportion as demonſtrates them to be carried round equally, or in a circle, the plane of which continued, paſſes through or near the eye of a ſpectator upon the earth.

The ſpots are by no means confined to one part of the ſun's diſk; though we have not heard of any being obſerved about his polar regions: and though their direction is from eaſt to weſt, yet the paths they deſcribe in their courſe over the diſk are exceedingly different; ſometimes being ſtrait lines, ſometimes curves, ſometimes deſcending from the northern to the ſouthern part of the diſk, ſometimes aſcending from the ſouthern to the northern.

By obſervations on the ſpots, the ſun is found to move round its axis once in about 25¼ days.

The apparent ſemidiameter of the ſun at a mean diſtance from the earth is 32′ 12″, and his real diameter is to that of the earth as 91.7431 to 1. The inclination of its axis to the axis of the ecliptic is 7°½. And the denſity of the ſun to that of the earth is as 1 to 4. Alſo the proportion of light and heat on the ſurface of the ſun to that on the earth is as 45025 to 1.

Plate 3.

Elements of Astronomy including the Solar System with the new discovered Planet the Georgium Sidus. See System of Astronomy.

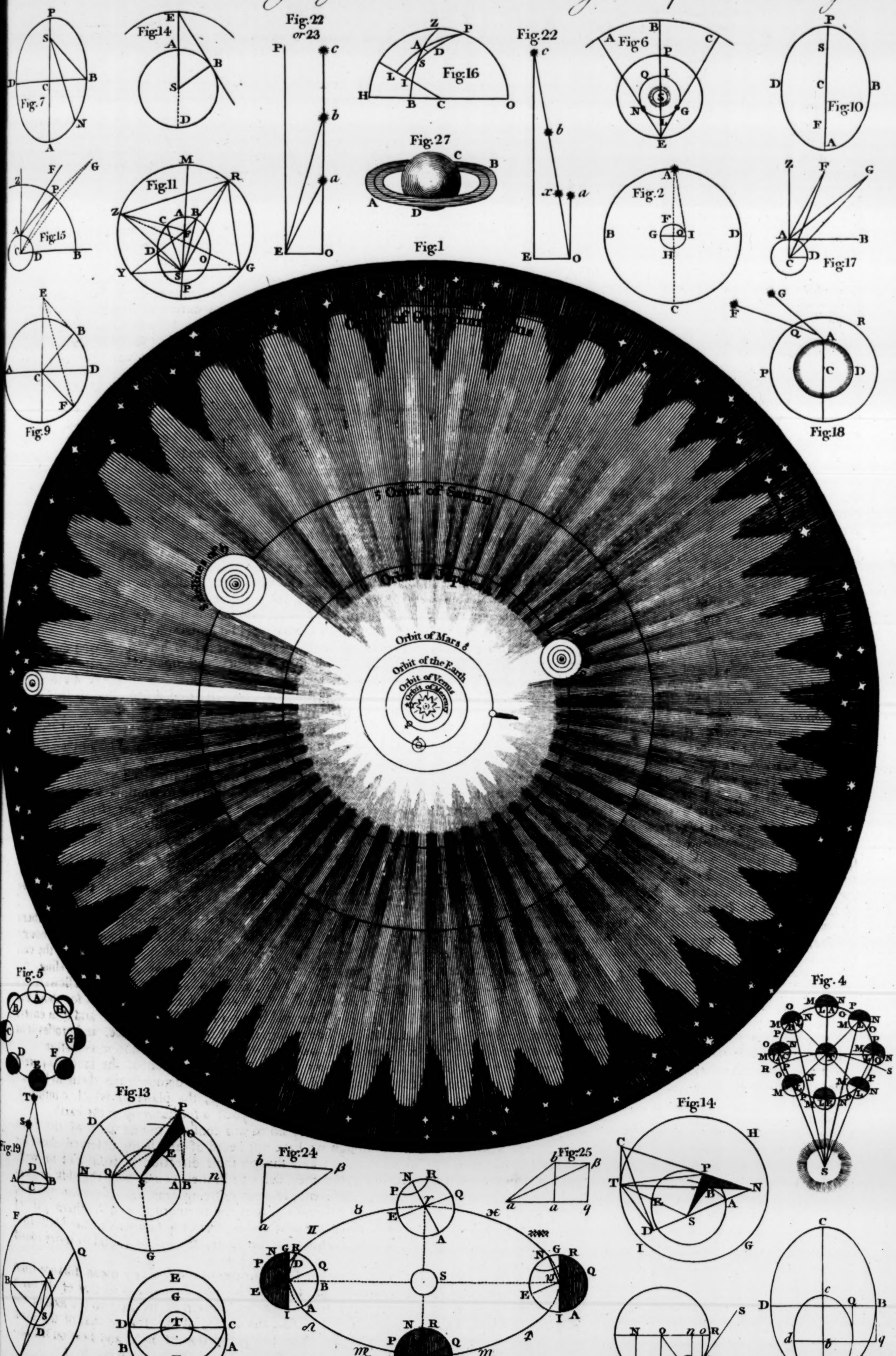
Fig. 7
Fig. 14
Fig. 22 or 23
Fig. 16
Fig. 22
Fig. 6
Fig. 10
Fig. 27
Fig. 15
Fig. 11
Fig. 1
Fig. 2
Fig. 17
Fig. 9
Fig. 18
♄ Orbit of Saturn
Orbit of Mars ♂
Orbit of the Earth
Orbit of Venus
Orbit of Mercury
Fig. 5
Fig. 4
Fig. 13
Fig. 19
Fig. 24
Fig. 25
Fig. 14
Fig. 12
Fig. 8
Fig. 3
Fig. 26
Fig. 21

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Plate 6.

Constellations in the Northern & Southern Hemispheres. See Astronomy

Fig. 1.

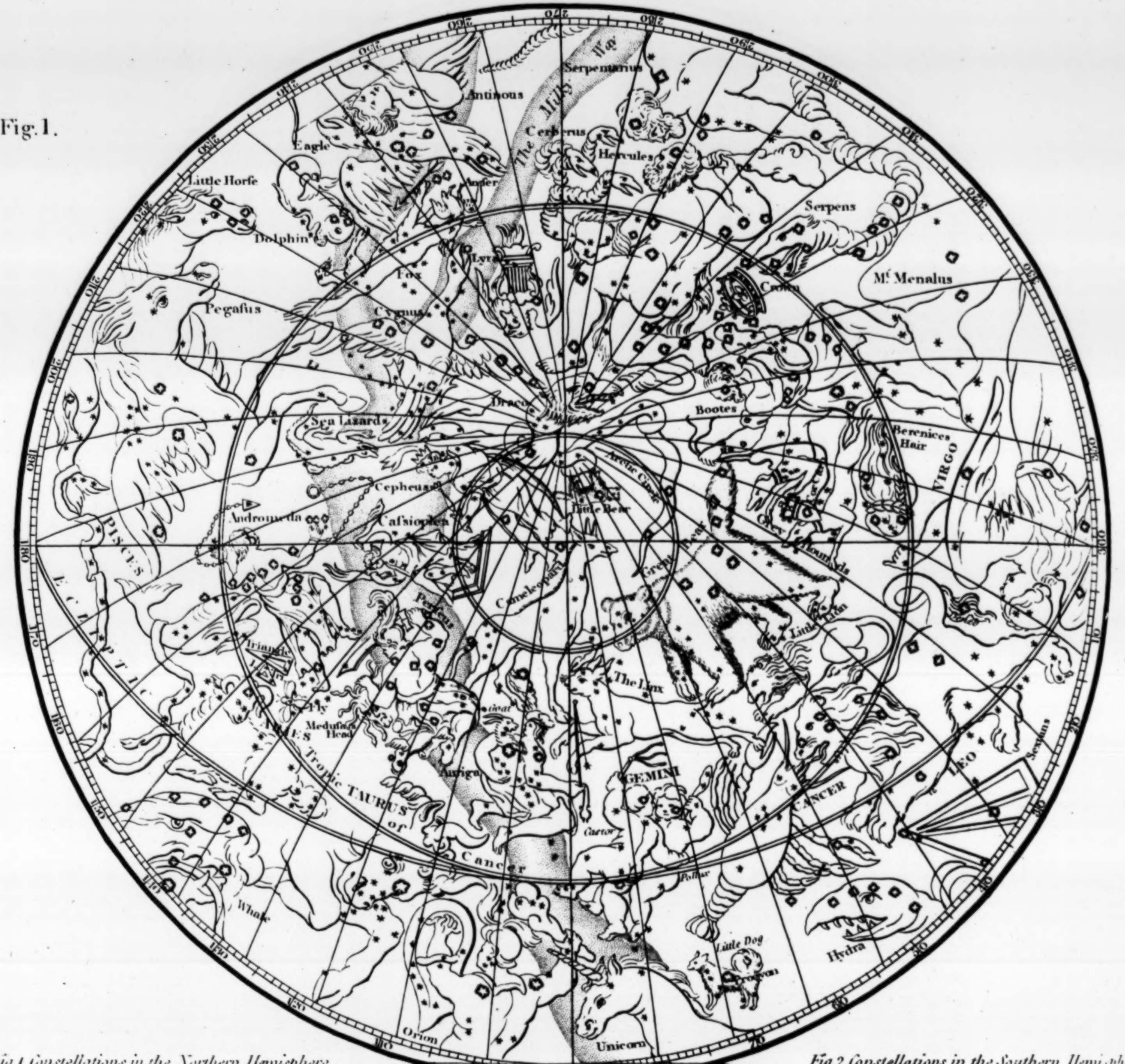
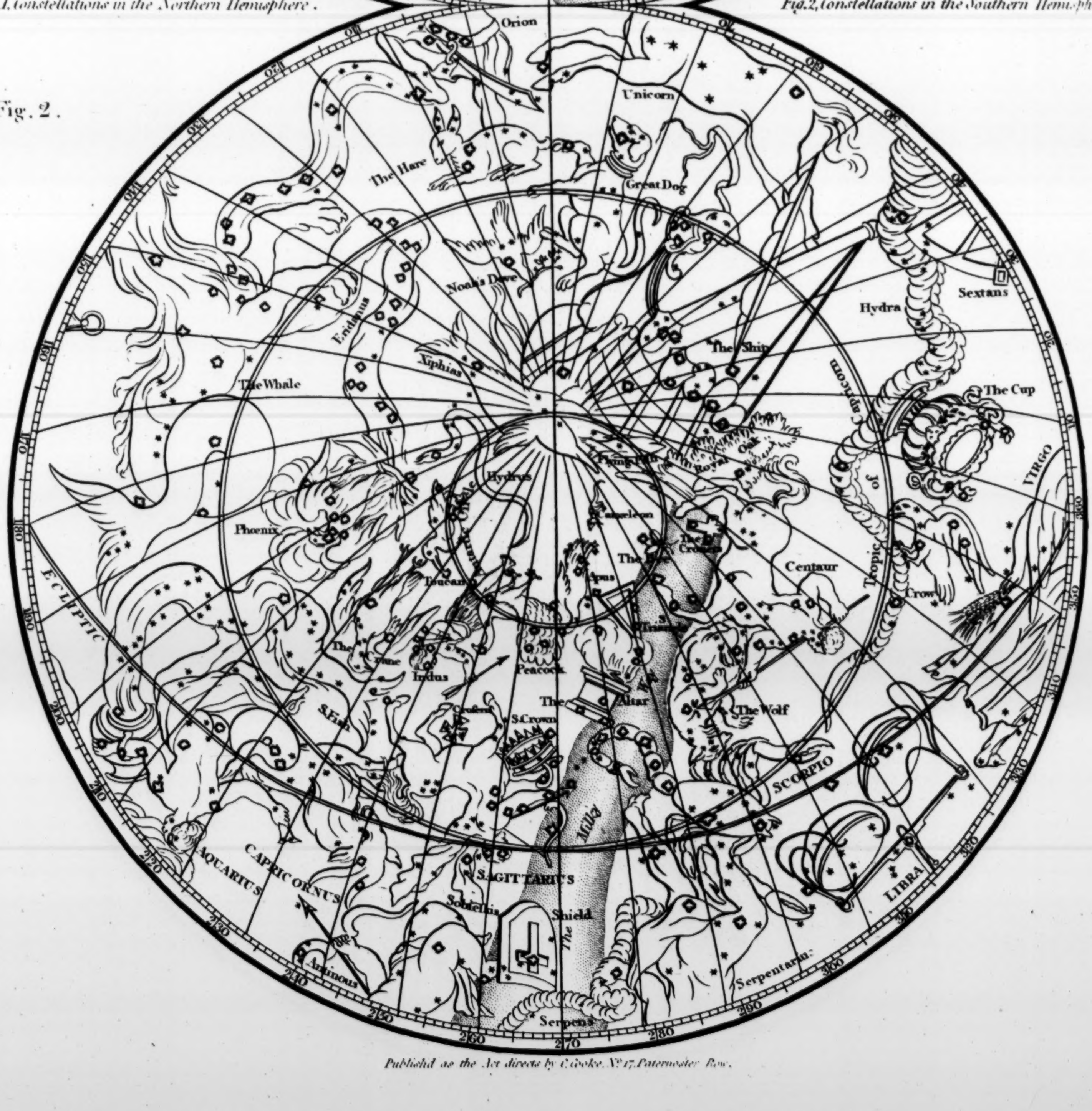

Antinous
Serpentarius
The Milky Way
Cerberus
Hercules
Eagle
Little Horse
Dolphin
Lyra
Fox
Cygnus
Serpens
Crown
Mt. Menalus
Pegasus
Draco
Sea Lizards
Bootes
Berenices Hair
VIRGO
Arctic Circle
Cepheus
Andromeda
Cassiopea
Little Bear
Camelopard
Great Bear
PISCES
Ecliptic
Triangle
Perseus
The Lynx
Little Lion
ARIES
Medusa's Head
Goat
Auriga
GEMINI
CANCER
LEO
Sextans
Tropic of Cancer
TAURUS
Castor
Pollux
Little Dog
Procyon
Hydra
Whale
Orion
Unicorn

Fig. 1. Constellations in the Northern Hemisphere.

Fig. 2. Constellations in the Southern Hemisphere.

Fig. 2.


Orion
Unicorn
The Hare
Great Dog
Noahs Dove
Eridanus
Hydra
Sextans
The Ship
The Cup
The Whale
Xiphias
Hydrus
Royal Oak
Tropic of Capricorn
VIRGO
Phoenix
Chameleon
The Cross
Centaur
Toucan
Apus
Crow
Ecliptic
The Crane
Indus
Peacock
Triangle
The Wolf
S. Fish
S. Crown
The Altar
SCORPIO
CAPRICORNUS
AQUARIUS
SAGITTARIUS
Sobieskis Shield
The Milky Way
LIBRA
Serpentarius
Antinous
Serpens

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Lodge sc.

THE FIXED STARS.

The fixed ſtars, as was obſerved in Section II. do not belong to this Syſtem, but are probably diſpoſed as ſo many ſuns to other Syſtems. It is certain, that they are not opake bodies as are the planets, but ſhine by their own native luſtre.

Among the fixed ſtars great changes have often been obſerved. Stars of a ſuperior magnitude have by degrees become leſs and leſs, ſo as hardly to be perceptible; and ſome have even vaniſhed, and have never been ſeen more; while others of an inferior ſize have gradually increaſed till they appeared as large as thoſe of the 2d or 3d magnitude, when they have again decreaſed and afterwards increaſed again, and ſo on in regular order.

Theſe phænomena of the ſtars may ariſe from each Syſtem's revolving round its centre of gravity, which Sir Iſaac Newton has demonſtrated muſt be the caſe when one body gravitates round another; for by this means they will at different periods be at different diſtances from us, and ſo appear under unequal magnitudes. However, it muſt be confeſſed, that unleſs the orbits they deſcribed in this way were very conſiderable, it would not materially alter their appearance; for we find their diſtance is ſo immenſe, that when they are obſerved from oppoſite parts of the earth's orbit it produces no ſenſible change. It is probable, therefore, that ſome of theſe phænomena may be effected by dark ſpots ariſing on their ſurface, ſimilar to thoſe on the ſun, which for a time eclipſe their brightneſs, and ſo cauſe them to appear of an inferior magnitude till the ſpots by degrees vaniſh, when they appear again of full ſize.

In order to keep a proper account of the ſtars, Aſtronomers ſuppoſe the heavens to be divided into what they call conſtellations, each containing a certain number of ſtars, of different magnitudes. The conſtellations are 80 in number, viz. 12 in the zodiac, 36 in the northern hemiſphere, and 32 in the ſouthern hemiſphere. The ſtars compoſing each conſtellation are for the eaſe of being remembered, ſuppoſed to form the outlines of ſome animal or figure, and accordingly in the maps of the ſtars we ſee the conſtellations thus repreſented, though the ſtars in moſt of them form very imperfect out-lines of the figures aſcribed to them.

The names of the conſtellations and the number of ſtars of each magnitude, are as follow:

NORTHERN CONSTELLATIONS.

Names.	Number.	Magnitudes.						Names.	Number.	Magnitudes.					
		1	2	3	4	5	6			1	2	3	4	5	6
Lit. Bear	12	0	2	1	4	3	2	Camelop.	23	0	0	0	5	7	11
Gr. Bear	105	0	5	5	16	30	49	Serpent	50	0	1	7	6	5	31
Dragon	49	0	1	7	8	10	23	Serpentar.	67	0	1	6	12	17	31
Cepheus	40	0	0	3	7	10	20	Sob. Shield	8	0	0	0	2	3	3
Greyho.	24	0	0	0	1	[illegible]	16	Eagle	29	1	0	5	1	4	18
Bootes	53	1	0	7	10	12	23	Antinous	34	0	0	5	2	7	20
M. Mænal	11	0	0	0	1	0	10	Dolphin	18	0	0	6	0	2	10
Ber. Hair	24	0	0	0	6	8	10	Colt	12	0	0	0	4	1	7
Chs Heart	3	0	1	0	0	0	2	Arrow	13	0	0	0	4	1	8
N. Crown	11	0	1	0	6	3	1	Androm.	66	0	3	2	10	16	35
Hercules	92	0	0	12	12	28	40	Perſeus	67	1	1	5	10	14	36
Cerberus	9	0	0	0	3	1	5	Pegaſus	81	0	3	4	9	11	54
Harp	24	1	0	3	2	8	10	Auriga	46	1	1	1	9	9	25
Swan	73	0	1	5	15	20	32	Lynx	55	0	0	1	8	21	25
Fox	29	0	0	0	6	11	12	Lit. Lion	20	0	0	1	6	5	8
Gooſe	10	0	0	0	0	2	8	Gr. Tri.	10	0	0	0	3	1	6
Lizard	12	0	0	0	3	5	4	Lit. Tri.	5	0	0	0	0	0	5
Caſſiopeia	52	0	0	5	7	7	33	Muſca	6	0	0	1	2	2	1

SOUTHERN CONSTELLATIONS.

Names.	Number.	Magnitudes.						Names.	Number.	Magnitudes.					
		1	2	3	4	5	6			1	2	3	4	5	6
Whale	80	0	2	8	13	10	47	Peacock	14	0	1	3	5	4	1
Eridanus	72	1	0	10	24	19	18	S. Crown	12	0	0	0	1	3	8
Phœnix	13	0	1	5	5	0	2	Crane	14	0	2	1	2	9	0
Am. gooſe	9	0	0	4	2	3	0	S. Fiſh	15	1	0	2	9	2	1
Orion	93	2	4	3	19	15	50	Hare	25	0	0	4	9	4	8
Monocer^s	32	0	0	1	10	10	11	Noah's D.	10	0	2	0		6	1
Little Dog	14	1	0	1	0	2	10	Cha's Oak	13	0	1	2	6	4	0
Hydra	53	0	1	3	14	13	22	Ship Argo	48	1	6	11	13	14	3
Sex. Urani	4	0	0	0	0	0	4	Great Dog	29	1	5	1	4	10	8
Cup	11	0	0	0	8	2	1	Bee	4	0	0	0	2	2	0
Crow	8	0	0	2	2	2	2	Swallow	11	0	0	0	4	3	4
Centaur	36	2	6	6	14	8	0	Indus	12	0	0	0	4	6	2
Wolf	36	0	0	3	6	18	9	Cameleon	10	0	0	0	0	9	1
Altar	9	0	0	1	6	1	1	Flyingfiſh	7	0	0	0	0	6	1
S. Trian.	5	0	1	2	0	2	0	Sword fiſh	7	0	0	2	2	1	2

CONSTELLATIONS IN THE ZODIAC.

Names. Northern.	Number.	Magnitudes.						Names. Southern.	Number.	Magnitudes.					
		1	2	3	4	5	6			1	2	3	4	5	6
Aries	46	0	1	1	3	5	36	Libra	33	0	2	1	8	3	19
Taurus	109	1	1	3	9	24	71	Scorpio	44	1	3	6	14	5	15
Gemini	94	1	2	4	8	13	66	Sagittari.	48	0	1	5	9	11	22
Cancer	75	0	0	0	6	8	61	Capricor.	58	0	[illegible]	2	5	9	42
Leo	91	2	2	6	13	11	57	Aquarius	93	0	0	4	7	18	54
Virgo	93	1	0	5	11	24	52	Piſces	110	0	0	1	7	28	74

The above Tables ſhew the number of what is uſually called the Conſtellation Stars; but, excluſive of thoſe, there are a variety of others diſcoverable by teleſcopes.

Dr. Herſchel, with his improved teleſcope, has diſcovered ſeveral thouſands of Stars which were not obſerved before; ſo that his Catalogue of Stars extends to three or four times the number contained in that given by Mr. Flamſtead.

There is a ſort of Stars named Nebulous Stars, from their appearing like a bright cloud. They are not to be diſtinguiſhed by the naked eye, and, when viewed through a teleſcope, appear as a cluſter of very ſmall Stars. And, indeed, to whatever part of the Heavens a good teleſcope is directed, a number of Stars will appear which are not diſcoverable by the eye alone.

Hence, though it is almoſt demonſtrable that the number of Stars is not infinite, yet it may be reaſonably inferred that there are thouſands, perhaps millions, which cannot be diſcovered, even by means of the beſt teleſcopes whatever; and hence is demonſtrable the infinite wiſdom, omnipotence, and omnipreſence of the Creator of the Univerſe.

It is with pleaſure I acknowledge myſelf indebted to Mr. Moody, for the following Table of Stars. He informs me, that he has carefully adjuſted their Right Aſcenſions, Declinations, &c. to the preſent Time, which renders the Table a valuable Acquiſition to thoſe who enter into the practical Part of Aſtronomy; as it will be found not only an accurate Account of thoſe particular Stars therein mentioned, but will alſo be of uſe to determine the Latitudes of Places on this Globe, by means of the obſerved Altitudes of thoſe Stars taken at particular Times.

T. BANKES.

A TABLE of the Right Ascensions, Declinations, Longitudes, Latitudes, and Magnitudes, of Twenty-one of the principal Fixed Stars, accurately rectified to the Commencement of the preſent Year, 1789.

Names.	Right Aſcen.			Declination.				Longitude.				Latitude.				Mag.
	°	′	″	°	′	″			°	′	″	°	′	″		
γ Pegaſi	0	35	55	14	10	36	N	♈	6	13	3	12	33	35	N	2
α Arietis	28	49	40	22	27	31	N	♉	4	42	47	9	57	30	N	2
α Ceti	42	49	6	3	15	10	N	♉	11	22	23	12	36	16	S	2
Aldebaran	65	57	28	16	4	21	N	♊	6	50	30	5	29	2	S	1
Capella	75	16	54	45	45	35	N		18	54	38	22	51	46	N	1
Rigel	76	6	0	8	27	27	S		13	52	53	31	9	10	S	1
β Tauri	78	14	32	28	24	51	N		19	37	46	5	21	59	N	2
α Orionis	85	56	21	7	21	10	N		25	48	32	16	3	31	S	1
Sirius	98	58	7	16	25	36	S	♋	11	10	53	39	32	55	S	1
Caſtor	110	16	52	32	20	7	N		17	18	18	10	4	35	N	2
Procyon	112	4	11	5	45	49	N		22	52	57	15	58	8	S	1
Pollux	113	6	16	28	32	4	N		20	18	43	6	40	5	N	2
Regulus	149	17	2	12	59	32	N	♌	26	53	58	0	27	27	N	1
Spica Virg.	198	31	35	10	3	14	S	♎	20	53	59	2	2	11	S	1
Arcturus	211	31	20	20	18	14	N		21	17	31	30	54	11	N	1
Antares	244	7	34	25	56	52	S	♐	6	49	7	4	32	17	S	1
ε Sagittarii	272	32	43	34	27	52	S	♑	2	8	14	11	0	45	S	2
α Aquillæ	295	7	3	8	19	9	N		28	47	40	29	18	36	N	1
2 α Capricor.	301	35	7	13	11	11	S	♒	0	54	46	6	57	16	N	3
Fomalhaut	341	29	30	30	44	4	S	♓	0	53	14	21	6	28	S	1
α Pegaſi	343	34	2	14	4	23	N		20	32	57	19	24	38	N	2

SECT. IX.

THE ASTRONOMY OF THE SPHERE.

Although the celeſtial bodies are placed at different diſtances from the earth, as has been before ſhewn; yet, an obſerver, living upon the earth, is not naturally ſenſible thereof, but imagines them all to be ſituate in one concave ſurface, of which the earth is the centre.

Likewiſe, though in reality the cauſe of day and night is the rotation of the earth round its own axis; and of the ſeaſons, its motion through its own orbit (or ecliptic) in a year; yet, to a ſpectator on the earth, theſe appear to be effected by the motion of the ſun, or heavens.

And as in moſt Aſtronomical Problems, it is the apparent or relative motions only that we have to determine; therefore, for the eaſe of imagination, and ſince it amounts to one and the ſame thing whether way theſe appearances are effected, Aſtronomers chuſe to ſuppoſe all celeſtial objects placed in one concave ſphere, as above; and to aſcribe to them all the motions which they ſeem to have, while the earth is conſidered as being at reſt.

Definitions.

I. The Aſtronomy of the ſphere is the method of finding (from proper data) the meaſure of certain arcs and angles, formed on the ſurfaces of the celeſtial and terreſtrial ſpheres by the *apparent motions* of the bodies which are ſeen in the heavens.

II. The ſurfaces of thoſe ſpheres are ſuppoſed to be concentric to the centre of the earth, and to have correſpondent circles deſcribed on both ſpheres.

III. Great Circles, are ſuch as divide either ſphere into two equal parts.

IV. Lesser Circles, are thoſe which divide either ſphere into unequal parts.

V. The Poles of a Circle, are thoſe points on the ſphere that are equally diſtant from that circle.

VI. An Axis, is a right line ſuppoſed to connect the poles.

VII. The Celestial Axis, is that right line about which the heavens ſeem to revolve.

VIII. The North and South poles of the world, are thoſe two points where the axis cuts the celeſtial ſphere.

IX. The Equinoctial, in the celeſtial; or Equator, on the terreſtrial ſphere, is that *great circle* which is equally diſtant from the poles of the world.

X. Meridians, or Hour Circles, or Circles of Right Ascension, or Circles of "Terrestrial Longitude," are great circles perpendicular to the equator, and paſſing through the poles of the world.

XI. The Ecliptic is a great circle inclined to the equator in an angle of 23° : 28′, and cutting it in two points diametrically oppoſite. This circle is ſuppoſed to be divided into 12 equal parts, called ſigns, beginning from one of its interſection with the equator; alſo each ſign is ſuppoſed to be divided into 30 equal parts, called degrees; each degree, into 60 minutes; each minute, into 60 ſeconds, &c. and in general every great circle is divided into 360 degrees, and each degree into 60 minutes, &c.

The names and characters of the ſigns of the ecliptic are as under.

Aries,	Taurus,	Gemini;	Cancer,	Leo,	Virgo,
♈	♉	♊	♋	♌	♍;
Libra,	Scorpio,	Sagittarius,	Capricornus,	Aquarius,	Piſces.
♎	♏	♐	♑	♒	♓

The former ſix being on the north ſide of the equinoctial, are called northern ſigns; and the latter ſix, being on the ſouth ſide thereof, are named ſouthern ſigns.

XII. The Cardinal Points of the Ecliptic, are the four firſt points of the ſigns ♈, ♋, ♎, ♑; thoſe of ♈ and ♎ are called Equinoctial Points; and thoſe of ♋ and ♑ are called Solstitial Points.

When the motion in the ecliptic is according to the order of ſigns, as from ♈ to ♉, and from ♉ to ♊, &c. it is ſaid to be forward, or *in conſequentia:* but when the motion is the contrary way, as from ♉ to ♈, from ♈ to ♓, &c. then it is ſaid to be backward, or in *antecedentia*.

Alſo when two planets, &c. are referred to the ſame point of the ecliptic, they are ſaid to be in *conjunction*. When they are referred to oppoſite points, they are ſaid to be in *oppoſition*. If they are 3 ſigns diſtant, they are in *quartile aſpect*; if 4 ſigns diſtant, in a *trine aſpect*. If 2 ſigns apart, in a *ſextile aſpect*. The characters uſed by Aſtronomers for denoting theſe aſpects, are the following ☌, conjunction; ☍, oppoſition; □, quartile; △, trine; and ⚹, ſextile.

The point of the ecliptic, which is riſing at any place, is called the *horoſcope*; the higheſt point of it is named the *nonageſimal degree*. The point in the meridian, is the *medium cœli*, or culminating point; the oppoſite point, the *imum cœli*.

XIII. The Equinoctial Colure is a meridian, paſſing through the equinoctial points.

XIV. The Solstitial Colure is a meridian, paſſing through the ſolſtitial points.

N. B. The colures cut one another at right angles in the poles of the world.

XV. Circles of Celestial Longitude, are great circles perpendicular to the ecliptic.

XVI. The Latitude of any Point in the heavens, is an arc of a circle of longitude intercepted between that point and the ecliptic, and is called north or ſouth latitude, according as the point is on the north or ſouth ſide of the ecliptic.

XVII. Parallels of Celestial Latitude, are ſmall circles parallel to the ecliptic.

XVIII. The Longitude of any Point in the heavens, is an arc of the ecliptic intercepted between the firſt point of Aries, and a circle of longitude paſſing through that point.

XIX. The Right Ascension of any Point of the celeſtial ſphere, is an arc of the equator contained between the firſt point of Aries, and a meridian paſſing through that point; or it is the angle formed by the equinoctial colure, and the meridian paſſing over that point.

XX. The Declination of any Point is an arc of the meridian, contained between that point and the equinoctial. If the point is on the north ſide of the equinoctial, it is called north declination; but, if it is on the ſouth ſide thereof, it is called ſouth declination.

XXI. The Obliquity of the Ecliptic is the angle made by the interſection of the equator and ecliptic, and is meaſured by the ſun's greateſt declination, which according to modern obſervations is about 23° : 28′.

XXII. Parallels of Declination are ſmall circles, parallel to the equinoctial.

The Tropic of Cancer is a parallel of declination in the northern hemiſphere, diſtant 23° : 28′ from the equinoctial; and the Tropic of Capricorn is a parallel of declination in the ſouthern hemiſphere, and at the like diſtance from the equinoctial. Alſo the Artic Polar Circle is a parallel of declination at 23° : 28′ diſtance from the North pole; and the Antartic Polar Circle is a parallel of declination, as far diſtant from the ſouth pole.

XXIII. The Zenith is that point of the heavens directly over a place.

XXIV. The Nadir is that point of the ſphere, which is directly under a place.

XXV. The Horizon is that great circle of the ſphere, which is equally diſtant from the Zenith and Nadir of any place, and divides the ſphere into the upper and lower hemiſpheres.

XXVI. The Rising of a celeſtial object, is when its centre appears in the eaſtern part of the horizon.

XXVII. The Setting of a celeſtial body, is when its centre diſappears in the weſtern quarters of the horizon.

XXVIII. Azimuths, or Vertical Circles, are great circles perpendicular to the horizon, paſſing through the Zenith and Nadir.

XXIX. The Prime Vertical, is that vertical circle which paſſes through the eaſt and weſt points of the horizon, and is at right angles to the *Meridian of the Place*, which is a vertical circle paſſing through the north and ſouth points of the horizon.

XXX. The Azimuth of any celeſtial object, is an angle at the Zenith formed by the meridian of any place, and a vertical circle paſſing through that object when it is above the horizon; or, it is meaſured by the arc of the horizon intercepted between thoſe vertical circles.

XXXI. The Amplitude of any Point in the heavens, is an arc of the horizon contained between that point at his riſing or ſetting, and the interſection of the meridian of the place with the horizon; or, it is the angle at the zenith included between the meridian of a place and a vertical circle, paſſing through the point at its riſing or ſetting.

XXXII. The Altitude of any Point in the heavens, is an arc of a vertical circle, intercepted between that point and the horizon.

XXXIII. The Zenith Distance of any object, is an arc of a vertical circle contained between that point and the zenith.

N. B. The altitude and zenith diſtance are complements of one another.

XXXIV. The Meridian Altitude, or Meridian Zenith Distance, is the altitude, or zenith diſtance, when the object is on the meridian of a place.

XXXV. The Culminating of any celeſtial object is the time it tranſits, or comes to the meridian.

XXXVI. Almincanthers, or Parallels of Altitude, are ſmall circles parallel to the horizon.

XXXVII. A Parallel Sphere, is that poſition of the ſphere wherein the circles apparently deſcribed by the diurnal rotation, are parallel to the horizon; which can happen only at the Poles.

XXXVIII. A Right Sphere, is that when the diurnal motions are at right angles to the horizon. This is the caſe with all places on the equator.

XXXIX. An Oblique Sphere, has all the diurnal motions oblique to the horizon. And thus the motions appear to all parts of the earth, except under the poles, and on the equator.

XL. Diurnal Arcs, are thoſe parts of the parallels of declination of celeſtial objects, apparently deſcribed between the times of the riſing and ſetting of thoſe objects.

XLI. Nocturnal Arcs, are the parts of thoſe parallels apparently deſcribed from the time of ſetting to the time of riſing.

N. B. Semi-diurnal and Semi-nocturnal Arcs, are the parts of the parallels between the meridian and their interſection with the horizon. The correſponding part of the equator anſwering to the ſemi-diurnal arc, gives the time between noon and the riſing or ſetting; and the equatorial part anſwering to the ſemi-nocturnal arc, ſhews the time between midnight and the time of riſing or ſetting.

XLII. The Oblique Ascension of any point in the heavens is the degree of the equator, which riſes with that *point* in an *oblique ſphere.*

XLIII. The **Oblique Descension** of any point in the heavens is the degree of the equator, which ſets with that point in an oblique ſphere.

XLIV. The **Ascensional Difference** belonging to any celeſtial object, is the difference between its *right* and *oblique aſcenſions.* In the ſun, it is the time that he riſes or ſets before or after the hour of ſix.

XLV. The **Latitude** of any place on the earth, is an arc of a terreſtrial meridian contained between that place and the equator; being called North or South latitude, according as it is on the North or South ſide of the equator.

XLVI. The **Longitude** of any place on the earth, is an arc of the equator contained between the meridian of that place and the meridian which is choſen for the firſt, where the reckoning of longitude begins.

Or, it is the angle at the pole formed by the firſt meridian, and that of the given place. The Engliſh compute the longitude of all places from the meridian of London.

XLVII. **Refraction**, in an Aſtronomical ſenſe, is the difference between the true and apparent altitudes of an object; it is owing to the atmoſphere's making all celeſtial objects appear more elevated above the horizon than they really are.

XLVIII. The **Twilight**, is that medium between light and darkneſs which happens in the morning before ſun-riſe, and in the evening after ſun-ſet. This is occaſioned by the atmoſphere's refracting the ſolar rays upon any place, although the ſun is below the horizon of that place; and by obſervation, it is found to begin and end at about 18° below the horizon.

XLIX. The **Crepusculem** is a ſmall circle parallel to the horizon at 18° below it.

That theſe Definitions and the following Problems may be the better underſtood, I ſhall ſhew the method of projecting the circles of the ſphere *in plaino.* There are three ſorts of projection, Stereographic, Orthographic, and Gnomonic; but the firſt being the beſt adapted to the preſent occaſion, I ſhall not inſiſt upon the latter two in this place, but refer to the word **Projection**, and Syſtem of **Dialling** for an account of the other.

In the Stereographic projection the eye is ſuppoſed to be placed at the pole of the plane, or primitive circle, on which the projection is made.

Problem I. *To project the Sphere upon the Plane of the Solſtitial Colure, or upon the Plane of the Meridian of any Place; thoſe Planes being ſuppoſed to coincide.*

The method: here the eye is ſuppoſed to be in the firſt point of ♈, or the common interſection of the equator, ecliptic and equinoctial colure; that being the pole of the plane of projection, or primitive circle.

1ſt. With a chord of 60 degrees deſcribe a circle PESQ, (Plate IV. *Figure* 1.) to repreſent the ſolſtitial colure, whoſe centre ♈ is its pole.

2d. A diameter EQ will be the equator, and another PS, at right angles to it will ſhew the equinoctial colure, or the axis of the world, whoſe extremities P, S, will be the North and South poles.

3d. For *Parallels of Declination.* On the primitive circle beginning at E and Q, lay off the chords of the given degrees of declination, ſuppoſe every 10 degrees; and alſo the diſtances of the tropics and polar circles from the equator, namely, 23°½ and 66½. Then from the centre ♈ in the axis PS, produced, apply the reſpective ſecants of the complements of the degrees laid on the primitive, and theſe will give the centres of the correſponding parallels of declination; from which centres with the extents to the ſeveral diviſions in the circumference, deſcribe the ſmall circles 10, 10; 20, 20; 30, 30; &c. and theſe will be the parallels of declination required. Among which *a*♋, *b*♑, are the tropics of Cancer and Capricorn; and *cc, dd,* the artic and antartic polar circles.

4th. *For the Circles of Right Aſcenſion*, or *Hour Circles.* In the diameter E Q produced, lay off from the centre ♈, both ways, the tangents of 15°, 30°, 45°, 60°, 75°, reſpectively; and they will be the centres of circles to be deſcribed through P, and S, cutting the equator in the points repreſenting the 24 hours; the ſolſtitial colure being the 12 o'clock, and the equinoctial colure, P. S. the 6 o'clock hour circles. And in like manner, may any other of theſe kind of circles be drawn.

5th. The *Ecliptic*, ♋ ♑ is drawn, making with the equator an angle of 23°½; whoſe poles *c, d,* are the interſections of the polar circles with the ſolſtitial colure.

6th. *Parallels of Celeſtial Latitude*, are drawn parallel to the ecliptic, in the ſame manner as circles of declination are drawn parallel to the equator.

7th. *Circles of Celeſtial Longitude* are deſcribed through *c, d,* the poles of the ecliptic, in the ſame manner as the circles of right aſcenſion were deſcribed through P, S, the poles of the equator; and thus were the diviſions found that are marked with the ſigns.

8th. The *Horizon* is repreſented by drawing a diameter HR making an angle with the axis PS, equal to the latitude of the place; and the poles of the horizon Z, N, the zenith and nadir are at 90° diſtant from the circle.

9th. *Azimuth*, or *Vertical Circles*, making any angle with the meridian, are deſcribed like circles of right aſcenſion. Thus ZN is the prime vertical, and ZAN is another azimuth, 45° from the ſouth.

10th. *Almicanthars*, or *Parallels of Altitude*, are in this projection drawn parallel to the horizon, in like manner as were the circles of declination drawn parallel to the equator.

Problem II. *To project the Sphere upon the Plane of the Horizon.*

In this projection the eye is ſuppoſed in one of the poles of the horizon, or plane of projection. (See Plate IV. *Figure* 2.)

1ſt. *The Horizon* is repreſented by the primitive circle, where the upper XII is the South; the lower XII, the North; E, the Eaſt; and Q, the Weſt points.

2d. *The Azimuth Circles*, are repreſented by diameters, drawn through Z, the centre or pole of the horizon. Thus the diameter XII, XII, is for the meridian, and EZQ for the prime vertical; and other azimuth circles, forming any angle with the meridian, are readily drawn by laying off their diſtances in the primitive, from the North or South points.

3d. *Parallels of Altitude*, are concentric to the primitive, and are deſcribed about the pole, Z, with the half tangent of their diſtance from it. Thus the ſmall circle, whoſe diameter is *ab*, is a parallel of altitude 10° above the horizon, or at 80° diſtance from its pole, Z.

4th. *The Equinoctial*'s diſtance from the zenith is equal to the latitude of the place, and therefore this circle makes with the horizon an angle, which is meaſured by the complement of the latitude; then, ſetting off from the centre Z, in Z XII, continued, the tangent of 50° (the latitude, in this Example, being ſuppoſed to be 40°) it will give the centre of the circle EAQ repreſenting the equinoctial; and the half tangent of 50°, ſet the ſame way from Z, will give P the pole of the world.

5th. *The Six o'Clock Hour Circle* paſſes through the poles of the world, making with the horizon an angle equal to the meaſure of the latitude; therefore, taking in the meridian from Z towards A, the tangent of the latitude 40°, it gives G, the centre of the ſix o'clock hour circle EPQ.

6th. *The Hour Circles* paſs through the poles of the world, and make with one another angles of 15°. Therefore, in a line DE, drawn through G, at right angles to the meridian, ſet off on both ſides of G, the tangents, 15°, 30°, 45°, 60°, 75°, to the radius PG, and they will give the centres of the ſeveral hour circles paſſing through P, and cutting the horizon and equinoctial in the hour points.

7th. *The Polar Circles, Tropics, and other Circles of Declination*, are deſcribed parallel to the equinoctial, about its pole P, at given diſtances from it, ſetting off on each ſide of Z, the half tangents of their greateſt and leaſt diſtances from Z; then the middles of thoſe intervals are the centres ſought.

Thus, the artic circle is diſtant from P about 23½°; then, to and from ZP = 50°, add and take 23½°, and there will be 73½° and 26½° reſpectively; and the half tangents of theſe ſet off from Z, give *p* and *q*; then, a circle being deſcribed on the diameter, *pq* is the artic circle.

In like manner will the centres of the tropic of Cancer *c*♋*c*, and of Capricorn *d*♑*d* be obtained.

8th. The northern portion of the ecliptic ♈♋♎ is deſcribed from a centre diſtant from Z towards P the tangent of 73½°, = the angle which the ecliptic makes with the horizon.

9th. *Circles of Longitude*, ♈*p*♎, *p*♉, *p*♊, *p*♌, *p*♍, are deſcribed through *p*, the pole of the ecliptic from centres in the line BFC, in like manner as the hour circles were deſcribed through P, the pole of the equator.

10th. *Circles of Celeſtial Latitude* VIII *q* VI, are deſcribed about *p* as the circles of declination were deſcribed about P, the pole of the equinoctial.

Problem III. *To project the Sphere upon the Plane of the Equator.*

In this projection the eye is ſuppoſed to be in one of the poles of the equator, (ſuppoſe in the ſouth pole) and projecting the north hemiſphere. (Plate IV. *Figure* 3.)

1ſt. *The Equator* is repreſented by the primitive circle, whoſe centre and pole is P.

2d. *The Hour Circles* are expreſſed by diameters making angles of 15° deg. with one another, of which XII P XII is the meridian or ſolſtitial colure, and VI P VI, the ſix o'clock circle, or equinoctial colure.

3d. *Circles of Declination*, are circles parallel and concentric to the equator, deſcribed from its centre with radii equal to the half tangents of their ſeveral diſtances from the pole P, or half co-tangents of their degrees of declination. Thus *pq*, the artic circle, and *a*♋; the tropic of Cancer are deſcribed with the half tangents of 23½°, and 66½° reſpectively, and ſo of the others.

4th. *The Ecliptic*, makes an angle of 23½° with the equator; therefore, the tangent of theſe degrees, laid from P towards *a*, will give the centre for deſcribing the ecliptic ♈♋♎, whoſe pole *p* is in the polar circle.

5th. *Circles of Longitude*, are deſcribed through *p*, the pole of the ecliptic, in like manner as the hour circles were deſcribed through P, the pole of the equator, in the laſt Problem; and thus were the diviſions ♉, ♊, ♌, ♍, obtained.

6th. *Circles of Celeſtial Latitude*, are projected in the ſame manner as the circles of declination in the laſt Problem.

7th. *The Horizon of any Place*, ſuppoſe of London, being inclined to the equator, in an angle equal to the co-latitude 38° 28′, the tangent of this, laid from P to Z, will give the centre, and Z the pole of the horizon HOR.

8th. *The prime Vertical* HZR, making an angle with the equator equal to the latitude of the place, 51° 32′, its centre is found by laying the tangent thereof from P towards *o*.

9th. *Azimuth Circles*, making given angles with the meridian, Z *o*, are thus deſcribed: In a line drawn through the centre of the prime vertical, at right angles to the meridian, take diſtances from that centre, equal to the tangents of the propoſed azimuth angles, the ſemidiameter of the prime vertical being radius, thoſe diſtances give the centres ſought; and thus was the azimuth, ZA, deſcribed.

10th. *Parallels of Altitude* are deſcribed about Z, the pole of the horizon, at the diſtances of the co-altitudes, in the ſame manner as were the circles of declination in the laſt Problem deſcribed about P, the pole of the equator; and thus was the ſmall circle V *b* VII deſcribed, at 10° diſtance from the horizon, or 80° diſtance from its pole Z.

PROBLEM IV. *To project the Sphere upon the Plane of the Ecliptic.*

The eye is here ſuppoſed to be in one of the poles of the ecliptic, and thence ſeeing the northern hemiſphere projected. Plate IV. *Figure* 4.

1ſt. *The Ecliptic* is here repreſented by the primitive circle, whoſe centre *p* is the pole of the ecliptic.

2d. *Circles of Longitude*, are herein ſhewn by diameters, thoſe making angles of 30° with one another being drawn through the diviſions marked with the ſigns of the zodiac.

3d. *Parallels of Celeſtial Latitude*, are circles deſcribed about *p*, concentric to the ecliptic; ſuch is the ſmall circle whoſe diameter is *ab*, repreſenting the parallel of 10° of latitude.

4th. *The Equator* makes an angle of 23½° with the ecliptic: therefore, the tangent of this inclination laid from *p* towards ♋, will give the centre of the equator ♈ XII ♎; and the half tangent of 23½° laid from *p*, the ſame way, gives P the pole of the equator.

5th. *The Equinoctial Colure*, which here makes the ſix o'clock hour circle, forms an angle with the ecliptic of 66½°, and the tangent thereof laid from *p* towards ♑, gives the centre of the ſix o'clock hour circle, ♈ P ♎.

6th. *Hour Circles*, paſſing through P, and making angles of 15° with one another, are deſcribed from centres, found in a right line paſſing through the centre of ♈ P ♎, and drawn at right angles to the ſolſtitial colure ♋ *p* ♑; by laying off in that line the tangents of 15°, 30°, 45°, 60°, 75°, reckoned from the centre of ♈ P ♎, on both ſides, the ſemidiameter of this circle being radius. Theſe hour circles cut the equator in the hour points.

7th. *Parallels of Declination*, ſuch as the tropic of Cancer, and artic circle, whoſe diameters are 12, 12, and *p q*, are deſcribed by laying off from *p*, the half tangents of their greateſt and leaſt diſtances. Thus *q*, being diſtant from *p* 47°, make *pq* = ½ tangent of 47°; then the middle of *pq* will be the centre of the polar circle.

8th. *The Horizon*, HOR, muſt make an angle with the ecliptic, equal to the difference between the co-altitude and the obliquity of the ecliptic, when P is projected to the north of *p*; otherwiſe, that angle is equal to the ſum of the ſaid quantities.

For London, where the aforementioned difference is 15° (= 38° 28′ — 23° 28′) the tangent of 15° gives the centre of HOR; and the half tangent gives Z the zenith.

9th. The prime vertical HZR, is deſcribed by laying from *p*, towards O, the co-tangent of *p*Z, for a centre.

10th. *Azimuth Circles* are deſcribed through Z, making given angles with the meridian ZO, by finding their centres in a line drawn through the centre of HZR in the manner deſcribed for the hour circles in Problem II.

11th. *Parallels of Altitude*, are repreſented by deſcribing ſmall circles parallel to the horizon HOR, at given diſtances from it; or, which comes to the ſame, by deſcribing ſmall circles about the pole Z, at diſtances equal to the complements of the given altitudes. And thus the circle *cdc* was deſcribed for a parallel of 33° of altitude.

PROBLEMS OF THE SPHERE.

PROBLEM V. *Given the Sun's Longitude, and the Obliquity of the Ecliptic; required the Sun's Right Aſcenſion and Declination.*

EXAMPLE. Let the obliquity of the ecliptic, or the ſun's greateſt declination, be 23° 28′; and let his place be 13° 16′ in ♉, what is his right aſcenſion and declination? (Plate IV. *Figure* 5.)

Here the primitive circle, PESQ, repreſents the plane of the ſolſtitial colure, whoſe centre is ♈; the diameter EQ is the equator; and the diameter PS, is the equinoctial colure; E ♋ is the ſun's declination, (= 23° 28′) ♋ ♑ is the ecliptic; ☉ is the place of the ſun; and ♈ ☉, is the ſun's longitude from ♈, = 43° 16′; alſo, P ☉ S is a circle of right aſcenſion.

Then in the right-angled ſpherical triangle ♈ ☉ B, there is given ♈ ☉ = 43° 16′, and the angle ☉ ♈ B = 23° 28′, to find ♈ B, the ſun's right aſcenſion, and B ☉, his preſent declination. Hence theſe proportions. See SPHERICAL TRIGONOMETRY.

As radius —	10.0000000	As radius —	10.0000000
Is to ſine ſun's long. ♈☉ (43° 16′)	9.8359408	To tangent ♈ ☉ (43° 16′)	9.9737071
So is S ∠ ☉ ♈ B (23° 28)	9.6001181	So coſ. ∠ ☉ ♈ B, (23° 28′)	9.9625076
To S B☉, the declination 15° 51′, *fere*	9.4360589	To tang. right aſcen. = 40° 48′ nearly	9.9362147

SCHOLIUM I. While the ſun is moving from ♈ to ♋, or is in the firſt quadrant of the ecliptic, the given longitude is the hypothenuſe in the triangle ♈ ☉ B, the declination B ☉ is north, and ♈ B is the right aſcenſion: but when the ſun has paſt the ſolſtice ♋, and is deſcending towards ♎, he is then ſaid to be in the ſecond quadrant, and his longitude or diſtance from ♈, being taken from 180°, the remainder ♎ ☉ becomes the hypothenuſe, and the declination is ſtill north; but the arc B ♎, which in the above caſe is the right aſcenſion, will then be only the ſupplement, and therefore it muſt be ſubtracted from 180°, in order to give the right aſcenſion required.

SCHOLIUM II. When the ſun is paſt the point ♎, and deſcending towards ♑, has got into the third quadrant, then the longitude reckoned from ♈ will be greater than 180°.

In this caſe, the exceſs above 180°, or the diſtance the ſun is removed from ♎, will be the hypothenuſe ♎ ☉; the declination will be South, and the arc ♎ A, found for the right aſcenſion muſt be added to 180°, to give the right aſcenſion eſtimated from ♈.

SCHOLIUM III. When the ſun has paſt the ſolſtice ♑, and is deſcending towards ♈, he is then in the fourth quadrant, and therefore its longitude is greater than 270°, and muſt be taken from 360°, to give the hypothenuſe ♎ ☉.

In this caſe the declination is South, and the right aſcenſion ♎ A, as found by the proportion, muſt be taken from 360° to give the right aſcenſion from ♈.

COR. At equal diſtances from the equinoctial points ♈ or ♎, the ſun will have equal quantities of declination, but they will be of different names, according as the ſun is on the north or ſouth ſides of the equinoctial.

PROBLEM VI. *Given the Obliquity of the Ecliptic, and the Sun's preſent Declination, to find his Longitude and Right Aſcenſion.*

Here, in the ſaid right-angled ſpherical triangle ♈ ☉ B, there are given the angle ☉ ♈ B, or ſun's greateſt declination, (23° 28′) and ☉ B, the preſent declination, to find ♈ ☉. the ſun's longitude; and ♈ B, his right aſcenſion.

And therefore, by Trigonometry, As ſine ∠ ☉ ♈ B (the greateſt declination) : ſine ☉ B (the preſent declination) : : radius : ſine ♈ ☉, the ſun's longitude; and as radius : co-tangent ∠ ☉ ♈ B : : tangent ☉ B : ſine of the right aſcenſion.

N. B. The right aſcenſion may be either greater or leſs than a quadrant. But when the ſun's longitude is greater than a quadrant, his right aſcenſion will be ſo too.

It would be ſuperfluous to enumerate examples. If the deſcription of each Problem, and the proportions for the ſolution thereof be laid down, nothing farther can be either neceſſary or deſirable in a work of this kind. For the reſt lays merely in taking out and adding up, &c. the logarithms for each caſe, which none who are acquainted with the previous requiſites (namely TRIGONOMETRY) can be ignorant of.

PROBLEM VII. *Given the Obliquity of the Ecliptic, and the Sun's Right Aſcenſion, to find his Longitude and preſent Declination.*

Here, in the aforeſaid right-angled ſpheric triangle, ♈ ☉ B, the leg ♈ B, or given right aſcenſion, and ∠ ☉ ♈ B, or obliquity of the ecliptic, being known, the hypothenuſe ♈ ☉, or ſun's longitude, and the other leg, ☉ B, or his preſent declination, will be found by the following proportions:

1ſt. As rad. : co-tangent ∠ ☉ ♈ B : : co-tangent ♈ B : co-tangent ♈ ☉.

2d. As rad. : tangent ∠ ☉ ♈ B : : ſine ♈ B : tangent ☉ B.

PROBLEM VIII. *Given the Latitude of the Place, and the Sun's preſent Declination; required the Sun's Altitude and Azimuth at 6 o'Clock?*

Here, in Plate IV. *Figure* 6. HR is the horizon; ZN, the prime vertical; RP, the latitude; PS, the ſix o'clock hour circle; EQ, the equator; *n m*, the parallel of declination; and ZON, the azimuth circle.

Now the things given and required, fall in either of the right angled triangles Z☉P, or ♈☉A, they being ſupplemental triangles to each other. In the former ſpheric triangle, right angled at P, there are given ZP, the co-latitude; ☉P, the complement of the declination to find Z☉, the co-altitude, and the ∠ ☉ZP = the azimuth; or, in the ſpheric triangle ♈A☉, right angled at A, there are given the latitude A♈☉, and the declination ♈☉, to find A☉, the altitude, and ♈ A the co-azimuth; in which caſe the proportions are as follow:

Astronomy – See the System.

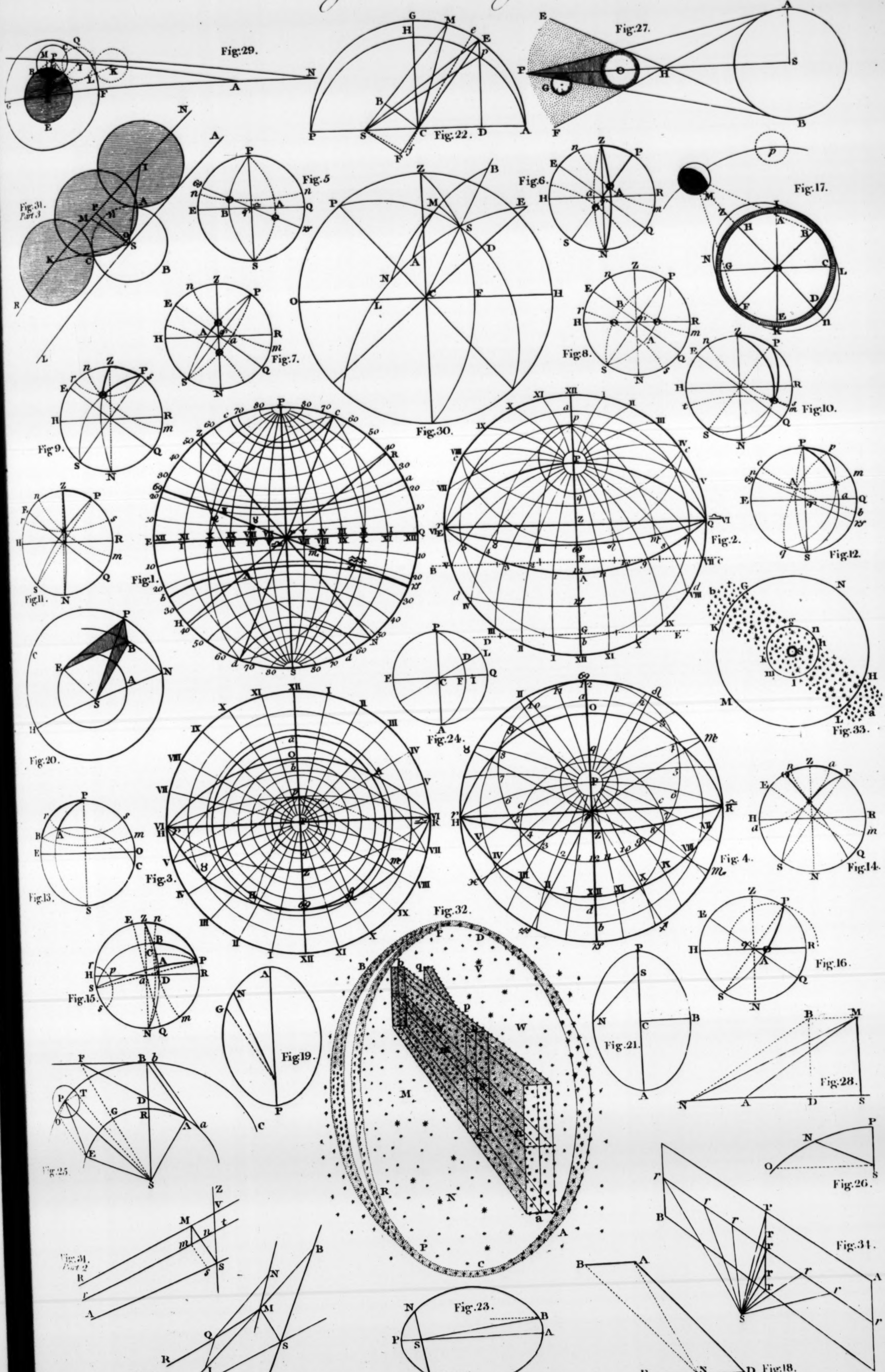
Fig.29.
Fig.22.
Fig.27.
Fig.31. Part 3
Fig.5
Fig.6.
Fig.17.
Fig.7.
Fig.8.
Fig.30.
Fig.9.
Fig.10.
Fig.11.
Fig.1.
Fig.2.
Fig.12.
Fig.20.
Fig.24.
Fig.33.
Fig.13.
Fig.3.
Fig. 4.
Fig.14.
Fig.32.
Fig.15.
Fig.19.
Fig.21.
Fig.16.
Fig.28.
Fig.25.
Fig.26.
Fig.31. Part 2
Fig.34.
Fig.23.
Fig.31. Part 1
Fig.18.

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As rad. : ſine ♈☉ : : ſine A♈☉ : ſine A☉ the altitude. And as rad. : coſine A♈☉ : : tangent ♈☉ : tangent ♈A, the co-azimuth, which taken from 90° leaves the azimuth required.

Scholium. From a due conſideration of this Problem, it is evident, that as the declination increaſes, the altitude increaſes, but the azimuth leſſens; and the contrary happens, while the declination is diminiſhing. Hence, when the ſun has no declination, the altitude at ſix o'clock will be nothing, or the ſun will be in the horizon; and the azimuth then being 90°, the ſun will riſe due eaſt in the morning, and ſet due weſt in the evening.

Problem IX. *Given the Latitude of the Place, and the Sun's Declination. Required tho Altitude and Hour, when the Sun is due Eaſt and Weſt?* See Plate IV. *Figure* 7.

The primitive circle is the meridian; HR, the horizon; ZN, the prime verticle; RP, the latitude; PS, the ſix o'clock hour circle; EQ, the equator; *nm*, the parallel of declination; ☉ the ſun's place, and P☉S, the hour circle. Here the things concerned in the Problem, fall in either of the triangles PZ☉, or ♈A☉.

In the ſpheric triangle PZ☉, right angled at Z, there are given PZ, the co-latitude, and P☉ the co-declination, to find Z☉ the co-altitude, and ∠ZP☉, the hour from noon.

Alſo in the ſpheric triangle ♈A☉, right angled at A, there are given ∠A♈☉ = latitude, and A☉ = declination; to find ♈☉, the altitude, and ♈A, the hour from ſix o'clock; for which the proportions are as under.

As ſine ∠A♈☉ : ſine A☉ : : rad. : ſine ♈☉, the altitude. And as rad. : co-tangent A♈☉ : : tangent A☉ : ſine A♈, the aſcentional difference or time from 6, which muſt be turned into hours and minutes, &c. by reckoning 15° to the hour; and then this added to ſix o'clock, gives the time in the morning when the ſun is eaſt; or ſubtracted therefrom, leaves the time in the evening when the ſun is weſt.

Scholium. When the latitude of the place and ſun's declination have the ſame name, then the greater the declination and latitude, the greater will be the altitude and time from 6. Likewiſe, when they have contrary names, the ſame things happen; but with this difference, that in the former caſe the days lengthen on account of the increaſe of the latitude and declination; whereas, in the latter caſe, the days ſhorten on that account.

Problem X. *Given the Latitude of a Place, and the Sun's Declination. Required his Amplitude and Aſcenſional Difference.* See Plate IV. *Figure* 8.

Here the primitive circle is the meridian of the place; HR, is the horizon; RP, the latitude; PS, the 6 o'clock hour circle; EQ, the equator; *nm*, the parallel of declination; ☉, the place of the ſun; and P☉S, the hour circle.

Then as the arc QR = co-latitude, meaſures the ∠Q♈R, there are given in the ſpheric triangle ♈☉A, (right angled at A) the ſun's declination = A☉; the co-latitude, A♈☉, to find the amplitude ♈☉ and the aſcenſional difference ♈A. Wherefore as ſine ∠A♈☉ : ſine A☉ : : rad. : ſine ♈☉, the amplitude, reckoned from the eaſt or weſt points of the horizon.

And as rad. : tangent ∠A♈O : : tangent of AO : ſine ♈A, the aſcenſional difference.

Scholium I. If the declination is north, the amplitude is north; and if ſouth, it is ſouth.

Scholium II. If *rs* be a parallel of declination, as far ſouth as *mn* is north; the hour circle PBS. paſſing through ☉, the place of the ſun at his riſing or ſetting will form a triangle ♈☉B = △♈☉A, where the amplitude is to the ſouthward of the eaſt and weſt points.

Scholium III. When the latitude and declination have the ſame name, the ſun riſes before and ſets after 6, and then the aſcenſional difference converted into time muſt be ſubtracted from 6 for the time of ſun-riſe, and added to 6 for the time of the ſun's ſetting; but when they are of contrary names, the ſun riſes after and ſets before 6, in which caſe the aſcenſional difference in time muſt be added to 6, for the time of riſing, and ſubtracted therefrom for the time of ſetting.

Scholium IV. The time of the ſun's ſetting being doubled, gives the length of the day; and the double of the time of his riſing, gives the length of the night.

Scholium V. When the latitude and declination have the ſame name, the difference between the right aſcenſion and the aſcenſional difference, is the oblique aſcenſion; and their ſum is the oblique deſcenſion: but when they are of contrary names, their ſum is the oblique aſcenſion, and their difference is the oblique deſcenſion.

Scholium VI. When the declination is equal to the co-latitude of any place (which can only happen to the places within the polar circles) then the parallel of the declination will not cut the horizon, and conſequently the ſun will not ſet in thoſe places during the time his declination exceeds the co-latitude. The like alſo holds with reſpect to the ſtars, for every ſtar whoſe co-declination, or polar diſtance, is not leſs than the latitude; or which is the ſame thing, whoſe declination is not leſs than the co-latitude of the place, thoſe ſtars will never deſcend below the horizon of that place: however, the above is to be only underſtood, when they are in the ſame hemiſphere with the given place; for when the ſtars are in a contrary hemiſphere, and the co-latitude of the place does not exceed the declination of thoſe celeſtial objects, then will they never riſe above the horizon of that place, and conſequently are never viſible there.

Problem XI. *Given the Latitude of a Place, the Sun's Declination and Altitude. Required the Hour from Noon and the Azimuth?* See Plate IV. *Figure* 9.

The primitive circle ZRNH, repreſents the meridian of the place; HR, the horizon; ZN, the prime vertical; RP, the latitude of the place; EQ, the equator; *nm*, the parallel of declination; *rs*, the parallel of altitude; ☉, the place of the ſun; Z☉N, an azimuth circle; and P☉S, an hour circle.

Then in the oblique angled ſpherical triangle P☉Z there are given the co-latitude, ZP; the co-altitude, or Zenith diſtance, Z☉; and the co-declination, or polar diſtance, ☉P; to find ∠☉ZP = the azimuth, and ∠☉PZ = the hour from noon. Hence by trigonometry.

As ſine Z☉ × ſine ZP : rad. : : ſine $\frac{\odot P+ZP-Z\odot}{2}$ × ſine $\frac{\odot P+Z\odot-ZP}{2}$: ſine ſquare of ½ ∠☉ZP, the degrees of which being doubled gives the ∠☉ZP, the azimuth.

And as ſine PZ × ſine ☉P : rad. ſquare : : ſine $\frac{Z\odot+ZP-\odot P}{2}$ × ſine $\frac{Z\odot+\odot P-ZP}{2}$: ſine ſquare of ½ ∠☉PZ; then the degrees, &c. of this being doubled gives ∠☉PZ, which, when converted into time, is the time from noon required.

N. B. Theſe proportions are adapted to the uſe of natural ſines, &c. but will be equally inſtructive in the caſe of *logarithm ſines*, to thoſe who are ſufficiently acquainted with their nature and uſe.

Problem XII. *Given the Latitude of the Place, and Sun's Declination. Required the Time when the Twilight begins and ends?* See Plate IV. *Figure* 10.

Here ZRNH is the meridian of the place, HR, the horizon ZN, the prime vertical, and *ts* a ſmall parallel circle at 18° below it; alſo RP is the latitude; EQ, the equator; *nm*, the parallel of declination; ☉, the place of the ſun; Z☉N, a vertical circle; and P☉S, the hour circle.

Then in the oblique angled ſpheric triangle Z☉P, there are given the co-latitude ZP, and the polar diſtance or co-declination, P☉; to find ∠ZP☉, the hour from noon.

This caſe is ſimilar to the latter in the preceding Problem; I ſhall therefore not repeat the proportion, but give a rule for ſolving the ſame by logarithms.

Take the ſine log. co-arith. P☉, the ſine log. co-arith. ZP, the log. ſine $\frac{Z\odot+P\odot-PZ}{2}$, and the log. ſine $\frac{Z\odot-P\odot+PZ}{2}$, add the whole together, then the half ſum will be equal to the ſine of ½ ∠ZP☉, the degrees, &c. of which being doubled, give ZP☉, which being converted into hours, &c. is the time from from noon. Wherefore, ſubtracting the ſame from 12, will give the time of day break, and adding it to 12, will ſhew the end of twilight.

N. B. When the declination becomes greater than the difference between the co-altitude and 18°, then the parallel of declination *nm*, will not cut the parallel *ts* 18° below the horizon; and conſequently at that time there will be no night in that place, but the twilight will continue from ſun ſetting to ſun riſing.

Problem XIII. *Given the Time of the Year, the Latitude of the Place, and the Altitude of a known fixed Star. Required the Hour of Night, when the Obſervation was made?* See *Figure* 11.

Here the meridian, horizon, and equator, are as before; *rs*, the parallel of altitude; ZP, is the co-latitude of the place; *nm*, the parallel of the ſtars declination; ✳, the place of the ſtar; Z✳N, a vertical circle; and P✳S, the hour circle. Then in the oblique angled ſpheric triangle P✳Z, there are given PZ, the co-latitude; Z✳, the co-altitude; ✳P, the polar diſtance, or co-declination of the ſtar, to find ∠ZP✳, or the hour from noon.

This is alſo a ſimilar caſe to the latter in Problem XI. and the ſame proportion will hold, ſubſtituting the ſtar for the ſun.

N. B. The ſtar's declination muſt be taken from a correct table of known ſtars, adjuſted to the preſent time.

Problem XIV. *Given the Obliquity of the Ecliptic, and a Star's right Aſcenſion and Declination. Required his Latitude and Longitude?* See *Figure* 12.

Here the primitive circle repreſents the ſolſtitial colure, EQ the equator; *nm* the parallel of the ſtars declination; ♈*a* is equal to the ſtars right aſcenſion P✳S, a circle of right aſcenſion; ✳ the place of the ſtar; E♋ = 23° : 28′, the obliquity of the ecliptic; ♋♑, the ecliptic; *p* and *q*, its poles; and *p*✳*q*, a circle of longitude.

Then in the oblique angled ſpheric triangle *p*P✳, there is given the obliquity of the ecliptic *p*P, the co-declination P✳, and the right aſcenſion = ∠pP✳, to find p✳, the co-latitude, and ∠Pp✳ = longitude.

Therefore by ſpheric trigonometry. As rad. : coſine of right aſcenſion :: tangent of the obliquity of the ecliptic : tangent of a 4th arc, which will be acute or obtuſe, according as ∠pP✳ is acute or obtuſe.

Alſo take the difference between this 4th arc, and the co-declination P✳; and call that the 5th arc. Then it will be as the coſine of the 4th arc : coſine of the 5th arc :: coſine of the obliquity of the ecliptic : the ſine of the required latitude, which will be north or ſouth, according as the ſtar by its declination is north or ſouth of the ecliptic.

Alſo as ſine of the co-latitude, thus found : ſine of the co-declination :: ſine of right aſcenſion to the coſine of the longitude, which will be in the ſame quadrant with the right aſcenſion.

N. B. On account of the preceſſion of the equinoxes, the fixed ſtars, although they keep always the ſame latitudes, are nevertheleſs conſtantly altering their longitudes, declinations, and right aſcenſions; the alteration in longitude is uniformly about 50″ yearly; but that of the right aſcenſion and declination is continually varying. So that many ſtars which once had north declination come to have ſouth, while others are changing from ſouth to north declination.

Problem XV. *Given the right Aſcenſions and Declinations of two fixed Stars. Required their Diſtance?* See Plate IV. *Figure* 13.

Let the primitive circle repreſent the circle of right aſcenſion of that ſtar, whoſe right aſcenſion is the greateſt; and let a circle of right aſcenſion PAS be drawn, ſo as to make an angle with PBS equal to the difference between the given right aſcenſions; then drawing the parallels of declination B*m* and *rs*, the interſections B and A will be the places of the two ſtars; B, being that whoſe right aſcenſion is the greateſt, and A, the other. Then drawing a great circle, BAC, through BA, there will be given in the ſpheric triangle BPA, the ſide BP = co-declination of the ſtar B; PA = co-declination of the ſtar A; and the included angle APB = difference of their right aſcenſions, to find their diſtance AB.

The data in this Problem is therefore the ſame as in the laſt, and the ſame method which ſolves the firſt caſe of that Problem, is equally applicable in this. See alſo Spherical Trigonometry.

Problem XVI. *Given the Latitudes and Longitudes of two known fixed Stars. Required their Diſtance?*

The conſtruction of this Problem, is like that of the laſt; only, inſtead of circles of right aſcenſion, read circles of longitude; and uſe parallels of latitude, inſtead of parallels of declination.

The method of computation is alſo the ſame, there being given two co-latitudes; and the included angle, which is the difference between the given longitudes.

Problem XVII. *Given the Latitude and Longitude of a fixed Star, and alſo the Obliquity of the Ecliptic. Required the Right Aſcenſion and Declination of ſuch Star?*

The conſtruction of this Problem is much the ſame as that of Problem XIV. only here the interſection of a parallel of latitude *cb*, with a circle of longitude *p*A*q*, will give the place of the ſtar.

The computation is alſo as in Problem XIV. for here are given P*p*, the obliquity of the ecliptic, *p*A = co-latitude, and ∠P*p*A = co-longitude, to find PA the co-declination, and ∠*p*PA, the right aſcenſion.

Problem XVIII. *Given the Meridional Altitude of any Celeſtial Object, ſuppoſe a Comet, its Diſtance from a known Star, and the Latitude of the Place. Required the Declination and right Aſcenſion of that Comet.* See *Figure* 14.

The primitive circle repreſents the meridian of the place; HR, the horizon; and ZN, the prime vertical; alſo RP = the latitude; EQ the equator; *nm* the parallel of declination of the propoſed ſtar; HO, the altitude of the comet; *aa*, a ſmall circle; O*a* being equal to the diſtance of the comet from the ſtar; and the place (✳) where it interſects *nm*, is the poſition of the ſtar at that time; likewiſe P✳S is a circle of right aſcenſion; and ⊙✳, a part of a great circle.

Then ſince HE is equal to the co-latitude, and HO = the altitude of the comet, it follows that EO, the required declination = HO∽HE, which is north, when the altitude exceeds the co-latitude.

Alſo, in the triangle P✳O, there are given the three ſides, viz. PO = co-declination of the comet; ⊙✳ = diſtance between the comet and ſtar, and P✳ the co-altitude; to find the ∠OP✳, the difference between the right aſcenſions of the comet and ſtar; for the ſolving of which ſee Spherical Trigonometry; then this difference ſubtracted from or added to the ſtar's right aſcenſion, according as the ſame is greater or leſs than the comets, will give the right aſcenſion of the comet.

Problem XIX. *Given the Latitude of a Place, the Sun's Declination and Azimuth, required his Altitude, and the Time of Obſervation.* See Plate IV. *Figure* 15.

To illuſtrate this by an Example:

Let the latitude be 13½° north, and the ſun's declination 23° 28′ north; required the ſun's altitude, and the time of the day when he is ſeen on the ENE azimuth circle.

Here the primitive circle repreſents the meridian of the place, HR, the horizon; ZN, the prime vertical; RP = the latitude; PS, the ſix o'clock hour circle; EQ, the equator; *nm*, the parallel of the ſun's greateſt declination; ZDN, the vertical circle, which cuts the parallel *nm* in the points A and B, and thereby ſhews, that at two diſtant times in the forenoon the ſun will have the azimuth propoſed; PAS and PBS, drawn through the points of interſection, A and B, are hour circles.

Now, in the ſpheric triangle PZA or PZB, there are known the co-latitude PZ = 76½°, the co-declination PA or PB = 66° 32′, and the azimuth angle, PZD = 67½°, to find ZA or ZB, and the ∠ZPA or ∠ZPB.

Now, as radius : coſ. azimuth :: co-tangent latitude : tangent of a fourth arc (M) = 57° 54′; and, as the ſine latitude : ſine declination :: coſ. M. : coſ. of a fifth arc (N) = 24° 54′.

Then, M + N, or 57° 54′ + 24° 54′ = 82° 48′ = ZA, the complement of the leſs altitude; and M − N, or 57° 54′ − 24° 54′ = 33° = ZB, the complement of the greater altitude. Therefore, when the ſun has 7° 12′, or 57° of altitude, he is on the given azimuth.

Again: As coſ. declination : ſine of azimuth :: coſ. leſs altitude : ſine of hour from noon = 88° 2′; and :: coſ. greater altitude : ſine of hour from noon = 33° 16′.

Alſo, 88° 2′ = in time, 5 hours, 52 minutes; and 33° 16′ = 2 hours, 13 minutes, the reſpective times from noon; and conſequently the ſun will be ſeen on the ENE azimuth, at 6 hours, 8 minutes, and again at 9 hours, 48 minutes in the morning. In the afternoon he will be ſeen on the WNW azimuth at 2 hours, 13 min. and at 5 hours, 52 minutes.

If it is required to find at what altitude the greateſt azimuth will happen at that place on the ſame day; then, ſince the azimuth circle in that caſe muſt touch the parallel *nm*, the greateſt diſtance of the equator will be 23° 28′; and, as their poles muſt be at the ſame diſtance, the interſection *p* of a ſmall circle (*rs*) with the horizon deſcribed about the pole S, at the diſtance of 23° 28′, will be the pole of the circle ZCN; then, having deſcribed an hour circle, PCS through *p*, there will be given in the ſpheric triangle, ZPC right-angled at C, the co-latitude PZ = 76½°, and the co-declination PC = 66° 32′, to find the greateſt azimuth or ∠; PZC, (= 70° 36′) the diſtance, ZC, (= 54° 8′); and the hour from noon (= 56° 27′) = 3 hours, 46 minutes.

Problem XX. *Given the Sun's Declination and Amplitude to find the Latitude of the Place.*

Here (Plate IV. *Fig.* 16) HR is the horizon; RO, the azimuth; EQ, the equator; ♈O, the co-amplitude; AO, the declination; and ∠A♈O, the co-latitude; therefore, in the ſpheric triangle, ♈OA, right-angled at A, there is given ♈O and AO to find ∠A♈O. The proportion is, as ſine ♈O : radius :: ſine AO : ſine ∠A♈O, the co-latitude required.

Problem XXI. *Given the Sun's Declination and his Aſcenſional Difference; required the Latitude of the Place.*

If the foregoing Problems, with their conſtructions, are well underſtood, the reader will not be at a loſs in deſcribing this and the remaining Problems in this Section; and therefore I ſhall only give the method of calculation in each caſe, and paſs over the conſtructions, that we may find room for other matters that are more eſſential to Aſtronomy. The proportion in this caſe is, as radius : co-tangent of the declination :: ſine of the aſcenſional difference : tangent of the latitude.

Problem XXII. *Given the Sun's Declination and Altitude at ſix o'Clock; required the Latitude of the Place.*

Solution.

As ſine of the declination : radius :: ſine of altitude : ſine of latitude.

Problem XXIII. *Given the Sun's Declination and Altitude when he is due Eaſt or Weſt; required the Latitude of the Place.*

Solution.

As ſine of altitude : radius :: ſine of declination : ſine of the latitude.

Problem XXIV. *Given the Sun's Altitude and Hour of the Day, on either Equinox; required the Latitude of the Place.*

Solution.

As ſine of the time from ſix : radius :: ſine altitude : coſine of latitude.

Problem XXV. *Given the Sun's Altitude, Declination and Azimuth; required the Latitude of the Place.*

Solution.

As radius : coſine azimuth :: co-tangent altitude : tangent of a fourth arc. And, as ſine of altitude : ſine declination :: coſine of fourth arc : coſine of a fifth arc. Then the difference between the fifth and fourth arcs is the co-latitude.

Problem XXVI. *Given the Sun's Declination, his Altitude, and the Hour of the Day; required the Latitude of the Place.*

Solution.

As radius : coſine of hour from noon :: co-tangent of declination : tangent of a fourth arc. And, as ſine declination : ſine altitude :: coſine of fourth arc : coſine of fifth arc, Then the difference between thoſe arcs is the co-latitude.

Other Problems might be added, but they are ſuch as ſeldom occur in practice; and thoſe who perfectly underſtand how to ſolve what have been here given, will not find it difficult to ſolve any other of the like nature, the whole depending on the doctrine of ſpherical triangles.

But ſeveral of the foregoing Problems may alſo be applied to other caſes than thoſe propoſed; viz. when the things concerned in each are the ſame, but with this difference, that the thing required in one caſe be given in the other, and that one of the things given in one caſe, be required in the other; for then the ſolution is had by merely varying the proportion.

Thus, in Problem XXIV. ſuppoſe the latitude had been given and the altitude required, then the proportion would have been as radius : ſine of hour from ſix : : coſine latitude : ſine of altitude; and ſo for any other; obſerving, that when the firſt term of any of the proportions is wanted, it will be, as 4th term : 3d term : : 2d term : 1ſt term. When the 2d term is wanted, it will be, as the 3d term : 4th term : : 1ſt term : term required; and when the 3d term is ſought, it will be, as the 2d term : 1ſt term : : 4th term : 3d term; it being evident, from the nature of equations and the doctrine of Ratio's, that the proportions will hold in each caſe.

SECT X.

OF THE TIDES:

Or, an Explanation of the Flux and Reflux of the Sea.

TO account for the ebbing and flowing of the ſea, is a ſubject that has excited the attention of philoſophers in every age; but the diſcovery of its true cauſe was reſerved for the honour of the illuſtrious Newton, who has ſhewn that the flux and reflux of the ſea is a natural conſequence reſulting from the laws and principles of gravitation, effected by the action of the moon upon the earth, or rather by the joint actions of the ſun and moon; that, however, of the moon, being by far the moſt conſiderable.

In explaining the phænomena of the tides it muſt be obſerved, that the power of gravity diminiſhes as the ſquare of the diſtance increaſes; and therefore the waters at Z (See Plate IV. *Figure* 17.) on the ſide of the earth ABCDEFGH next the moon M are more attracted than the central parts of the earth O by the moon, and the central parts are more attracted by her than the waters on the oppoſite ſide of the earth at *n*; and therefore the diſtance between the earth's centre and the waters on its ſurface under and oppoſite to the moon will be increaſed. For, let there be three bodies at H, O, and D; if they are all equally attracted by the body M, they will all move equally faſt toward it, their mutual diſtances from each other continuing the ſame. If the attraction of M is unequal, then that body which is moſt ſtrongly attracted will move faſteſt, and this will increaſe its diſtance from the other body. Therefore, by the law of gravitation, M will attract H more ſtrongly than it does O, by which the diſtance between H and O will be increaſed; and a ſpectator on O will perceive H riſing higher toward Z. In like manner, O being more ſtrongly attracted than D, it will move farther towards M than D does: conſequently, the diſtance between O and D will be increaſed; and a ſpectator on O, not perceiving his own motion, will ſee D receding farther from him towards *n*; all effects and appearances being the ſame, whether D recedes from O, or O from D.

Suppoſe now there is a number of bodies, as A,B,C,D,E,F,G,H, placed round O, ſo as to form a flexible or fluid ring: then, as the whole is attracted towards M, the parts at H and D will have their diſtance from O increaſed; whilſt the parts at B and F being nearly at the ſame diſtance from M as O is, theſe parts will not recede from one another; but rather, by the oblique attraction of M, they will approach nearer to O. Hence, the fluid ring will form itſelf into an ellipſe ZIBL*n*KFNZ, whoſe longer axis *n*OZ produced, will paſs through M, and its ſhorter axis BOF will terminate in B and F. Let the ring be filled with fluid particles, ſo as to form a ſphere round O; then, as the whole moves towards M, the fluid ſphere being lengthened at Z and *n*, will aſſume an oblong or oval form. If M is the moon, O the earth's centre, ABCDEFGH the ſea, covering the earth's ſurface, it is evident, by the above reaſoning, that whilſt the earth by its gravity falls toward the moon, the water directly below her at B will ſwell and riſe gradually towards her; alſo the water at D will recede from the centre (ſtrictly ſpeaking, the centre recedes from D), and riſe on the oppoſite ſide of the earth; whilſt the water at B and F is depreſſed, and falls below the former level. Hence, as the earth turns round its axis from the moon to the moon again in 24⅘ hours, there will be two tides of flood and two of ebb in that time, as we find by experience.

As this explanation of the ebbing and flowing of the ſea is deduced from the earth's conſtantly falling towards the moon by the power of gravity, ſome may find a difficulty in conceiving how this is poſſible, when the moon is full, or in oppoſition to the ſun; ſince the earth revolves about the ſun, and muſt continually fall towards it, and therefore cannot fall contrary ways at the ſame time: or if the earth is conſtantly falling towards the moon, they muſt come together at laſt. To remove this difficulty, let it be conſidered, that it is not the centre of the earth that deſcribes the annual orbit round the ſun, but the common centre of gravity of the earth and moon together: and that whilſt the earth is moving round the ſun, it alſo deſcribes a circle round that centre of gravity; going as many times round it in one revolution about the ſun as there are lunations or courſes of the moon round the earth in a year: and therefore the earth is conſtantly falling towards the moon from a tangent to the circle it deſcribes round the ſaid common centre of gravity.

The earth's diameter bears a conſiderable proportion to its diſtance from the moon; but is next to nothing when compared to its diſtance from the ſun. Therefore the difference of the ſun's attraction on the ſides of the earth under and oppoſite to him, is much leſs than the difference of the moon's attraction on the ſides of the earth under and oppoſite to her; and conſequently the moon muſt raiſe the tides much higher than they can be raiſed by the ſun.

From this theory it may be thought the tides ought to be higheſt directly under and oppoſite to the moon. But we find, that in open ſeas, where the water flows freely, the moon is generally paſt the meridian, when it is high water. The reaſon is obvious: for though the moon's attraction was to ceaſe altogether, when ſhe was paſt the meridian, yet the motion of aſcent communicated to the water before that time, would make it continue to riſe for ſome time after; much more muſt it do ſo when the attraction is only ſomething diminiſhed.

Thus, to inſtance a ſimilar caſe, experience ſhews, that the day is hotter about three in the afternoon, than when the ſun is on the meridian, becauſe of the increaſe made to the heat already imparted.

The tides anſwer not always to the ſame diſtance of the moon from the meridian at the ſame places; but are variouſly affected by the action of the ſun, which brings them on ſooner when the moon is in her firſt and third quarters, and keeps them back later when ſhe is in her ſecond and fourth: becauſe, in the former caſe, the tide raiſed by the ſun alone would be earlier than the tide raiſed by the moon; and, in the latter caſe, later.

When the moon is neareſt the earth, ſhe attracts ſtrongeſt, and ſo raiſes the tides moſt; the contrary happens when ſhe is fartheſt from the earth, becauſe of her weaker attraction. When both luminaries are in the equator, and the moon in perigee, ſhe raiſes the tides higheſt of all, eſpecially at her conjunction and oppoſition; both becauſe the equatorial parts have the greateſt centrifugal force from their deſcribing the largeſt circle, and from the concurring actions of the ſun and moon. At the change, the attractive forces of the ſun and moon being united, they diminiſh the gravity of the waters under the moon, and their gravity on the oppoſite ſide is diminiſhed by means of a greater centrifugal force. At the full, whilſt the moon raiſes the tide under and oppoſite to her, the ſun, acting in the ſame line, raiſes the tide under and oppoſite to him; whence their conjoint effect is the ſame as at the change; and, in both caſes, occaſion what we call the Spring Tides. But at the quarters the ſun's action on the waters at O and H diminiſhes the effect of the moon's action on the waters at Z and N; ſo that they riſe a little under and oppoſite to the ſun at O and H, and fall as much under and oppoſite to the moon at Z and N; making what we call the Neap Tides, becauſe the ſun and moon then act croſs-wiſe to each other. But theſe tides happen not till ſome time after; becauſe in this, as in other caſes, the actions do not produce the greateſt effect when they are at the ſtrongeſt, but ſome time afterward.

The ſun, being nearer the earth in winter than in ſummer, therefore the greateſt tides happen not till ſome time after the autumnal equinox, and return a little before the vernal.

As the tides are principally governed by the moon, they muſt turn on the axis of the moon's orbit, or nearly ſo, which is inclined 23½ degrees to the earth's axis at a mean ſtate: and therefore the poles of the tides muſt be ſo many degrees from the poles of the earth, or in oppoſite points of the polar circles, going round theſe circles in every lunar day.

When the moon is in the equator, the tides are equally high in both parts of the lunar day, or time of the moon's revolving from the meridian to the meridian again, which is 24 hours 50 minutes. But as the moon declines from the equator towards either pole, the tides are alternately higher and lower at places having North or South latitude. Whilſt the moon has North declination, the greateſt tides in the northern hemiſphere are when ſhe is above the horizon; and the reverſe whilſt her declination is South.

But the tides are ſo retarded in their paſſage through different ſhoals and channels, and otherwiſe ſo variouſly affected by ſtriking againſt capes and headlands, that to different places they happen at all diſtances of the moon from the meridian, conſequently at all hours of the lunar day. The tide propagated by the moon in the German ocean, when ſhe is three hours paſt the meridian, takes 12 hours to come from thence to London bridge; where it arrives by the time that a new tide is raiſed in the ocean. And therefore, when the moon has North declination, and we ſhould expect the tide at London to be greateſt when the moon is above the horizon, we find it is leaſt; and the contrary, when ſhe has South declination. At ſeveral places it is high-water three hours before the moon comes to the meridian; but that tide which the moon puſhes as it were before her, is only the tide oppoſite to that which was raiſed by her when ſhe was nine hours paſt the oppoſite meridian.

SECT. XI.

Of the Aberration of the fixed Stars, cauſed by the Compound Motion of the Rays of Light, and of the Earth in its Orbit.

IT is found from obſervations of the eclipſes of Jupiter's ſatellites, that light is about 8 minutes in paſſing from the ſun to the earth: and as the earth deſcribes about 1° in a day, it will therefore in 8 minutes deſcribe 20″ in its orbit; and conſequently the velocity of light is to the velocity of the earth in its orbit, as radius to an arc of 20″, or as 10300 to 1.

Now, if AN (Plate IV. *Figure* 18.) be the path of a body in free ſpace, its apparent way on a moveable plane will be different, for it will be that which is made by the reſolution of the two motions on a moveable plane.

Thus let AN be deſcribed in any time by the body, and NF be deſcribed by (a point in) the plane, in the ſame time. Now as the plane moves forward in the direction NF or AB, it leaves all the points of the fixed line AN behind it; all of which will therefore ſeem to move backwards in the plane. Therefore make ND = NF, for the body, inſtead of going to N in free ſpace will ſeem to go to D, and therefore AD will be the apparent path of the body in that plane. Therefore a ray of light emitted from the ſtar in the direction AN, will fall upon the point D of the moving plane; and, hence, an obſerver at D will ſuppoſe the ſtar ſituated in the line DA. Conſequently, if BN be parallel to AD, and the point D tranſlated to N in the ſaid time, an obſerver at N will ſuppoſe the ſtar ſituated in the line NB, making the angle BNF or ADF leſs than ANF, the angle, which it would appear under if the plane was at reſt; ſo that the angle of elevation BNF above the line of direction NF of the obſerver, is leſs than before, being taken on the ſide towards which the obſerver moves. The ooſerver, therefore, inſtead of ſeeing the ſtar at A its real place will ſee it at B, its apparent place. On the contrary, if the obſerver moves from F to N and D; and B, be the real place of the ſtar; then to an obſerver if at N, its apparent place would be at A.

The apparent place B is always in the plane of aberration, drawn through the way of the obſerver NF, and the line NA drawn from the obſerver to the real place of the ſtar; for AB, being parallel to NF, is in the plane ADNF, and the angle BNA or NAD, is the angle of aberration; and by the quantity of this angle, the ſtar is depreſſed, in going towards it; or raiſed in going from it.

Now in the triangle AND it is as AN : ND :: ſine ADN : ſine NAD; but AN and ND being given, the ſine $\angle$NAD, the aberration, will be as ſine ADN. And becauſe AN is 10300 times as great as ND, therefore the ſine NAD does not differ from its arc or angle, and conſequently the angle of aberration NAD or ANB, is always as the ſine of the angle of the earth's way, ADN, or ANF. Hence the angle of aberration ANB is greateſt when AN is perpendicular to ND, and becomes nothing when ANF is nothing.

And ſince AN is to ND, as radius to 20″; therefore, when AN is perpendicular to ND, the $\angle$NAD, or ANB, will be 20″, which is the greateſt it can be. In other caſes it will be as rad. : ſine ANF, (the angle of the earth's way) :: 20″ to the aberration correſponding to that angle, which angle is always taken in the plane of aberration ADNF.

By reaſon of the aberration, if a ſtar was placed in the pole of the ecliptic, it would appear to deſcribe a circle of 40″ diameter round the pole in a year. Any other ſtar will appear to deſcribe a ſmall ellipſis in a year; the tranſverſe axis of which is 40″, and parallel to the ecliptic; and the conjugate axis thereof at right angles to the former, and leſs than it in the ratio of it to the ſine of the ſtar's latitude.

M. De La Caille, in his valuable Treatiſe of Aſtronomy, gives the following methods for finding the aberration in right aſcenſion and declination of a ſtar.

For the Aberration in right Ascension. Seek in the Aſtronomical tables that point of the ecliptic, which correſponds to the point of the equator marked by the right aſcenſion of the ſtar; this point (which call N) is always that wherein the ſun being found, the aberration makes the apparent right aſcenſion the leaſt. Take in the ſame tables the angle made by the ecliptic, and a meridian paſſing through that point N; and ſay, as the product of the radius by the coſine of the declination of a ſtar, is to the product of the coſine of the diſtance of the ſun from the point N, by the ſine of the angle between the ecliptic and meridian of N, ſo is 20″ to the aberration in right aſcenſion; and is additive or ſubtractive, according to the ſituation of the ſun to the point N, which is eaſy to determine.

For the Aberration in Declination. Take from the Aſtronomical tables the declination of the point N, and ſay as the ſum of the declinations of the ſtar and the point N (if of different names) or of their difference (if of the ſame name) is to the coſine of the right aſcenſion of the ſtar; ſo is the ſine of the obliquity of the ecliptic, to the co-tangent of an arc, which is the diſtance between the point N in the ecliptic, where the aberration in right aſcenſion makes his right aſcenſion the leaſt; and that point of the ecliptic (which call T) where the ſun is found, when the aberration in declination makes his declination the leaſt.

The point T is obtained by ſubtracting the arc found from the place of N, if the right aſcenſion of the ſtar is proceeding from 0° to 90° with ſouth latitude and north declination; or from 180° to 270° with north latitude and ſouth declination; or, T is found by adding this arc to the place N, if the right aſcenſion is between 270° and 90° with latitude and declination, both north; or between 90° and 270° with latitude and declination, both ſouth. On the contrary, the ſupplement of the ſaid arc from place N muſt be ſubtracted, if the right aſcenſion is between 90° and 180° with ſouth latitude and north declination; or is between 270° and 360° with north latitude and ſouth declination. Finally, the ſupplement of this arc from the place N muſt be added, if the right aſcenſion is between 270° and 90° with latitude and declination, both ſouth; or between 90° and 270° with latitude and declination, both north.

Then ſay, as the product of the radius by the ſine of NT, is to the product of the coſine of the diſtance of the ſun from the point T, by the ſine of the ſum, or difference, of the declination of the ſtar and point N, ſo is 20″ to the aberration in declination; which is eaſily applied to the true declination of the ſtar, according to its ſituation in regard to the ſun.

The effect of the aberration of light on the planets may be found thus. Say as the horary motion of the ſun, multiplied by the radius of the annual orbit of the earth, is to the diſtance of the earth from the planet multiplied by 20″; ſo is the horary motion of the planet, in longitude, in latitude, in right aſcenſion, or declination, to a quantity, whereby the aberration of light has diminiſhed ſuch longitude, latitude, right aſcenſion, or declination.

SECT. XII.

Of the irregular Motions of the Planets, the Methods of determining their Places, the Equation of Time, &c.

IN order to the underſtanding of the matters treated of in this Section, it will be proper to premiſe the following definitions.

I. The True Anomaly of a Planet, is the angle ASN (at the ſun S) comprehended between the aphelion A, and the planet N, in its orbit; or of a comet between it and the perihelion. See Plate IV. *Figure* 19.

II. The Mean Anomaly is an angle ASG, taken proportional to the time of the planet's moving from the aphelion A, to the place N, in its orbit. An arch of a circle, or the area ANS of the ellipſis, may alſo be taken for the mean anomaly.

This angle ASG increaſes uniformly with the time, or with the area ANS; and therefore the motion of SG, round the centre S, is called the Mean Motion.

III. The Equation of the Centre, is the $\angle$ NSG, or the difference between the True and Mean Anomalies. This is alſo named the *Proſthaphaereſſis*.

IV. The Heliocentric Place, Heliocentric Longitude, and Heliocentric Latitude of a Planet, are the planet's place, longitude, and latitude, as ſeen from the ſun.

V. If S be the ſun (*Figure* 20.) E, the earth; P, the planet, and PB perpendicular to the ecliptic. Then in the triangle EPS, or EBS, reduced to the ecliptic, the angle at the ſun ESP, or ESB, contained between the earth and the planet, is called the Angle of Commutation.

VI. The Angle of Elongation, is the angle at the earth PES, or BES, contained between the ſun and the planet.

VII. The Parallax of the Orbit is the angle at the planet, or its place in the ecliptic EPS, or EBS, contained between the ſun and earth. Here AE is the earth's orbit, NPC the planet's orbit, NB its orbit, reduced to the ecliptic, HSN, the Line of the Nodes, and N, the ascending Node.

VIII. The Curtate Distance of a Planet from the ſun or the earth, is the line SB or EB, drawn from the ſun or the earth, to the point where the perpendicular from the planet cuts the ecliptic. This is the diſtance of the planet from the ſun or the earth, reduced to the ecliptic.

IX. The Argument of Latitude, is the Angle at the ſun, NSP, between the Planet and its aſcending Node, reckoned in the planet's orbit, NPC.

X. The Radix is the place of a planet at ſome remarkable point of time, as the birth of Chriſt, the beginning of a particular century, &c. From this point all the motions are calculated as from a fixed foundation.

XI. Apparent or Solar Time, is the time as it is ſhewn by the ſun, and proceeds irregularly, by reaſon of the earth's motion, which is ſometimes quicker or ſlower than at other times.

XII. Mean or Astronomical Time, is the time that goes forward uniformly, without any acceleration or retardation. This is alſo called True Time.

XIII. An Astronomical Day, begins at the noon of the preceding day, and ends at the noon of the following day, the hours being reckoned from 1 to 24.

XIV. The Astronomical Year begins and ends on the laſt day of December, at *noon*, and theſe beginnings or endings are different, in different places according to the difference of longitude.

Proposition I. *Having given either the true Anomaly or the Diſtance of a Planet from the Sun, to find the other, and the Time when it will be in that Part of its Orbit correſponding therewith, as alſo the Mean Anomaly.*

Here the periodical time, the orbit of the planet, and the time of its being in its perihelion being ſuppoſed to be known, Mr. Emerſon has demonſtrated that if PNAB (*Figure* 21) be the orbit, S the ſun, C the centre, P the perihelion, A the aphelion, and if the ſemi-tranſverſe CP be put $= a$, ſemiconjugate CB$=c$, eccentricity CS$=n$, the diſtance of the planet SN$=y$; its periodic time t; coſine of Angle PSN$=z$, and D $=$ number of degrees in the arc whoſe coſine is $\frac{a-y}{n}$, and radius 1, that the time of the planets deſcribing the part of its orbit SPN will be truly exhibited by this expreſſion $\frac{Dt}{360} - \frac{t\sqrt{2ay-cc+yy}}{2a\times 3.1416}$. and if y $\left(\text{which is equal } \frac{cc}{a+zn}\right)$ is given, then z, or the true anomaly which is equal to $\frac{cc-ay}{ny}$, is alſo given; or if z, or the true anomaly be given, then y or the time of the planets arriving at N will be known; and the difference between this time and half the periodic time, will give the time of its moving from the aphelion.

If the planet in moving from the perihelion be paſt the aphelion, then the above expreſſion ſhews the time in which it will come to the perihelion again.

Alſo the mean anomaly will be equal to $D - \frac{57.29578\sqrt{nn-\overline{a-y}^2}}{a}$ reckoning from the perihelion.

Proposition II. *From the Mean Anomaly given to find the true Anomaly.*

By the laſt Propoſition, the Mean Anomaly is found directly from the true; but there is no direct way of finding the true Anomaly from the mean; but Mathematicians are obliged to have recourſe to methods of approximation.

The following Solution, by the late excellent aſtronomer and mathematician, Mr. G. **Witchel**, may be acceptable to our readers.

" To explain this, let ApHP, (Plate IV. *Fig.* 22) be the elliptic orbit of the planet, ACP the tranſverſe axis, HC the ſemi-conjugate, and S, the focus in which the ſun is placed; moreover, let A, p, and P repreſent any three places of the planet, at three given inſtants of time: then it will be, as the time of deſcribing the elliptic arc Ap, is to the time of deſcribing the elliptic arc pP, ſo is the trilinear area ApS, to the trilinear area pPS, and conſequently, the given area of the ſemi-ellipſe ApPA, is divided by the line pS, in the given ratio of the time of deſcribing the elliptic arc Ap, to the time of deſcribing the elliptic arc pP. To divide an ellipſis in this manner, is the famous Keplerian problem, which has exerciſed geometricians for almoſt two centuries.

SOLUTION.

" Let the ſemi-circle AGP be deſcribed upon the tranſverſe axis ACP, and through p, the place of the planet, let DpE be drawn, parallel to the ſemi-conjugate HC, meeting the ſemi-circle in the point E; join E,S, and the ſemi-circle will be divided by the line ES, in the ſame ratio, as the ſemi-ellipſe AHP is by the line pS, as is demonſtrated by the writers on conics; let E, C, be joined, upon which, produced if needful, let fall from S, the perpendicular SF; take the arc EM equal in length to the right-line SF, and join M,C: Then it is evident, that the area of the ſector ECM, will be equal to the area of the triangle ECS, and conſequently, the area of the ſector ACM, will be equal to the trilinear area ASE: hence the ſector AMC, or the angle ACM, will be proportional to the elliptic area ApS, which is called, the mean anomaly of the planet, as the angle ACE, is denominated, the **Eccentric Anomaly**, and the angle ASp, the true, or co-equate anomaly."

Mr. Witchel proceeds to find the eccentric anomaly, and from thence the true anomaly on principles which evince his profound knowledge in geometry, and concludes with the following

PRACTICAL RULE.

"It will be moſt convenient to have the eccentricity expreſſed in decimal parts of the ſemi-tranſverſe axis: that done, from the log. of the perihelion diſtance, ſubtract the log. of the aphelion diſtance, and let the remainder be called A; likewiſe to the log. of the eccentricity add the log. 1.758123 (being the log. of the number of degrees contained in an arc equal to the radius) and call the ſum B; to the log. A, add the log. tangent of half the mean anomaly, and the ſum will be the log. tangent of an arc; ſubtract this arc from half the mean anomaly, and to the log. ſine of the remainder add the log. 1.758123, and the ſum will be the log. of the difference of the mean and eccentric anomalies, very nearly: then if the mean anomaly be leſs than 180°, ſubtract this difference therefrom, otherwiſe add it thereto, and it will give the firſt value of the eccentric anomaly, which will be ſufficiently exact in each of the planets, except Mars and Mercury: in the former the error, when greateſt, will be about three-fourths of a ſecond; but in the latter, it will amount to one-third of a minute: in order therefore, to correct it, let the log. ſine of the eccentric anomaly, as found above, be added to the log. B, and the ſum will be the log. of the difference of the two anomalies to a ſtill greater exactneſs: then, if to the log. co-ſine of the eccentric anomaly, there be added the log. of the eccentricity, the ſum will be the log. of a fraction, which, if the eccentric anomaly is more than 270°, or leſs than 90°, muſt be added to unity, otherwiſe ſubtracted therefrom, and the ſum, or difference, will be a number, by which if the difference of the two values of the eccentric anomaly be divided, the quotient will be the error of the firſt value of the eccentric anomaly: then if the eccentric anomaly is in the firſt or third quadrant, let the error be ſubtracted therefrom, otherwiſe added thereto, and it will give the eccentric anomaly to a very great degree of exactneſs: laſtly, to the log. tangent of half the eccentric anomaly add half the log. of A, and the ſum is the log. tangent of half the true anomaly."

Mr. **Emerson** has demonſtrated the following Properties:

1ſt. That the aphelion diſtance, AS, is to the ſemi-conjugate CH, as the tangent of half the eccentric anomaly, ACE, to the tangent of half the true anomaly ASp.

2d. That the ſquare root of the aphelion diſtance S A is to the ſquare root of the perihelion diſtance SP, as the tangent of half the eccentric anomaly to the tangent of half the true anomaly.

3d. That the ſine of the true anomaly is to the ſine of the eccentric anomaly, as the ſemi-conjugate to the diſtance (Sp) of the planet from the ſun.

4th. And that the ſine of half the true anomaly is to the ſine of half the eccentric anomaly, as the ſquare root of the perihelion diſtance, SP, to the ſquare root of Sp, the diſtance of the planet from the ſun.

From the foregoing Propoſitions, Tables may be made for computing the place of a planet in its orbit.

Proposition III. *To find the Equation of Time, or the Difference between the true and apparent Time.*

All uniform motions are proportional to the times in which thoſe motions are performed: hence, if the times are given, the motions will be known, or if the motions are given, the times will be known, and conſequently the motions and times may be taken for the meaſures of one another; but ſince the motion of the earth (or apparent motion of the ſun) in its orbit, is not uniform, the apparent time will not be equable.

Likewiſe, as the ſun's apparent motion is not in the plane of the equator, but in an orbit inclined to it in an angle of 23° 28′, it will on that account alſo appear to move unequally therein, ſo that there are two cauſes that produce the inequality of natural days, to wit, the eliptical orbit of the earth, and its obliquity to the equator. To explain this, See Plate IV. *Figure* 23. Let ANP be the earth's orbit; S, the ſun, and let the area ASB be $=$ area PSD, then the areas ASB and PSD are deſcribed in equal times; and ſince AS is greater than PS, the arc PD is greater than AB. Conſequently the earth moves ſlower in the aphelion A, and quicker in the perihelion P, varying with an increaſed motion from A to P, ſo that at any place N, the angular motion is reciprocally as $\overline{SN}^2$

Now, ſuppoſe AB and PD to be deſcribed in times equal to that of the earth's rotation; then, when the earth has made an entire rotation about its axis, the meridian of any place will paſs through the ſame ſtar as it did at the beginning, when it was at A. But the earth in the ſame time having really (or the ſun apparently) moved through an arc of the ecliptic equal to AB, the ſame meridian does not paſs through the ſun, it being then parallel to AS; and therefore the earth muſt continue its revolution about its axis, through an angle equal to ASB, before it can overtake the ſun.

Again, the earth paſſing through PD in the time of its rotation, the meridian, being then parallel to PA, will not paſs through the ſun at S, but the earth muſt continue its rotation through the angle PSD, before the meridian overtakes the ſun.

Now the angle PSD, being greater than the angle ASB, and the earth's diurnal motion being uniform, the meridian will be longer in overtaking the ſun at P than at A, or, which is the ſame, the ſun will be longer in coming to the meridian at P than at A, and ſo the day (viz. including day and night) will be longer when the earth is in the perihelion than in the aphelion; and ſince the perihelion happens near the middle of winter, the natural days will be longer in winter than in ſummer.

Again, by the doctrine of centripetal forces, the mean motion round S will be equal to the true motion, when SN is equal to the ſquare root of the product of the ſemi-axis, and that happens in two points of the orbit.

Let AEPQ, (*Figure* 24) be the prime vertical; EQ, the equinoctial; EL, the ecliptic. Suppoſe the ſun, moving uniformly, to be at D, then the meridian, PDFA, being drawn through the point D, and the poles P and A, it is plain that when D is near C, the motion CD, along the ecliptic, is greater than that along the equinoctial CF, becauſe the hypothenuſe CD is greater than the baſe CF; but when D is near L, the motion along the equinoctial FQ is greater than that in the ecliptic DL; for the part DL, almoſt coinciding with a parallel circle, muſt be leſs than the correſponding part, FQ, of the great circle. Hence there is a point between C and L, where the motion along CL is equal to the motion in the equator, CQ, or, which is the ſame, where the motion of longitude is equal to the motion of right aſcenſion; but in all other points theſe two motions are unequal. After a quadrant of the ecliptic is deſcribed, they coincide at L and Q, and therefore they coincide at the equinoctial and ſolſtitial points.

Hence, the equation of time is effected by two cauſes, ſolely independent on each other. When they concur together, they increaſe this inequality; when they are of a contrary kind, they decreaſe it; and, in this caſe, when they are equal to each other, the inequality vaniſhes.

To find the equation of time anſwering to each ſeparate cauſe, proceed thus.

I. *For that depending on the Elliptical Orbit of the Earth.*

Find the true a anomaly from the mean, by a table computed for that purpoſe, according to Prop. II. the difference between the true and mean anomalies, converted into time, gives the equation of time; in which caſe obſerve, that from the aphelion to the perihelion, where they coincide, the mean place precedes the apparent place, but from the perihelion to the aphelion, the apparent place precedesthe mean; and conſequently, the equation of time will be additive or ſubtractive accordingly.

II. *For the Equation depending on the Obliquity of the Ecliptic.*

Let CD, in the aforeſaid figure, be the ſun's longitude; and let CI (in the equinoctial) be taken equal to CD. Then in the right-angled triangle, CDF, there are given the hypothenuſe CD, and the angle C, to find the right aſcenſion CF; then CF, taken from CD or CI, gives the difference FI, which converted into time, is the equation for the longitude CD: where note, that the mean place, I, precedes the apparent place, F, in the firſt and third quadrants of the ecliptic; but in the ſecond and fourth quadrants, the apparent place precedes the mean, and the equation of time reſulting from this cauſe, isadditive or ſubtractive accordingly.

The final, or total equation, as reſulting from both cauſes, is the ſum or difference of theſe equations, according as they are of like or different kinds, and is to be added or ſubtracted accordingly, as ſhall be denoted by the ſign of the greater of the two former equations.

PROPOSITION IV. *To find the Sun's Place and Diſtance at a given Time, by Aſtronomical Tables.*

Let $L =$ the ſun's mean place or longitude; $P =$ the place of the apogee; $A =$ the ſun's mean anomaly; $E =$ the equation belonging to the anomaly A, which is + or —; $G =$ the arc belonging to the equation of time, which is alſo + or —; and let $D =$ log. diſtance of the ſun, anſwering to the ſaid anomaly; then $L+E+C =$ ſun's true place, or $P+A+E+G =$ ſun's place, and the number anſwering to the log. D, is his diſtance.

PROPOSITION V. *To find the Place of a Planet at a given Time, by Aſtronomical Tables.*

Let $L =$ the planet's mean longitude or place; $F =$ the longitude of the aphelion; $L-F = A$, the mean anomaly; $E =$ the equation anſwering to A, which is + or —; $N =$ the place of the aſcending node; $L+E = H$, the heliocentric longitude; $H-N$, the argument of latitude; $R =$ the reduction belonging to $H-N$, which is + or —; then $L+E+R =$ the true heliocentric longitude.

Alſo, let $B =$ diſtance anſwering to A; $X =$ the heliocentric latitude; and $c =$ the curtation for $H-N$; then $B-C =$ curtate diſtance of the planet in the place of the ecliptic; and the difference of the longitudes of the earth and planet is the angle of commutation, or angle at the ſun; then in the triangle made by the ſun, earth, and planet, there are two ſides, and the included angle made at the ſun, given, to find the angle at the earth or angle of elongation, which added to or ſubtracted from the ſun's place, according as the planet's place or ſun's place is foremoſt, (which will appear by the conſtruction, if a figure is drawn) will give the Geocentric Place of the planet.

The Geocentric Latitude will be found by the following proportion:

As the ſine of the angle of commutation reduced to the ecliptic : ſine of the elongation : : tangent of the heliocentric latitude : tangent of the geocentric latitude.

PROPOSITION VI. *To find the Time when a Planet is ſtationary.*

If the orbits of the planets were exact circles, the time might be exactly found, but as they are elliptical, there is no direct method by which this buſineſs can be accurately performed; however, as their orbits do not widely differ from circles, we may approach near to the time, which may be corrected by repeated trials.

Mr. Emerſon has demonſtrated, that if AR, and CB, (Plate IV. *Figure* 25) be the orbits of two planets, both circular, and in the ſame plane; and S, the ſun in their common centre; and if the radius SA or SR be put $= r$, and the radius $SB = R$, then ſuppoſing one of them A, or B, to be the earth, and the other any planet, that ſuch planet will appear ſtationary to a ſpectator on the earth, when the coſine of the angle $ASB = \frac{\sqrt{Rr}}{R+r-\sqrt{Rr}}$, radius being 1. Wherefore, having the mean diſtances of the earth and planet, find, by the above Theorem, the angle at the ſun between the earth and planet, when it is ſtationary; and for the time when the planet is ſuppoſed to be ſtationary or nearly ſo, find the heliocentric places of the earth and planet, and you will have the angle between them, as it appears at the ſun; then if this angle be the ſame as the ſtationary angle found as above, the aſſumed time is the time required, nearly; but if not, find the number of days which the earth and planet have to move in their orbits, till they make that angle; which may be done thus: Let P be the periodic time of the planet, p that of the earth, and $x =$ number of days required. Then $P : 360° : : x : \frac{360x}{P}$, the arc run through by the planet; and as $p : 360° : : x : \frac{360x}{p}$, the arc run through by the earth; and the difference of theſe arcs or angles, muſt be put equal to the ſum or difference of the two former mentioned angles, as the caſe requires, which will give an equation from which x will be readily found, and ſo the time of their being ſtationary will be determined nearly; to correct which find the geocentric longitude of the planet for the day ſo determined, and alſo for the following day; if they happen to be the ſame, then the planet is ſtationary on one of theſe days; but if not, obſerve whether it is direct or retrograde. If it be direct, it is either ſhort of the firſt ſtation or paſt the ſecond. If it is retrograde, it is either paſt the firſt or ſhort of the ſecond ſtation. Wherefore you muſt accordingly take 3, 4, or more days, ſooner or later than this time as the caſe requires, and compute anew the geocentric longitude of the planet for that time and the day following; and if as before, theſe do not agree, a new time muſt be taken and their places computed again, till at laſt they are found to correſpond. Then, when you are within a day of the true time, compute the planets geocentric longitude for three ſucceſſive days; and ſo having the progreſs or regreſs of the planet for theſe times, the exact time of the planet's being ſtationary, may be found by the method of interpolation; for which ſee the word INTERPOLATION.

PROPOSITION VII. *Having given the Time of any one Tranſit of Mercury, or Venus, over the Sun's Diſk to find all the Times, wherein we may expect to ſee a Tranſit of the ſame Planet, when it is in the ſame Node.*

It is known from obſervation that the inferior planets, Mercury and Venus, ſometimes paſs over the ſun's diſk, and appear thereon as black ſpots. This phænomenon can only happen when the earth and planet are in or near the line of nodes, the planet being at the ſame time retrograde.

The ſun muſt be ſo near the node, as that his apparent ſemidiameter may exceed the geocentric latitude of the planet; for otherwiſe, it is evident the planet will not appear on his diſk.

Alſo, ſince the line of the nodes of each planet is nearly fixed in one place, the earth will be in the line of the nodes, always in or near the ſame point of his orbit; and hence, the planet being retrograde in the aſcending node, and the earth at that time in the line of nodes, the tranſits will conſtantly happen about the ſame time of the year; and the ſame for the deſcending node.

Now let $P =$ the periodic time of the earth; and p, the periodic time of the planet; then we have only to find two whole numbers as x and y, ſuch as that xP may be equal to yp, or that $\frac{p}{P}$ may be equal to $\frac{x}{y}$; that is, to find two whole numbers in the ſame ratio, or nearly ſo, as p and P.

For Mercury, thoſe numbers are $\frac{6}{25}$, $\frac{7}{29}$, $\frac{13}{54}$, $\frac{33}{137}$, $\frac{4}{191}$, &c. each ratio approaching nearer and nearer to the truth; the upper number (x) is the number of ſydereal years, in which a tranſit may be expected to return.

At the end of 6 years it rarely happens, but frequently at the end of 7. Alſo at the end of 13, 33, 46, or any additions made by them, a tranſit will probably happen. On November 12, 1782, there was a tranſit of Mercury, and at the diſtance of about 7 years, viz. on November 5, of the preſent year, there will be another. Alſo on May 4, 1786, there was a tranſit of Mercury, and at the diſtance of 13 years, viz. on May 7, 1799, there will be another, which are all that will happen in the preſent century.

For Venus, the numbers $\frac{x}{y}$ are $\frac{8}{13}$ $\frac{235}{382}$ $\frac{713}{1159}$ &c. therefore at the diſtance of 8 years, or 235 years, or 713 years, or their compounds, (though but ſeldom after 8 years) a tranſit of Venus will probably return. In 1639 on November 24, old ſtile, there was a tranſit of Venus, and at the diſtance of about 235 years, viz. on November 27 A. D. 1874, old ſtile there will be another, alſo on May 23, A. D. 1769 there was a tranſit of Venus, and on May 28, A. D. 1996, there will be another which are all that will happen before the expiration of the two following centuries.

PRO-

PROPOSITION VIII. *To find the exact Time of the Ingreſs and Egreſs of an inferior Planet, paſſing over the Sun's Diſk, and its neareſt Approach to the Sun's Centre.*

By the laſt propoſition find the time when the tranſit will nearly happen; and to that time find the place of the earth, and the planets heliocentric longitude: If theſe agree they are then in conjunction; but if not, the time of their conjunction muſt be found thus. Put P, p, for the periodic times of the earth and planet, reſpectively, then $\frac{360}{p} - \frac{360}{P} =$ the degrees which the planet gains of the ſun in a day, which put $= D$. Then ſay as $D^{\circ} : 1$ day : : difference between the earth's and planet's heliocentric places in degrees, to the time (in days) either to the conjunction, or paſt it, according as the earth or planet is foremoſt. But if that time ſhould prove to be not the time of the true heliocentric conjunction, the operation muſt be repeated till the true time is had, or the time may be found by the rule of falſe. Then having the heliocentric places of the earth and planet, the place of the node, and the diſtance between them, the daily or horary motions of both the ſun and planets, and the inclination of the orbit, which is the planet's path upon a fixed plane, the path of the planet on the moveable plane of the ſun's diſk may be eaſily found, as alſo its diſtance from the ſun's centre, when neareſt, and the time of the beginning and ending of the tranſit.

PROPOSITION IX. *To find the Quantity of Matter in any Body that has another revolving about it.*

Plate IV. *Figure* 25.

The quantity of matter in any central body, is as the cube of the diſtance of the revolving body directly; and the ſquare of the periodical time inverſly, by centripetal forces.

Let S be the ſun, E the earth, P a planet, T or Q a ſatellite, and let radius $PT = r$, periodical time of T or $Q = p$. Then the quantity of matter in the body P is as $\frac{r^3}{p^2}$, or $\frac{PT^3}{pp}$.

Now p or the periodic time is known for all the planets and ſatellites; and to find PT, let ST, EQ, be tangents to the orbit at T and Q; then PT is as $SP \times$ angle PST; or PQ, as $PE \times$ angle PEQ; becauſe theſe angles are very ſmall. Therefore $SP \times$ angle $PST = PE \times PEQ$. Now the greateſt elongation, or the angle PEQ is found by obſervation; and the heliocentric places of the planet P, and the earth E are known, by the theory of the planets. Therefore in the triangle ESP, two ſides ES, SP, and the included angle ESP are given to find EP. And EP being known, as alſo PS, the angle PST will be known; and from hence QT or TP. And therefore the quantity $\frac{PT^3}{pp}$ will be known which is proportional to the quantity of matter in P.

Therefore it will be, as rad. : PE : : S.QEP : PQ or PT.

Or elſe, PS : PE : : angle PEQ : angle PST the heliocentric elongation; and then as rad : PS : : S.PST : P T. Thus the diſtance of Venus from the Sun is known to be 723.4. And PT for Jupiter's 4th ſatellite, is found to be 12.508; for Saturn's 4th ſatellite 8.5084; for the Moon 3.0546. And p or the periodic time for Venus, is $224^d.7$; for Jupiter's 4th ſatellite, 16.687^d; for Saturn's 4th ſatellite, 15.944; and for the Moon, 27.322. Therefore $\frac{PT^3}{pp}$ for the Sun, Jupiter, Saturn, and the Earth, comes out 7497.8; 7.0255; 2.423; and .03817. Therefore the quantities of matter in the Sun, Jupiter, Saturn, and the Earth, are as 196420; 184.05; 63.48; and 1, reſpectively. This is ſuppoſing the ſun's parallax to be $10\frac{1}{2}$ ſeconds, and conſequently the angle, the radius of the moon's orbit, ſubtends at the ſun, 10′ 30″. If the ſun's parallax be more or leſs than $10'\frac{1}{2}$; the quantity of matter in the earth muſt be increaſed or diminiſhed in the triplicate of that ratio; the reſt remaining the ſame.

COR. I. The real diameters of the ſun and planets, are; for the Sun 10000, Saturn 790, Jupiter 996, Mars 57, the Earth 109, Venus 112, Mercury 40, the Moon 30.

COR. II. Hence the denſity of the ſun, and ſuch of the planets as have ſatellites, are; the Sun 100, Saturn $65\frac{1}{2}$, Jupiter 95, the Earth 393.

COR. III. The weight of a body at the ſurface of any planet, is as the denſity and diameter of the planet. And therefore is at the Sun 23.34, Saturn 1.208, Jupiter 2.209, and the Earth 1.

PROPOSITION X. *To find the Proportion between the Axis of the Sun or Planet, and its Equinoctial Diameter.*

Let $r =$ radius of the ſun or planet, $f =$ force of gravity on its ſurface, $v =$ verſed ſine of the arch deſcribed in 1 ſecond by its rotation, to the radius r. $H =$ equinoctial or greateſt radius. Then if the force of gravity f be denoted by the ſpace a heavy body deſcends in a ſecond at its ſurface, v will denote the centrifugal force ariſing from its revolving; and this is equal to the diminution of its gravity. But ſo much as the gravity of a column of the planet is diminiſhed, ſo much is its height increaſed, to make an equilibrium. And this is the ſame within the planet as at the ſurface; as both theſe forces decreaſe in the ſame ratio. Therefore we ſhall have $f : f - v : : H : r$. And $f : f - v : :$

$2H : 2r$; that is, $f : f - v : :$ as the equinoctial diameter : to the polar diameter nearly.

Therefore, if the diameter and time of revolution be known; the arc deſcribed in a ſecond will be known, and v the verſed ſine of that arc. Alſo f will be known, by having the gravitating force upon the ſurface. And hence, the ratio of the diameters will be found.

COR. In the earth, the ratio of the axis to the equatorial diameter, will be found as 285 to 286. And in Jupiter as 11′ to 12. In the ſun the difference is quite inſenſible. In the reſt of the planets, there wants the proper data.

With regard to the ſeveral irregularities and inequalities which take place in the *lunar theory*, they are ſo many, and affected with ſuch variations, that I chooſe rather to refer to thoſe authors who have made them their peculiar ſtudy, and have written particularly on the ſubject, than enter into the minutias of a matter ſo perplexed and intricate that there are ſcarce two writers who are perfectly of one opinion. The moſt diſtinguiſhed authors on this ſubject are Newton, Euler, De la Lande, Clairault and Mayer.

SECT. XIII.

OF COMETS.

Comets are ſo called from their having a long tail, ſomewhat reſembling the appearance of hair. Though this is not always the caſe; for ſome comets have appeared which were as well defined and as round as planets: but in general they have a luminous matter diffuſed around them, or projecting out from them, which to appearance very much reſembles the Aurora Borealis. When theſe appear, they come in a direct line towards the ſun, as if they were going to fall into his body; and after having diſappeared for ſome time in conſequence of their proximity to that luminary, they fly off again on the other ſide as faſt as they came, projecting a tail much greater and brighter in their receſs from him than when they advanced towards him; but, getting daily at a farther diſtance from us in the heavens, they continually loſe of their ſplendor, and at laſt totally diſappear. Their apparent magnitude is very different; ſometimes they appear only of the bigneſs of the fixed ſtars; at other times they will equal the diameter of Venus, and ſometimes even of the ſun or moon.

The true motion of comets was diſcovered from the obſervations made by Sir Iſaac Newton on the great comet of 1680. This deſcended almoſt perpendicularly towards the ſun, with a prodigious velocity; aſcending again with the ſame velocity retarded, as it had been before accelerated.

The many exact obſervations made on this comet enabled Sir Iſaac Newton to determine that they are a kind of planets which move in very eccentric ellipſis.

Dr. Halley collected all the obſervations he could on comets; and calculated the periodical times of 24 of them, on a ſuppoſition of their being parabolas; but afterwards found that they agreed better with the ſuppoſition of their motion being performed in very eccentritic elliptical orbits. On this he calculated a table of their elements; from which it was manifeſt that they were not comprehended in the zodiac, ſome of them making an angle of upwards of 80° with the ecliptic.

By computations founded on theſe elements, the Doctor concluded that the comet of 1682 was the ſame which had appeared in 1607 and 1531: that it had a period of 75 or 76 years; and he ventured to foretel, that it would return about the year 1758.

The comet which appeared in 1661, was ſuppoſed to be the ſame with that of 1532, and to have a period of 129 years; and, from the equality of periods, and ſimilitude of appearances, it was concluded that the great comet of 1680 was the ſame which had appeared in 1106, in the time of Henry I. and the conſulate of Lampadius and Oreſtes, about the year 531, and in the year 44 B. C. before Julius Cæſar was murdered; conſequently its period muſt be about 575 years.

Since the time of Dr. Halley, other aſtronomers have calculated the elements of 25 other comets; all of which, excepting one of three which appeared in 1759, and which differs but little from that of 1531, 1607, and 1682, and is therefore accounted the ſame, differ very much from each other; ſo that we cannot help concluding them all to be different, and that the number of theſe bodies is very great.

Though the orbits of all comets are either parabolas or very eccentric ellipſes, yet there are vaſt differences among them; for the planes of ſome comets are almoſt perpendicular to others, and ſome of their ellipſes are much wider than others. The narroweſt ellipſis of any comet hitherto obſerved was that of 1680. There is alſo a great inequality in the motion of comets, their velocity being incomparably greater in their perihelion than in their aphelion.

Aſtronomers are now generally agreed, that comets are opaque bodies, enlightened by the ſun; and of this opinion was Sir Iſaac Newton, for the confirmation of which, he obſerves, that if a comet be ſeen in two parts of its orbit, at equal diſtances from the earth, but at unequal diſtances from the ſun, it always ſhines brighteſt in that neareſt the ſun.

Their diſtance may be known from their parallax, according to which Sir Iſaac found the diſtance of the comet of 1577 to be about 210 ſemidiameters of the earth, its apparent diameter being ſeven minutes; whence alſo he concluded, that the true diameter of the comet was to that of the earth as 3 to 14.

Various conjectures have been formed reſpecting the tails of comets; though it is acknowledged by all, that they depend on the ſun ſomeway or other.

Sir Iſaac Newton was of opinion, that the tail of a comet is a very thin vapour which the head ſends out by reaſon of its heat: that it aſcends from the ſun juſt as ſmoke does from the earth: that as the aſcent of ſmoke is cauſed by the rarefaction of the air wherein it is entangled, cauſing ſuch air to aſcend and carry the ſmoke up with it, ſo the ſun's rays acting upon the comet or atmoſphere of the comet, do by rarefaction and refraction heat the ſame; that this heated atmoſphere heats, and by heating rarefies, the æther that is involved therein; and that the ſpecific gravity with which ſuch æther tends to the ſun, is ſo diminiſhed by its rarefaction, that it will now aſcend from him by its relative lightneſs, and carry with it the reflecting particles whereof the tail is compoſed.

The near approach of ſome comets to the ſun ſubjects them to intenſe and inconceivable degrees of heat. Newton calculated that the heat of the comet of 1680 muſt have been near 2000 times as great as that of red hot iron. The calculation is founded upon this principle, that the heat of the ſun falling upon any body at different diſtances is reciprocally as the ſquares of thoſe diſtances; but it may be obſerved, that the effect of the heat of the ſun upon all bodies near our earth depends very much on the conſtitution of thoſe bodies, and of the air that ſurrounds them.

Indeed, according to his calculation, the comet of 1680 muſt be for ever in a ſtate of violent ignition. He hath computed that a globe of red-hot iron of the ſame dimenſions with the earth, would ſcarce be cool in 50,000 years. If then the comet be ſuppoſed to cool 100 times faſter than red-hot iron, as its heat was 2000 times greater, it muſt require upwards of a million of years to cool it. In the ſhort period of 575 years, therefore its heat will be ſcarce diminiſhed; and, of conſequence, it muſt now be in a ſtate of ignition very little inferior to that of the ſun itſelf. Sir Iſaac Newton hath farther concluded, that this comet muſt be conſiderably retarded in every ſucceeding revolution by the atmoſphere of the ſun within which it enters; and thus muſt continually come nearer and nearer his body, till at laſt it falls into it. This, he thinks, may be one uſe of the comets, to furniſh fuel for the ſun, which otherwiſe would be in danger of waſting from the continual emiſſion of its light.

He adds, that for the conſervation of the water and moiſture of the planets, comets ſeem abſolutely requiſite; from whoſe condenſed vapours and exhalation all the moiſture which is ſpent in vegetation and putrefaction, and turned into dry earth, &c. may be reſupplied and recruited; for all vegetables grow and increaſe wholly from fluids; and again, as to their greateſt part, turn by putrefaction into earth; an earthy ſlime being perpetually precipitated to the bottom of putrefying liquors. Hence the quantity of dry earth muſt continually increaſe, and the moiſture of the globe decreaſe, and be quite evaporated, if it have not a continual ſupply from ſome part or other of the univerſe. "And I ſuſpect (adds our great author), that the ſpirit, which makes the fineſt, ſubtileſt, and beſt part of our air, and which is abſolutely requiſite for the life and being of all things, comes principally from the comets."

Mr. Whiſton, from Flamſtead's meaſure of its apparent diameter, concluded the nucleus of the comet to be about ten times as big as the moon, or equal to a fourth part of the earth, and attributed the univerſal deluge in the time of Noah to the near approach thereof. His opinion was, that the earth paſſing through the atmoſphere of the comet, attracted therefrom great part of the water of the flood; that the nearneſs of the comet raiſed a great tide in the ſubterraneous waters, ſo that the outer cruſt of the earth was changed from a ſpherical to an oval figure; that this could not be done without making fiſſures, and cracks in it, through which the waters forced themſelves by the hollow of the earth being changed into a leſs capacious form; that along with the water thus ſqueezed up on the ſurface of the earth, much ſlime or mud would riſe; which, together with the groſſer part of the comet's atmoſphere, would, after the ſubſiding of the water, partly into the fiſſures and partly into the lower parts of the earth to form the ſea, cover all over the antediluvian earth, to a conſiderable depth.

The ſame comet he thought would probably, when coming near the earth, and heated in an immenſe degree in its perihelion, be the inſtrumental cauſe of that great cataſtrophe, the general conflagration foretold in the ſacred writings.

The analogy between the periodical times of the planets and their diſtances from the ſun, diſcovered by Kepler, takes place alſo in the comets. In conſequence of this, the mean diſtance of a comet from the ſun may be found by compairing its period with the time of the earth's revolution round the ſun. Thus the period of the comet that appeared in 1531, 1607, 1682, and 1759, being about 76 years, its mean diſtance from the ſun may be found by this proportion: As 1, the ſquare of one year, the earth's periodical time, is to 5776 the ſquare of 76, the comet's periodical time; ſo is 1,000,000, the cube of 100 the earth's mean diſtance from the ſun, to 5,776,000,000, the cube of the comet's mean diſtance. The cube root of this laſt number is 1794, the mean diſtance itſelf in ſuch parts as the mean diſtance of the earth from the ſun contains 100. If the perihelion diſtance of this comet, 58, be taken from 3588 double the mean diſtance, we ſhall have the aphelion diſtance, 3530, of ſuch parts as the diſtance of the earth contains 100; which is a little more than 35 times the diſtance of the earth from the ſun. By a like method, the aphelion diſtance of the comet of 1680 comes out of 138 times the mean diſtance of the earth from the ſun, ſuppoſing its period to be 575 years; ſo that this comet, in its aphelion, goes more than 14 times the diſtance from the ſun that Saturn does.

A TABLE of the ELEMENTS of the principal COMETS which have hitherto been duly obſerved.

Comet of A. D.	Place of Aſcending Node.				Inclination of Orbit.			Place of Perihelion.				Perihelion diſtance from ⊙ the diſt. of ⊕, being 1.	Mean Time of the Perihelion.			Motion.
		°	′	″	°	′	″		°	′	″		d.	h.	m	
1264	♍	19	0	0	36	30	0	♑	21	0	0	445	July 6	8	0	Direct
1337	♊	24	21	0	32	11	0	♉	7	59	0	·40666	June 2	6	25	Retro.
1472	♑	11	46	20	5	20	0	♉	15	33	30	·54273	Feb. 28	22	23	Retro.
1531	♉	19	25	0	17	56	0	♒	1	39	0	567	Aug 24	21	18	Retro.
1532	♊	20	27	0	32	36	0	♋	21	7	0	·5091	Oct. 19	22	12	Direct
1533	♌	5	44	0	35	49	0	♌	27	16	0	.2028	June 16	19	30	Retro.
1556	♍	25	42	0	32	6	30	♑	8	50	0	.4639	Apr 21	20	3	Direct
1577	♈	25	52	0	74	32	45	♌	9	22	0	·18342	Oct. 26	18	45	Retro.
1580	♈	18	57	20	64	40	0	♋	19	5	50	·59628	Nov. 28	15	0	Direct
1585	♉	7	42	30	6	4	0	♈	8	51	0	1·09358	Sep. 27	19	20	Direct
1590	♍	15	30	40	29	40	40	♏	6	54	30	·57661	Jan. 29	3	45	Retro.
1593	♍	14	14	15	87	58	0	♍	26	19	0	·08911	July 8	13	39	Direct
1596	♒	12	12	30	55	12	0	♏	18	16	0	·51293	July 31	19	55	Retro.
1607	♉	20	21	0	17	2	0	♒	2	16	0	·5868	Oct. 16	3	50	Retro.
1618	♊	16	1	0	37	34	0	♈	2	14	0	·37975	Oct. 29	12	23	Direct
1652	♊	28	10	0	79	28	0	♈	28	18	40	·8475	Nov. 2	15	40	Direct
1661	♊	22	30	30	32	35	50	♋	25	58	40	·44851	Jan. 16	23	41	Direct
1664	♊	21	14	0	21	18	30	♌	10	41	25	1·02579	Nov. 24	11	52	Retro.
1665	♏	18	2	0	76	5	0	♊	11	54	30	·10649	Apr 14	5	15	Retro.
1672	♑	27	30	30	83	22	10	♉	16	59	30	·69739	Feb. 20	8	37	Direct
1677	♏	26	49	10	79	3	15	♌	17	37	5	·28059	Apr 26	0	37	Retro.
1678	♍	11	40	0	3	4	20	♒	27	46	0	1·23802	Aug 16	14	3	Direct
1680	♑	2	2	0	60	56	0	♐	22	39	30	.00612	Dec. 8	0	6	Direct
1682	♉	21	16	30	17	56	0	♒	2	52	45	·58328	Sept. 4	7	39	Retro.
1683	♍	23	23	0	83	11	0	♊	25	29	30	·5602	July 3	2	50	Retro.
1684	♐	28	15	0	65	48	40	♏	28	52	0	.96015	May 29	10	16	Direct
1686	♓	20	34	40	31	21	40	♊	17	0	30	·325	Sept. 6	14	33	Direct
1698	♐	27	44	15	11	46	0	♑	0	51	15	.69129	Oct. 8	16	57	Direct
1699	♌	21	45	35	69	20	0	♏	2	31	6	·744	Jan. 3	8	23	Retro.
1702	♎	9	25	15	4	30	0	♌	18	41	3	.6459	Mar. 2	14	12	Direct
1706	♈	13	11	40	55	14	10	♊	12	29	10	.42581	Jan. 19	4	23	Direct
1707	♉	22	46	35	88	36	0	♊	19	54	56	.85974	Nov 30	23	30	Direct
1718	♌	8	43	0	30	20	0	♌	1	30	0	1.02654	Jan. 3	23	39	Retro.
1723	♈	14	16	0	49	59	0	♉	12	52	20	.99865	Sept 16	16	19	Retro.
1729	♒	10	32	37	76	58	4	♒	22	40	0	4.2614	June 14	10	57	Direct
1737	♏	16	22	0	18	20	45	♒	25	55	0	·22282	Jan. 19	8	21	Direct
1739	♈	27	25	14	55	42	44	♋	12	38	40	.67358	June 6	10	0	Retro.
1742	♎	5	38	29	66	59	14	♏	7	35	13	.76568	Jan. 28	4	39	Retro.
1742	♊	18	21	15	2	19	33	♋	2	41	45	83501	Dec. 30	20	26	Direct
1744	♉	15	46	11	47	5	18	♎	17	10	0	·22249	Feb. 19	8	4	Direct
1747	♒	27	18	50	79	6	20	♑	7	2	0	2.1985	Feb. 20	7	11	Retro.
1748	♏	22	52	15	85	27	0	♏	5	0	50	.84067	Apr. 17	19	26	Retro.
1748	♉	4	39	43	56	59	3	♋	6	9	24	.65526	June 7	1	24	Direct
1757	♏	4	12	50	12	50	20	♌	2	58	0	·33754	Oct. 21	7	55	Direct
1759	♉	23	45	35	17	40	15	♒	3	8	10	5849	Mar 12	13	50	Retro.
1759	♌	19	39	24	78	59	22	♉	23	24	20	·79851	Nov 27	2	19	Direct
1759	♊	18	56	19	4	37	23	♌	19	2	48	.96193	Dec. 16	12	41	Retro.
1762	♓	19	23	0	84	45	0	♋	15	14	0	1.0124	May 28	15	18	Direct

As the orbits of all comets are either parabolas or ellipſes (though probably they are all ellipſes); and as their elliptical orbits are ſo very eccentric, that they approach exceedingly near to parabolas, aſtronomers, for the eaſe of computation, generally make their calculations on comets, as if their orbits were actually parabolas.

On this ſuppoſition, Mr. Emerſon, in his Aſtronomy, has demonſtrated that the times in which different comets move through ſimilar parts of their orbits, are as the ſquare roots of the cubes of their perihelion diſtances; that if a comet's perihelion diſtance be equal to the mean diſtance between the ſun and earth, it will deſcribe a quadrant of its orbit in 109 days, 14 hours, 46 minutes, and 12 ſeconds; and that if p be put = the perihelion diſtance of any comet, the time of its moving from its perihelion to the 90° of its orbit, will be $109.615p\sqrt{p}$ days.

Mr. Emerſon has alſo ſhewn, that if PNO (Plate IV. *Figure* 26) be the orbit of a comet, S, the ſun, P the perihelion, N the place of the comet. And if the perihelion diſtance SP be put $=p$, comet's diſtance SN $=y$, coſine of true anomaly PSN $=z$, and $v =$ verſed ſine of the ſupplement thereof. Alſo if 109.615 days, the time of a comet's deſcribing a quadrant whoſe perihelion diſtance is 1, = mean diſtance of the earth be put $=t$; and D = time of the perihelion; then will the diſtance $y = \frac{2p}{1+z} = \frac{2p}{v}$; the time from the perihelion, D, $= \frac{\overline{2p+y} \times t}{4} \sqrt{y+p}$; and the area PSN $= \frac{2p+y}{3} \times \sqrt{py-pp}$. Alſo if c be the coſine of half the true anomally, then the comets diſtance $y=\frac{p}{cc}$, radius being 1.

Note, the comet's orbit and the time of the perihelion are here ſuppoſed to be known.

Hence a table may be made for finding when a comet will be in any given part of its orbit, or, on the contrary, for finding in what point of its orbit it will be in at any given time.

N. B. In Section VII. I have ſhewn how to determine the orbit of a planet, but there is no ſuch direct method for finding the orbit of a comet; and therefore Aſtronomers uſually feign an orbit at pleaſure, and examine how it agrees with the motions of the comet, as determined by obſervation; and if they find it differ therefrom, they aſſume another orbit, and ſo on by trial, till at laſt they meet with one that will give the comet's place, &c. at any propoſed time, according to obſervations; and thence they conclude that ſuch orbit is the true one.

M. de la Caille has ſhewn, that if t be put for the tangent of half any true anomally of a comet, moving in a parabolic orbit; a, for the time it is in going from the perihelion to 90°, and b, for the time in paſſing from the perihelion to any aſſigned point in its orbit; alſo the diſtance of the comet from the ſun in its perihelion being ſuppoſed 1, and the times a and b, being given, that the tangent of half the true anomally will be found by extracting the root of the following cubic equation, viz. $t^3+3t=\frac{4b}{a}$; and therefore by ART. XXV. of our New Syſtem of ALGEBRA, t will be found $=\overline{\frac{2b}{a}+\sqrt{\frac{4b^2}{a^2}+1}}\Big|^{\frac{1}{3}}-\frac{9}{\overline{\frac{2b}{a}+\sqrt{\frac{4b^2}{a^2}+1}}\Big|^{\frac{1}{3}}}$.

The degrees, &c. anſwering to the tangent t, being doubled, will give the true anomally; and when the comet is direct, that being added to or ſubtracted from the place of the comet in its perihelion, according as the comet is paſt or ſhort of the perihelion, will give its true heliocentric place in its orbit; or, if it is retrograde, the ſame muſt be ſubtracted from or added to the perihelion place, according as the comet's place precedes or ſucceeds the place of the perihelion.

In order to calculate the place of a comet at any time propoſed, as ſeen from the earth, obſerve the following directions.

1ſt. Having the perihelion diſtance of the comet, find the time in which it will go through 90° of its orbit, and from thence the true anomally, or angle from the perihelion, anſwering to the given time; then adding, or ſubtracting the ſame (as the caſe ſhall require) from the place of the perihelion, its true heliocentric place in its orbit will be had.

2d. Subtract the place of aſcending node from the comet's true heliocentric place, and the remainder will be the argument of the comet's latitude; then ſay, as radius is to the coſine of the inclination of the comet's orbit, ſo is the tangent of the argument of latitude to the tangent of the comet's diſtance from the aſcending node meaſured in the ecliptic, which added to the true place of the comet's node, the ſum will be the comet's true heliocentric place reduced to the ecliptic; and as radius : ſine of argument of latitude :: ſine inclination of the comet's orbit : ſine of its latitude ſeen from the ſun.

3d. Calculate the ſun's diſtance from the earth and his true place from Aſtronomical Tables: from this ſubtract 6 ſigns, and the remainder will be the place of the earth, as ſeen from the ſun; then the difference between the comet's true heliocentric longitude in the ecliptic, and the longitude of the earth, will give the angle at the ſun between the earth and comet.

4th. Add the logarithm of the comet's perihelion diſtance to twice the logarithm of radius (or 20.0000000) and from the ſum ſubtract twice the coſine of half the comet's true anomally, and the remainder will be the logarithm of its true diſtance from the ſun.

5th. Say as radius : coſine of the comet's latitude ſeen from the ſun :: comet's real diſtance from the ſun, to its abridged diſtance, or diſtance meaſured upon the plane of the ecliptic.

6th. Then as the ſum of the comet's abridged diſtance, and of the earth's real diſtance from the ſun, is to their difference, ſo is the tangent of the complement of half the angle at the ſun (found by ART. III.) to the tangent of an arc, which added to this complement, if the comet's abridged diſtance exceed the earth's real diſtance from the ſun, or ſubtracted, if the comet's diſtance is leſs than the earth's, will give the angle at the earth, comprehended between the ſun's place and the comet's geocentric place, and from thence may be deduced the comet's geocentric place; for the ſun's place + or — this angle, according as the comet is before or behind the ſun in the ecliptic, will give the comet's *true geocentric longitude*.

7th. As the ſine of the angle at the ſun (found by ART. III.) is to the ſine of the angle at the earth (found by ART. VI.) ſo is the tangent of the comet's latitude as ſeen from the ſun, to the tangent of its latitude as ſeen from the earth, or *geocentric latitude*.

SECT. XIV.

THE CAUSE OF ECLIPSES OF THE SUN AND MOON, WITH METHODS OF DETERMINING WHEN THEY HAPPEN, AND RULES FOR CALCULATING THE TIME OF THE MOON's SOUTHING, RISING AND SETTING, &c.

THE earth and moon being opake bodies, and deriving their light from the ſun, do each of them caſt forth a ſhadow as it were behind them, or towards the oppoſite or contrary hemiſphere, to that in which the ſun appears.

And as light is propagated in right lines, and the earth and moon are nearly ſpherical, ſuch ſhadow will terminate in a point and occupy a conical ſpace. Now when either the moon or earth paſſes through the ſhadow of the other, it is thereby deprived of illumination from the ſun, and by degrees becomes inviſible to a ſpectator on the body from whence the ſhadow iſſues; and ſuch ſpectator will obſerve an eclipſe of that body which is paſſing through the ſhadow. Alſo a ſpectator on the earth or moon, when paſſing through the ſhadow of the other, will obſerve an eclipſe of the ſun, by reaſon of its being deprived of the ſun's light; ſo that in reality the eclipſe, in this caſe, is not an eclipſe of the ſun, but of the body itſelf.

To explain this more clearly, let AB (Plate IV. *Figure* 27.) be a luminous body, as the ſun, CD an opake ſpherical body expoſed to its light; and let AC and BD be drawn, interſecting each other in P, ſo will the cone CDP repreſent the ſhadow of CD. Now within this ſhadow, no light can come from the luminous body AB. Alſo let there be drawn BCE and ADF; then the ſpace ECPDF will be the penumbra, ariſing from the ſhadow of CD; into which ſpace ſome light comes from part of the body AB; thoſe parts of it which are neareſt the ſhadow being leſs illuminated than thoſe which are more remote, by reaſon that ſuch parts receive a leſs portion of rays from the illuminating body.

If any opake body, as G, be near the ſhadow CDP, then if part of it enters the ſhadow, ſuch part will be totally dark; and that part which remains in the penumbra, will have ſome faint light; thoſe places, however, which are the fartheſt from DP, having the moſt light. Conſequently the body G will then be eclipſed, either partially or totally.

If the centre of the body G paſs through the axis of the cone CDP, it will be centrally eclipſed; and if its diameter be leſs than the diameter of the conical ſhadow in that place, it will be totally eclipſed. Therefore, if AB be the ſun, CD the earth, moving in its orbit, and G the moon revolving about the earth; then, as the moon G advances towards an oppoſition of the ſun, or a full moon, it will come nearer to the ſhadow of the earth CDP; and if the moon is ſo near her nodes as to paſs through the ſhadow, ſhe will be eclipſed. If the moon's orbit was in the plane of the ecliptic, or earth's orbit, ſhe would be centrally eclipſed every full moon. Alſo when the moon by revolving in her orbit comes to the oppoſite ſide at H, where it is new moon, ſhe being then between the ſun AB and earth CD, will, in like manner, caſt a ſhadow upon the earth, and thereby cauſe an eclipſe of the earth, or an apparent eclipſe of the ſun. But the diameter of the moon being conſiderably leſs than the earth's diameter, and conſequently much more ſo is that of her ſhadow, at the diſtance of the earth, ſhe can never totally eclipſe the earth; ſo that in every eclipſe of the ſun (or earth) there will be many parts of the globe that will ſuffer no eclipſe at all, even though the ſun may be above the horizon. A ſpectator on any part where the ſhadow comes will be ſenſible of an eclipſe, if the ſun be then above the horizon of that place; alſo, as I have obſerved in regard to the moon, ſo here in reſpect of the earth, if the moon and earth were in one plane, there would be a central eclipſe of the ſun or earth at every conjunction of the ſun and moon, (or new moon); but that being not the caſe, an eclipſe of the ſun or moon can only happen when the moon at her conjunction or oppoſition is in or near to either of her nodes, or points where the plane of her orbit interſects the orbit of the earth.

As the earth is conſiderably greater than the moon, and even at the diſtance of the moon the diameter of its ſhadow is equal to thrice the moon's diameter; therefore, it frequently happens, that the moon becomes totally eclipſed, and continues to be ſo for ſome time.

Every eclipſe of the moon begins on the eaſtern and goes off on her weſtern ſide; for the moon's motion being ſwifter than the earth's, ſhe overtakes the ſhadow, and with her eaſtern limb enters into it on the weſt ſide, as ſhe proceeds eaſtward; but eclipſes of the ſun begin on the weſtern ſide, for the moon being then in the oppoſite part of her orbit, and overtaking the earth, the earth enters into her ſhadow on the weſtern ſide.

If the atmoſphere be ſerene, every eclipſe of the moon is viſible at the ſame inſtant, to all the inhabitants of that ſide of the globe to which ſhe is oppoſite; for as part of the moon's body at leaſt will enter the ſhadow, it muſt be, that every ſpectator to whom ſhe is viſible, will be ſenſible of the darkneſs which comes on that part; but with regard to eclipſes of the ſun, they do not happen to all places at the ſame inſtant; for the moon's ſhadow paſſing over the earth eclipſes different parts of it progreſſively, ſo that when it is ending at one place it is beginning at another; and in ſome places there is no eclipſe at all; and this even ſuppoſing the ſun to be viſible at each place all the while.

If, when the moon is in conjunction and near the node, her conical ſhadow does not reach the earth, but terminates at a leſs diſtance, then, ſince nothing but the penumbra falls upon the earth, there will be no total darkneſs on any part thereof; but to a ſpectator, ſituate at or near the point where the axis of the cone (produced) cuts the earth, the moon will appear with a bright ring ſurrounſting her, which ring is the edge of the ſun appearing all around the circle of the moon; the moon's apparent diameter being then leſs than the ſun's. This is called an annular eclipſe.

The duſky red light with which the moon ſometimes appears when eclipſed, is owing to the refraction of the rays of light paſſing through the earth's atmoſphere, and falling upon the moon.

No eclipſe of the moon can happen, but when the diſtance of the centres of the moon and of the earth's penumbra is leſs than the ſum of their ſemidiameters; for, if the diſtance be greater, the moon and penumbra cannot touch each other. Therefore, in lunar eclipſes, the moon's latitude muſt be leſs than the ſum of the ſemidiameters of the moon and penumbral ſhadow of the earth taken at the moon's orbit.

Alſo no eclipſe of the ſun (with reſpect to a particular place) can happen, unleſs the diſtance of the centres of the ſun and moon be leſs than the ſum of their ſemidiameters; but that there ſhall be none in any place, it is only neceſſary that the ſaid diſtance be leſs than the above ſum added to the moon's parallax.

Hence, in eclipſes of the ſun (taken generally) the moon's latitude muſt be leſs than the ſum of the ſemidiameters of the ſun and moon, and the moon's horizontal parallax; but that it may be viſible in a certain place, the parallax muſt be excluded.

The Requiſites belonging to an Eclipſe of the Moon.

I. In an eclipſe of the moon, half the angle of the cone of the earth's ſhadow, viz. $\frac{1}{2}\angle CPD = \angle CPO$ is equal to the ſun's apparent ſemidiameter, leſs his horizontal parallax.

II. Half the angle of the earth's penumbral cone, or $\frac{1}{2}\angle CHD = \angle CHO$, is equal to the ſum of the ſun's apparent ſemidiameter, and his horizontal parallax; and conſequently the ſaid half angle is equal to half the angle of the dark cone (or $\frac{1}{2}\angle CPD$, or CPO) added to the ſun's horizontal parallax.

III. The apparent ſemidiameter of the earth's dark ſhadow at the moon's orbit, is equal to the ſum of the horizontal parallaxes of the ſun and moon, leſs the ſun's apparent ſemidiameter.

IV. The apparent ſemidiameter of the earth's penumbra at the moon's orbit, is equal to the ſum of the horizontal parallaxes of the ſun and moon, together with the ſun's apparent ſemidiameter.

V. To find the length of the ſhadow OP, there are given in the triangle COP, the $\angle P =$ ſun's apparent ſemidiameter, leſs his parallax, and CO the earth's radius, to find $P\odot$.

PROPOSITION I. *To find the ∠ that the Moon's Way makes with the Ecliptic.* (Plate IV. *Figure* 28.)

Here the inclination of the moon's orbit are ſuppoſed to be known, and the horary motions of the ſun and moon.

Let NS be the ecliptic; NM, the moon's orbit; and let S be the ſun in the ſun's eclipſe, or the centre of the earth's ſhadow in an eclipſe of the moon; and M the moon at the time of the ſyziges. Take NA to NS as the ſun's horary motion to the moon's at that time, and draw MA, the moon's apparent orbit; ſo will the angle MAS be the angle required.

For by the conſtruction, in the time that the moon is in moving from N to M (that is through NS reckoned in the ecliptic) the ſun moves through a ſpace DS equal to NA. Therefore the ſun is in D, when the moon is in the node at N. Let there be drawn DB parallel to SM, and MB parallel to SD; and join BN, which will be parallel to MA. Now ſince the moon makes the ſame latitude DB or SM in the ſame time whether the ſun moves or ſtands ſtill; and ſince SM is her latitude when the ſun is at S, DB (=SM) will be her latitude, ſuppoſing the ſun ſtationary at D without any motion towards S, and conſequently NB will be her apparent way to an eye at D, through which ſhe ſeems to move in the ſame time; or which is the ſame, AM will be her apparent way to an eye fixed at S; for the triangles AMS and NBD are equal, and ∠ MAS is the angle of her way with the ecliptic. By the theory of relative motions in bodies moving the ſame way, all the apparent motions are the ſame, as if one body ſtood ſtill, and the other moved forward with a motion equal to the difference of their motions: and here ND or AS is the difference of their motions ſuppoſing S to be fixed. Hence the following proportions: as the moon's horary motion : ſun's horary motion :: SN, the diſtance from the node, to AN. Then SA=SN—AN.

And as ſine of SA : radius :: tangent of moon's latitude : tangent of ∠ A or the angle of the moon's way.

N. B. It is the apparent orbit AM that muſt be uſed in calculating the ſeveral particulars of an eclipſe, becauſe an obſerver conſiders not S as moving, and therefore only the relative motions are concerned.

PROPOSITION. II. *To calculate an Eclipſe of the Moon.* (Plate IV. *Figure* 29.)

I. Find the true time of the oppoſition, or full moon, when an eclipſe it to happen, by aſtronomical tables, the precepts for which are generally given along with the tables; and let that time be reduced to apparent time, by increaſing or diminiſhing the ſame, by the equation of time, as occaſion requires.

II. From aſtronomical tables calculate the true places of the ſun and moon when in oppoſition, as alſo the ſun's mean anomally, and the place of his apogee, together with the place of the moon's aſcending node, the place of her apogee, and her latitude.

III. Let NS be a part of the ecliptic, NM the moon's orbit; S, the centre of the earth's ſhadow, and M, the moon when in oppoſition. Take NA to NS as the ſun's horary motion to the moon's, and draw AM for the way of the moon from the ſun. Then in the right angled ſpherical triangle ASM, there are given AS (=NS—NA) and SM, the moon's latitude, to find the angle SMA.

IV. Let fall SP perpendicular to AM. Now ſince the arches SM, MP, and SP, are very ſmall, they may be taken for right lines, and the triangle SMP for a plane triangle without any ſenſible error. Then having SM and angle SMP, MP and SP may be found; P, being the place of the moon in the middle of the eclipſe. Likewiſe the time of the moon's moving through MP will be known by the horary motion, and from thence the time when ſhe is at P, or the middle of the eclipſe.

V. From aſtronomical tables find the ſun and moon's apparent ſemidiameters, for the time of oppoſition, and their horizontal parallaxes.

VI. From any convenient ſcale of equal parts with the centre P and radius PB, (equal to the minutes contained in the moon's radius) deſcribe the circle BC*o*, for the moon: and with the radius SD, (equal to the ſum of the ſun and moon's horizontal parallaxes, leſs the ſun's ſemidiameter in minutes) deſcribe the circle DEB, from the centre S, then this circle will repreſent the earth's dark ſhadow. Likewiſe from the ſame centre S, and with the radius SF (equal to the ſum of the ſun and moon's parallaxes added to the ſun's ſemidiameter in minutes) deſcribe the circle FQG, and it will repreſent the earth's penumbra. Then the ſeveral requiſites may be found nearly by ſcale and compaſſes: or by calculation; thus: To find when the moon firſt touches the penumbra at L, there are given in the right angled triangle SPK, SP, and SK, (the ſum of the radii SL and PB) to find PK; which being known the time of the moon's paſſing through it will be known, by her horary motion from the ſun.

And to find when the moon firſt enters the dark ſhadow at D, there are given SP, and SI (the ſum of the radii SD and PB) of the right angled triangle SPI, to find PI, and conſequently the time of half the duration in the ſhadow. Alſo to find the digits or 12th parts of the moon eclipſed, $Pn + Po - SP = no$, the part eclipſed, and $\frac{6\,no}{Po} =$ the number of digits eclipſed.

But in total eclipſes of the Moon, the earth's ſhadow is often much wider than the moon, and then more than 12 digits are ſaid to be eclipſed, and that, in proportion to ſuch exceſs.

Now the times of paſſing through PI, PK, &c. being known, as alſo the time of the middle of the eclipſe, at P, the beginning and ending thereof will be conſequently known.

PROPOSITION III. *To find the Way of the Moon from the Sun, in a Solar Eclipſe, ſuppoſing the Obſerver at reſt.*

Let HZO, (Plate IV. *Figure* 30) be the meridian of the place, HO, the horizon; EC, the equinoctial; EL, the ecliptic; Z, the zenith; P, the pole; S and M the places of the ſun and moon in conjunction; and PSD, the ſun's meridian.

Then having found the ſun's diſtance from the node NS, and the moon's latitude SM, &c. take NA to NS as the ſun's horary motion to the moon's horary motion; and thence SA will be known; and having drawn MA, there will be given SA and SM of the ſpheric triangle ASM, right angled at S, to find ∠ SMA; AM, being the moon's way from the ſun.

But becauſe the eye of the obſerver is in motion, through the earth's rotation, which gives an apparent motion to the moon, contrary to that of the obſerver, the quantity and direction of that motion muſt be found.

Now ſince the obſerver is carried eaſtward towards the point C, the apparent motion of the moon will be in the line CS; and to determine the poſition of CS in reſpect of AM, there are given ES and ∠E of the right angled triangle EDS to find DS and ∠ESD or ASP. And in the triangle ZPS there are given PS or complement of DS, the angle ZPS, (from the hour of the day) and ZP, the complement of the latitude, to find ZS, and angles PZS and ZSP. Then ∠ZSP, and ∠ASP, being known, ∠ZSA will be known; and MSA being a right angle, ZSM will be known. Alſo in the right angled triangle CFS, there are given CF, the meaſure of the angle FZC or difference between the angle PZS and the right angle CZP, and SF, the complement of ZS, to find CS and ∠CSF or BSZ; then ∠BSZ and ∠ZSM being known, ∠BSM will be known; and ∠SMA being known, the ſupplement thereof, SMB, is conſequently known, and hence alſo ∠ SBM.

To find the quantity of the motion. That along at M is already known; and with regard to the apparent motion along SB; the ſine of 15° (the horary motion of a point in the equinoctial) is .259 to the radius 1. And if b be the moon's horizontal parallax, then the radius of the earth appears at the moon under the angle b, and therefore 15° of the equinoctial appears under the angle of $.259\,b =$ the horary motion of a point in the equinoctial viewed directly from the moon = the moon's apparent motion ſeen from that point in the equinoctial; but this motion muſt be diminiſhed on two accounts; 1. becauſe it is leſs in a parallel circle in proportion to the coſine of the latitude, and 2dly on account of the obliquity of the motion when not perpendicular to the rays of the ſun, and this will be as the ſine of CS, the ſun's diſtance from the eaſt or weſt points of the horizon. Therefore to find the quantity of this motion, to the log of $.259b$, add the coſine of the latitude, and the ſine of CS. and the ſum abating twice radius is the log of this apparent motion. Then this motion muſt be compounded with the motion along AMB, thus:

Let AS (Plate IV. *Figure* 31) be a portion of the ecliptic, SB the way of the apparent motion, MA the moon's way from the ſun. Draw NM parallel to SB, and let MN be the horary motion along SB or MN, and MI the horary motion of the moon from the ſun. Complete the parallelogram NMIQ, and draw the diagonal MQR, which is the direction of the motion compounded of the obſerver's and the moon's motions, and MQ is the total apparent motion, ſuppoſing the obſerver at reſt.

Then in the plain triangle QMI, there are given MI and IQ, (or MN) and $\angle MIQ = MBS$, to find $\angle QMI$, and ſide QM, or the abſolute horary motion. Then the angles QMI and IMS, being known, $\angle QMS$ is alſo known.

It muſt be obſerved, that if the ſun be in the Eaſtern hemiſphere, in which caſe the concave ſide of the Eaſtern hemiſphere is here projected in (Plate IV. *Figure* 30) then the moon's motion from the ſun is from M towards A, and the other apparent motion is from S towards B, or from M towards N. But if the ſun is in the weſtern hemiſphere, this projection repreſents the convex ſide of the ſphere, and then the moon moves from the ſun in the direction AM, and the other apparent motion is from S towards C, being contrary.

PROPOSITION IV. *To calculate an Eclipſe of the Sun for a particular Place given.*

I. By aſtronomical tables find the true time of the conjunction or new moon, and the places of the ſun and moon at that time, with all the other requiſites, adapted to the particular place.

II. Having found the way of the moon from the ſun, as directed in the laſt Propoſition, find, by the aſtronomical tables, the moon's horizontal parallax, her apparent diameter, and horary motion, as alſo the ſun's apparent diameter, and his horary motion.

To avoid trouble, if the ſphere be projected on a large ſcale, it will give the requiſites with tolerable exactneſs, without calculation, by meaſuring the ſeveral angles and ſides; and here it is beſt to project the concave ſide, for then every thing appears as it is in nature.

III. Find the moon's parallax of altitude, by making as rad. : coſ. altitude : : moon's horizontal parallax : her parallax of altitude Vt or Mm. Alſo find her parallax of latitude Mn, and longitude Ss or mn, by PROB. XVII. SECT. VII, and from thence her apparent latitude and longitude will be known.

IV. Draw the line ASL for the ecliptic, and from a large ſcale of minutes erect SM perpendicular to AS, and equal to the apparent latitude; make the angle SMR, as found in the laſt Propoſition; and draw NMR, for the moon's apparent path. From S let fall SP, perpendicular to MR, and SP will be the leaſt diſtance of the centres of the ſun and moon, or the middle of the eclipſe. From the centre S with the radius equal to the minutes contained in the ſun's ſemidiameter, deſcribe the circle ABC for the ſun; and from the centre P, with the radius equal to the moon's ſemidiameter, deſcribe the circle AOCD for the moon. If theſe circles do not intereſt, there will be no eclipſe: but if they interſect, an eclipſe muſt neceſſarily happen.

V. P is the place of the moon, in the middle of the eclipſe. Make SI and SK = ſum of the ſemidiameters of the ſun and moon, and the moon's centre will be at I in the beginning of the eclipſe, and at K in the ending of it. Now, in the triangle PSI, there are given SI and SP to find PI=PK, which reduced to time, by help of the moon's apparent horary motion, gives half the duration of the eclipſe, and conſequently the beginning and end will be known.

VI. To find the quantity no, or the digits eclipſed, we have $no = Sn + Po - SP$, and $\frac{6no}{Po} =$ the number of digits.

N. B. The time found being mean time, muſt be reduced to the apparent time, by the equation of time. And if the given place be not that for which the tables are made, a proper allowance muſt be made for the difference of meridians.

PROPOSITION V. *To calculate the Time of the Moon's Southing.*

RULE. Subtract the ſun's right aſcenſion in time from the moon's right aſcenſion in time at noon on the day preceding the time when the moon's ſouthing is required, and the remainder will be the time preceding noon, of the moon's diſtance from the meridian, when the ſun at noon is upon it. Find the increaſe of the moon's right aſcenſion above the ſun's, in the ſpace of 24 hours. Then ſay as 24 hours is to the increaſe of the moon's right aſcenſion in time, ſo is the diſtance of the moon's from the ſun's right aſcenſion in time on the noon of the preceding day, to the proportional increaſe of the moon's right aſcenſion above that of the ſun's in time, to be added to the moon's diſtance from the meridian at noon, for the true time of the moon's ſouthing.

N. B. When the ſun's right aſcenſion is greater than the moon's, 24 hours muſt be added to the latter, that ſubtraction may be made of the firſt.

PROPOSITION VI. *To find the Time of the Moon's riſing and ſetting.*

I. For the eſtimate time. RULE. Subtract the right aſcenſion of the ſun from the oblique aſcenſion of the moon, in time, to which add or ſubtract 6 hours, according as the remainder is leſs or greater than 6 hours. From new to full moon, it is the ſetting that is to be found, but from full to new moon, the riſing muſt be found.

For the true time. Take the ſun's oblique aſcenſion in time, (according to the given latitude) at the eſtimate time of the moon's riſing, from the moon's oblique aſcenſion at the ſame time; and add the time of ſun-riſe to the remainder, for the near time of the moon's riſing that day. And to correct the time ſtill nearer, repeat the operation by computing the oblique aſcenſions for the time laſt found.

In like manner, the time of the moon's ſetting is found by taking the oblique aſcenſion of the ſun from the oblique aſcenſion of the moon, at the eſtimate time of ſetting; and by adding the time of the ſun's ſetting on that day, to the remainder, which may be corrected as the former.

SECT. XV.

DR. HERSCHEL's DESCRIPTION OF THE UNIVERSE.

IT was the opinion of former aſtronomers, that our ſun, beſides occupying the centre of the ſyſtem which properly belongs to him, occupied alſo the centre of the univerſe; but Dr. Herſchel is of a very different opinion.

With a Newtonian reflector of 20 feet focal length, and an aperture of 18 inches, he firſt began to ſurvey the Via Lactea, and found that it completely reſolved the whitiſh appearance into ſtars, which the teleſcopes he formerly uſed had not light enough to do. The portion he firſt obſerved was that about the hand and club of Orion, and found therein an aſtoniſhing multitude of ſtars, whoſe number he endeavoured to eſtimate by dividing them into what he calls fields of ſtars, and counting their number, and ſo computing from a mean of theſe, how many might be contained in a given portion of the milky-way. In the moſt vacant place to be met with in that neighbourhood he found 63 ſtars; other ſix fields contained 110, 60, 70, 90, 70, and 74 ſtars; a mean of all which gave 79 for the number of ſtars to each field: and thus he found, that by allowing 15 minutes for the diameter of his field of view, a belt of 15 degrees long and two broad, which he had often ſeen paſs before his teleſcope in an hour's time, could not contain leſs than 50,000 ſtars, large enough to be diſtinctly numbered; beſides which, he ſuſpected twice as many more, which could be ſeen only now and then by faint glimpſes for want of ſufficient light.

The ſucceſs he had with the milky-way ſoon induced him to turn his teleſcope to the nebulous parts of the heavens. Moſt of theſe yielded to his reflector, which plainly diſcovered them to be compoſed of ſtars, or at leaſt to contain ſtars, and to ſhow every other indication of conſiſting of them entirely. "The nebulæ, ſays Dr. Herſchel, are arranged into ſtrata, and run on to a great length; and ſome of them I have been able to purſue, and to gueſs pretty well at their form and direction. It is probable enough that they may ſurround the whole ſtarry ſphere of the heavens, not unlike the milky-way, which undoubtedly is nothing but a ſtratum of fixed ſtars: one of theſe nebulous beds, is ſo rich, that, in paſſing through a ſection of it in the time of only 36 minutes, I have detected no leſs than 31 nebulæ, all diſtinctly viſible upon a fine blue ſky. Their ſituation and ſhape, as well as condition, ſeem to denote the greateſt variety imaginable. In another ſtratum, or perhaps a different branch of the former, I have often ſeen double and treble nebulæ variouſly arranged; large ones with ſmall, ſeeming attendants; narrow, but much extended lucid nebulæ or bright daſhes; ſome of the ſhape of a fan, reſembling an electric bruſh iſſuing from a lucid point; others of the cometic ſhape, with a ſeeming nucleus in the centre, or like cloudy ſtars, ſurrounded with a nebulous atmoſphere: a different ſort again contain a nebuloſity of the milky kind, while others ſhine with a fainter mottled kind of light, which denotes their being reſolvable into ſtars.

"It is very probable that the great ſtratum called the *milky-way*, is that in which the ſun is placed, though perhaps not in the very centre of its thickneſs. We gather this from the appearance of the galaxy, which ſeems to encompaſs the whole heavens, as it certainly muſt do if the ſun is within the ſame.

"Thus in *Figure* 32. an eye at S within the ſtratum *a b*, will ſee the ſtars in the direction of its length *ab*, or height *e d*, with all thoſe in the intermediate ſituation, projected into the lucid circle ABCD; while thoſe in the ſides *me*, *nw*, will be ſeen ſcattered over the remaining part of the heavens at MVNW.

"If the eye were placed ſomewhere without the ſtratum, at no very great diſtance, the appearance of the ſtars within it would aſſume the form of one of the leſſer circles of the ſphere, which would be more or leſs contracted to the diſtance of the eye; and if this diſtance were exceedingly increaſed, the whole ſtratum might at laſt be drawn together into a lucid ſpot of any ſhape, according to the poſition, length, and height of the ſtratum.

"Let us now ſuppoſe, that a branch or ſmaller ſtratum ſhould run out from the former in a certain direction, and let it alſo be be contained between two parallel planes extended indefinitely onwards, but ſo that the eye may be placed in the great ſtratum ſomewhere before the ſeparation, and not far from the place where the ſtrata are ſtill united; then will this ſecond ſtratum not be projected into a bright circle like the former, but will be ſeen as a lucid branch proceeding from the firſt, and returning to it again at a certain diſtance leſs than a ſemicircle. Thus, in the ſame figure, the ſtars in the ſmall ſtratum *pg* will be projected into a bright arc at PRRP, which, after its ſeparation from the circle CBD, unites with it again at P.

"What has been inſtanced in parallel planes may eaſily be applied to ſtrata irregularly bounded, and running in various directions; for their projection will of conſequence vary according to the quantities of the variations in the ſtrata and the diſtance of the eye from the ſame. And thus any kind of curvatures, as well as various degrees of brightneſs, may be produced in the projections.

"From appearances, then, we may infer, that the ſun is moſt likely placed in one of the great ſtrata of the fixed ſtars, and very probably not far from the place where ſome ſmaller ſtratum branches out from it.

"Various methods may be taken to come to a knowledge of the ſun's place in the ſidereal ſtratum, one of which I have already begun to put in practice. I call it *gauging the heavens*, or the *ſtar-gauge*. It conſiſts in repeatedly taking the number of ſtars in ten fields of view of my reflector very near each other; and by adding their ſums, and cutting off one decimal on the right, a mean of the contents of the heavens in all the parts which are thus gauged are obtained. Thus it appears, that the number of ſtars increaſes very much as we approach the milky way; for in the parallel from 92 to 94 degrees north polar diſtance, and right aſcenſion 15 h. 10′, the ſtar-gauge runs up from 9.4 ſtars in the field to 18.6 in about an hour and an half; whereas in the parallel from 78 to 80 degrees north polar diſtance, and R. A. 11, 12, 13, and 14 hours, it very ſeldom riſes above 4. We are, however, to remember, that, with different inſtruments, the account of the gauges will be very different, eſpecially on our ſuppoſition of the ſun in a ſtratum of ſtars. For let *ab*, Plate IV. *Figure* 33. be the ſtratum, and ſuppoſe the ſmall circle *ghlk* to repreſent the ſpace into which, by the light and power of a given teleſcope, we are enabled to penetrate, and let GHLK be the extent of another portion which we are enabled to viſit by means of a larger aperture and power; it is evident, that the gauges with the latter inſtrument will differ very much in their account of ſtars contained at MN and at KG or LH, when with the former they will hardly be affected with the change from *mn* to *kg* or *lk*.

"The ſituation of the ſun in the ſidereal ſtratum will be found by conſidering in what manner the ſtar-gauge agrees with the length of a ray revolving in ſeveral directions about an aſſumed point, and cut off by the bounds of the ſtratum. Thus, in *Figure* 34. let S be the place of an obſerver; S rrr, *Srrr*, lines in the plane rSr, *rSr*, drawn from S within the ſtratum to one of the boundaries here repreſented by the plane AB. Then, ſince neither the ſituation of S nor the form of the limiting ſurface AB, is known, we are to aſſume a point, and apply to it lines proportional to the ſeveral gauges that have been obtained, and at ſuch angles from each other as they may point out; then will the termination of theſe lines delineate the boundary of the ſtratum, and conſequently manifeſt the ſituation of the ſun within the ſame.

"In my late obſervations on nebulæ, I ſoon found, that I generally detected them in certain directions rather than in others: that the ſpaces preceding them were generally quite deprived of their ſtars, ſo as often to afford many fields without a ſingle ſtar in it: that the nebulæ generally appeared ſome time after among ſtars of a certain conſiderable ſize, and but ſeldom among very ſmall ſtars: that when I came to one nebula, I generally found ſeveral more in the neighbourhood: that afterwards a conſiderable time paſſed before I came to another parcel. Theſe events being often repeated in different altitudes of my inſtrument, and ſome of them at conſiderable diſtances from each other, it occurred to me that the intermediate ſpaces between the ſweeps might alſo contain nebulæ; and finding this to hold good more than once, I ventured to give notice to my aſſiſtant at the clock, that 'I found myſelf on nebulous ground.' But how far theſe circumſtances of vacant places preceding and following the nebulous ſtrata, and their being as it were contained in a bed of ſtars ſparingly ſcattered between them, may hold good in more diſtant portions of the heavens, and which I have not yet been able to viſit in any regular manner, I ought by no means to hazard a conjecture."

By a continued ſeries of obſervations, Dr. Herſchel became confirmed in his judgment; and in a ſucceeding paper has given a ſketch of his opinions concerning the interior conſtruction of the heavens. "That the milky way, ſays he, is a moſt extenſive ſtratum of ſtars of various ſizes, admits no longer of the leaſt doubt; and that our ſun is one of the heavenly bodies belonging to it, is as evident. I have now viewed and gauged this ſhining zone in almoſt every direction, and find it compoſed of ſhining ſtars, whoſe number, by the account of thoſe gauges, conſtantly increaſes and decreaſes in proportion to its apparent brightneſs to the naked eye. But in order to develope the ideas of the univerſe that have been ſuggeſted by my late obſervations, it will be beſt to take the ſubject from point of view at a conſiderable diſtance both of ſpace and time.

"Let us then ſuppoſe numberleſs ſtars of various ſizes ſcattered over an indefinite portion of ſpace, in ſuch a manner as to be almoſt equally diſtributed through the whole. The laws of attraction, which no doubt extend to the remoteſt regions of the fixed ſtars, will operate in ſuch a manner as moſt probably to produce the following remarkable effects.

"I. It will frequently happen, that a ſtar, being conſiderably larger than its neighbouring ones, will attract them more than they will be attracted by others that are immediately around them; by which means they will be in time, as it were, condenſed about a centre; or, in other words, form themſelves into a cluſter of ſtars of almoſt a globular figure, more or leſs regularly ſo according to the ſize and original diſtance of the ſurrounding ſtars.

"II. The next caſe, which will happen almoſt as frequently as the former, is where a few ſtars, though not ſuperior in ſize to the reſt, may chance to be rather nearer each other than the ſurrounding ones; for here alſo will be formed a prevailing attraction in the combined centre of gravity of them all, which will occaſion the neighbouring ſtars to draw together; not, indeed, ſo as to form a regular globular figure, but, however, in ſuch a manner as to be condenſed towards the common centre of gravity of the whole irregular cluſter. And this conſtruction admits of the utmoſt variety of ſhapes, according to the number and ſituation of the ſtars which firſt gave riſe to the condenſation of the reſt.

"III. From the compoſition and repeated conjunction of both the foregoing forms, a third may be derived, when many large ſtars, or combined ſmall ones, are ſituated in long extended regular or crooked rows, hooks, or branches; for they will alſo draw the ſurrounding ones ſo as to produce figures of condenſed ſtars coarſely ſimilar to the former, which gave riſe to theſe condenſations.

"IV. Likewiſe, when a cluſter of ſtars is forming in one part of a ſpace, there may be another collecting in a different, but perhaps not far diſtant, quarter, which may occaſion a mutual approach towards their common centre of gravity.

"V. In the laſt place, as a natural conſequence of the former caſes, there will be great cavities or vacancies formed by the retreat of the ſtars towards the various centres which attract them; ſo that, upon the whole, there is evidently a field of the greateſt variety for the mutual and combined attractions of the heavenly bodies to exert themſelves in.

"From this theoretical view of the heavens, which has been taken from a point not leſs diſtant in time than in ſpace, we will now retreat to our own retired ſtation, in one of the planet's attending a ſtar in its great combination with numberleſs others: and in order to inveſtigate what will be the appearances from this contracted ſituation, let us begin with the naked eye. The ſtars of the firſt magnitude, being in all probability the neareſt, will furniſh us with a ſtep to begin our ſcale. Setting off, therefore, with the diſtance of Sirius or Arcturus, for inſtance, as unity, we will at preſent ſuppoſe, that thoſe of the ſecond magnitude are at double, thoſe of the third at treble, the diſtance, &c. Taking it for granted then, that a ſtar of the ſeventh magnitude (the ſmalleſt ſuppoſed viſible with the naked eye) is about ſeven times as far as one of the firſt, it follows, that an obſerver who is incloſed in a globular cluſter of ſtars, and not far from the centre, will never be able with the naked eye to ſee to the end of it; for ſince, according to the above eſtimations, he can only extend his view to about ſeven times the diſtance of Sirius, it cannot be expected that his eyes ſhould reach the borders of a cluſter which has perhaps not leſs than 50 ſtars in depth every were around him. The whole univerſe to him, therefore, will be compriſed in a ſet of conſtellations richly ornamented with ſcattered ſtars of all ſizes. Or if the united brightneſs of a neighbouring cluſter of ſtars ſhould, in a remarkable clear night, reach his ſight, it will put on the appearance of a ſmall, faint, whitiſh, nebulous cloud, not to be perceived without the greateſt attention. Let us ſuppoſe him placed in a much extended ſtratum, or branching cluſter of millions of ſtars, ſuch as may fall under the third form of nebulæ already conſidered. Here alſo the heavens will not only be richly ſcattered over with brilliant conſtellations, but a ſhining zone or milky way will be perceived to ſurround the whole ſphere of the heavens, owing to the combined light of thoſe ſtars which are too ſmall, that is, too remote to be ſeen. Our obſerver's ſight will be ſo confined, that he will imagine this ſingle collection of ſtars, though he does not even perceive the thouſandth part of them, to be the whole contents of the heavens. But allowing him now the uſe of a common teleſcope, he begins to perceive that all the milkineſs of the bright path which ſurrounds the ſphere is effected by ſtars. He perceives, that thoſe objects which had been called nebulæ, are evidently nothing but cluſters of ſtars. Their number encreaſes upon him; and when he reſolves one nebula into ſtars, he diſcovers ten new ones which he cannot reſolve. He then forms the idea of immenſe ſtrata of fixed ſtars, of cluſters of ſtars and of nebulæ; till, going on with ſuch interreſting obſervations, he ſtill perceives, that all theſe appearances muſt naturally ariſe from the confined ſituation in which he is placed.

Dr. Herſchel then propoſes the following

PROBLEM.

"The ſtars being ſuppoſed nearly equally ſcattered, and their number, in a field of view of a known angular diameter, being given, to determine the length of the viſual ray.

"Here, the arrangement of the ſtars not being fixed upon, we muſt endeavour to find which way they may be placed ſo as to fill a given ſpace moſt equally. Suppoſe a rectangular cone cut into fruſtula by many equidiſtant planes perpendicular to the axis; then, if one ſtar be placed at the vertex and another in the axis at the firſt interſection, ſix ſtars may be ſet around it ſo as to be equally diſtant from one another, and from the central ſtar. Theſe poſitions being carried on in the ſame manner, we ſhall have every ſtar within the cone ſurrounded by eight others at an equal diſtance from that ſtar taken as a centre. *Figure* 35 contains four ſections of ſuch a cone diſtinguiſhed by alternate ſhades; which will be ſufficient to explain what ſort of arrangement I would point out.

"The ſeries of the number of ſtars contained in the ſeveral ſections will be 1, 7, 19, 37, 61, 91, &c. which, continued to n terms, the ſum of it, by the differential method, will be $na + n.\frac{n-1}{2}d' + n.\frac{n-1}{2}.\frac{n-2}{3}d''$, &c. where a is the firſt term, d', d'', d''', &c. the firſt, ſecond, and third differences. Then, ſince $a=1$, $d'=6$, $d''=6$, $d'''=0$, the ſum of the ſeries will be n^3. Let S be the given number of ſtars; 1 the diameter of the baſe of the field of view; and B the diameter of the great rectangular cone; then by trigonometry we ſhall have $B = \frac{\text{Radius}}{\text{Tang. } \frac{1}{2}\text{ field}}$. Now, ſince the field of view of a teleſcope is a cone, we ſhall have its ſolidity to that of the great cone of the ſtars formed by the above conſtruction, as the ſquare of the diameter of the baſe of the field of view to the ſquare of the diameter of the great cone, the height of both being the ſame; and the ſtars in each cone being in the ratio of the ſolidity, as being equally ſcattered, we have $n = \sqrt[3]{B^2 S}$; and the length of the viſual ray $= n - 1$, which was to be determined." Another ſolution of this problem, on the ſuppoſition of another arrangement of ſtars, is given; but Dr. Herſchel prefers the former.

From the data now laid down, Dr. Herſchel next endeavours to prove that the earth is 'the planet of a ſtar belonging to a compound nebula of the third form.' "I ſhall now, (ſays he) proceed to ſhow, that the ſtupendous ſidereal ſyſtem we inhabit, this extenſive ſtratum, and its ſecondary branch, conſiſting of many millions of ſtars, is in all probability a detached nebula. In order to go upon grounds that ſeem to me to be capable of great certainty, they being no leſs than an actual ſurvey of the boundaries of our ſidereal ſyſtem, which I have plainly perceived as far as I have yet gone round it, every where terminated, and in moſt places very narrowly too, it will be proper to ſhow the length of my ſounding line, if I may ſo call it, that it may appear whether it was ſufficiently long for the purpoſe.

"In the moſt crowded parts of the milky-way, I have had fields of view that contained no fewer than 588 ſtars, and theſe were continued for many minutes; ſo that in one quarter of an hour's time there paſſed no leſs than 116,000 ſtars through the field of view of my teleſcope. Now if we compute the length of the viſual ray, by putting $S = 588$, and the diameter of the field of view 15 minutes, we ſhall find $n = \sqrt{B^2 S} = 498$; ſo that it appears the length of what I have called my ſounding line, or $n - 1$, was not probably leſs than 497 times the diſtance of Sirius from the ſun.

"It may ſeem inaccurate that we ſhould found an argument on the ſtars being equally ſcattered, when, in all probability, there may not be any two of them in the heavens whoſe mutual diſtance ſhall be equal to that of any other two given ſtars: but it ſhould be conſidered, that when we take all the ſtars collectively, there will be a mean diſtance which may be aſſumed as the general one; and an argument founded on ſuch a ſuppoſition will have in its favour the greateſt probability of not being far ſhort of truth.

"If ſome other high gauge be ſelected from the table, ſuch as 472 or 344, the length of the viſual ray will be found 461 and 415. And although in conſequence of what has been ſaid, a certain degree of doubt may be left about the arrangement and ſcattering of the ſtars, yet when it is recollected, that in thoſe parts of the milky-way, where theſe high gauges were taken, the ſtars were neither ſo ſmall nor ſo crowded, as they muſt have been, on a ſuppoſition of a much farther continuance of them, when certainly a milky or nebulous appearance muſt have come on, I need not fear to have over-rated the extent of my viſual ray; and indeed every thing that can be ſaid to ſhorten it will only contract the limits of our nebulæ, as it has in moſt places been of ſufficient length to go far beyond the bounds of it. Thus in the ſides of our ſtratum, oppoſite to our ſituation in it, where the gauges often run below 5, our nebulæ cannot extend to 100 times the diſtance of Sirius; and the ſame teleſcope which could ſhow 588 ſtars in a field of view of 15 minutes, muſt certainly have preſented me alſo with the ſtars in theſe ſituations, had they been there. If we ſhould anſwer this by obſerving, that they might be at too great a diſtance to be perceived, it will be allowing that there muſt at leaſt be a vacancy amounting to the length of a viſual ray, not ſhort of 400 times the diſtance of Sirius; and this is amply ſufficient to make our nebulæ a detached one. It is true, that it would not be conſiſtent confidently to affirm that we were on an iſland, unleſs we had found ourſelves every where bounded by the ocean; and therefore I ſhall go no farther than the gauges will authoriſe: but conſidering the little depth of the ſtratum in all thoſe places which have been actually gauged, to which muſt be added all the intermediate parts that have been viewed and found to be much like the reſt, there is but little room to expect a connection between our nebula and any of the neighbouring ones. A teleſcope, with a much larger aperture than my preſent one, graſping together a greater quantity of light, and thereby enabling us to ſee farther into ſpace, will be the ſureſt means of completing and eſtabliſhing the arguments that have been uſed: for if our nebula is not abſolutely a detached one, I am firmly perſuaded that an inſtrument may be made large enough to diſcover the places where the ſtars continue onwards. A very bright milky nebuloſity muſt there undoubtedly come on, ſince the ſtars in a field of view will increaſe in the ratio of n^3 greater than that of the cube of the viſual ray.

Thus, if 588 ſtars, in a given field of view, are to be ſeen by a ray of 497 times the diſtance of Sirius, when this is lengthened to 1000, which is but little more than double the former, the number of ſtars in the ſame field of view will be no leſs than 4774: for when the viſual ray r is given, the number of ſtars S, will be $= \frac{n^3}{B^2}$; where $n = r + 1$; and a teleſcope with a threefold power of extending into ſpace, or with a ray of 1500, which I think may eaſily be conſtructed, will give us 16096 ſtars. Nor would theſe be ſo cloſe, but that a good power applied to ſuch an inſtrument might eaſily diſtinguiſh them; for they need not, if arranged in regular ſquares, approach nearer to each other than 6''.27: but the milky nebuloſity I have mentioned, would be produced by the numberleſs ſtars beyond them, which, in one reſpect, the viſual ray might alſo be ſaid to reach. To make this appear, we muſt return to the naked eye; which, as we have before eſtimated, can only ſee the ſtars of the ſeventh magnitude, ſo as to diſtinguiſh them: but it is nevertheleſs very evident, that the united luſtre of millions of ſtars, ſuch as I ſuppoſe the nebula in Andromeda to be, will reach our ſight in the ſhape of a very ſmall faint nebuloſity; ſince the nebula of which I ſpeak may eaſily be ſeen in a fine evening. In the ſame manner my preſent teleſcope, as I have argued, has not only a viſual ray that will reach the ſtars at 497 times the diſtance of Sirius, ſo as to diſtinguiſh them, and probably much farther, but alſo a power of ſhowing the united luſtre of the accumulated ſtars that compoſe a milky nebuloſity at a diſtance far exceeding the former limits: ſo that from theſe conſiderations it appears again highly probable, that my preſent teleſcope, not ſhewing ſuch a nebuloſity in the milky-way, goes already far beyond its extent; and conſequently much more would an inſtrument, ſuch as I have mentioned, remove all doubt on the ſubject, both by ſhowing the ſtars in the continuation of the ſtratum, and by expoſing a very ſtrong milky nebuloſity beyond them, that could no longer be miſtaken for the dark ground of the heavens.

Dr. Herſchel offers ſome thoughts on the origin of the nebulous ſtrata of the heavens and their antiquity. "If it were poſſible, ſays he, to diſtinguiſh between the parts of an indefinitely extended whole, the nebula we inhabit might be ſaid to be one that has fewer marks of antiquity than any of the reſt. To explain this idea perhaps more clearly, we ſhould recollect, that the condenſation of cluſters of ſtars has been aſcribed to a gradual approach; and whoever reflects on the number of ages that muſt have paſſed before ſome of the cluſters that are to be found in my intended catalogue of them could be ſo far condenſed as we find them at preſent, will not wonder if I aſcribe a certain air of youth and vigour to many very regularly ſcattered regions of our ſidereal ſtratum. There are, moreover, many places in it, in which, if we may judge from appearances, there is the greateſt reaſon to believe, that the ſtars are drawing towards ſecondary centres, and will in time ſeparate into cluſters, ſo as to occaſion many ſubdiviſions. Hence we may ſurmiſe, that when a nebulous ſtratum conſiſts chiefly of nebulæ of the firſt and ſecond forms, it probably owes its origin to what may be called the decay of a great compound nebula of the third form; and that the ſubdiviſions which happened to it in length of time, occaſioned all the ſmall nebulæ which ſprung from it to lie in a certain range, according as they were detached from the primary one. In like manner, our ſyſtem, after numbers of ages, may very poſſibly become divided ſo as to give riſe to a ſtratum of two or three hundred nebulæ; for it would not be difficult to point out ſo many beginning or gathering cluſters in it.

"Some parts of our ſyſtem ſeem already to have ſuſtained greater ravages of time than others: for inſtance, in the body of the Scorpion is an opening or hole, which is probably owing to this cauſe. It is at leaſt four degrees broad; but its height I have not yet aſcertained."

Thus, then, according to Dr. Herſchel, the univerſe conſiſts of nebulæ, or innumerable collections of innumerable ſtars, each individual of which is a ſun not only equal, but much ſuperior to ours.

Though in the above extracts from Dr. Herſchel's papers, the words *condenſation*, *cluſters*, &c. of ſtars, frequently occur, we are by no means from thence to imagine that any of the celeſtial bodies in our nebulæ are nearer to one another than we are to Sirius, whoſe diſtance is ſuppoſed not to be leſs than 400,000 times that of the ſun from us, or 38 millions of millions of miles. The whole extent of the nebula being in ſome places near 500 times as great, muſt be ſuch, that the light of a ſtar placed at its extreme boundary, ſuppoſing it to fly with the velocity of 12 millions of miles every minute, muſt have taken near 3000 years to reach us. Dr. Herſchel, however, is by no means of opinion, that our nebula is the moſt conſiderable in the univerſe.

"My opinion, ſays the doctor, of their ſize is grounded on the following obſervations: There are many round nebulæ of the firſt form, of about five or ſix minutes in diameter, the ſtars of which I can ſee very diſtinctly; and on comparing them with the viſual ray calculated from ſome of my long gauges, I ſuppoſe by the appearance of the ſmall ſtars in thoſe gauges, that the centres of theſe round nebulæ may be 600 times the diſtance of Sirius from us." He then goes on to tell us, that the ſtars in ſuch nebulæ are probably twice as much condenſed as thoſe of our ſyſtem; otherwiſe the centre of it would not be leſs than 6000 times the diſtance of Sirius from us; and that it is poſſibly much under-rated by ſuppoſing it only 600 times the diſtance of that ſtar.

In the courſe of Dr. Herſchel's obſervations and inquiries concerning the ſtructure of the heavens, an objection occurred, that if the different ſyſtems were formed by the mutual attractions of the ſtars, the whole would be in danger of deſtruction by the falling of them one upon another. A ſufficient anſwer to this, he thinks, is, that if we can really prove the ſyſtem of the univerſe to be what he has ſaid, there is no doubt but that the great author of it has amply provided for the preſervation of the whole, though it ſhould not appear to us in what manner this is effected. Several circumſtances, however, he is of opinion, manifeſtly tend to a general preſervation; as, in the firſt place, the indefinite extent of the ſidereal heavens, which muſt produce a balance that will effectually ſecure all the great parts of the whole from approaching to each other. "There remains then, ſays he, only to ſee how the particular ſtars belonging to ſeparate cluſters are prevented from ruſhing on to their centres of attraction." This he ſuppoſes may be done by projectile forces; "the admiſſion of which will prove ſuch a barrier againſt the ſeeming deſtructive power of attraction, as to ſecure from it all the ſtars belonging to a cluſter, if not for ever, at leaſt for millions of ages. Beſides, we ought perhaps to look upon ſuch cluſters, and the deſtruction of a ſtar now and then in ſome thouſand of ages, as the very means by which the whole is preſerved and renewed. Theſe cluſters may be the laboratories of the univerſe, wherein the moſt ſalutary remedies for the decay of the whole are prepared.

SECT. XVI.

PLATE I. FIGURE I.

OF ASTRONOMICAL INSTRUMENTS.

DESCRIPTION OF THE UNIVERSAL EQUATORIAL,

As conſtructed by Mr. George Adams, *of Fleet Street.*

THE principal parts of this inſtrument are the azimuth, or horizontal circle YZ, *a* the nut to turn it. LM, the hour circle; ABD, the teleſcope; and *de*, its level; C, a ſcrew for adjuſting the hairs; the declination circle EKG, and its pinion F; the nonius to this circle is marked H; IK the axis for the teleſcope; *c* a ſmall level to this axis. O is the nut by which the hour circle is turned round; R, S, T, the adjuſting ſcrews that ſupport the inſtrument; X the axis of the azimuth circle; V the nonius thereto, and W, W, two ſpirit levels; PYQ the latitude arch.

The reader will obtain a perfect idea of the various uſes to which this inſtrument may be applied by the following Problems.

Problem I. *To take the Meridian Altitude of the Sun, Moon, or Star, &c.*

Make the polar axis perpendicular to the horizon, and when the ſun is coming near to the meridian, elevate the teleſcope till the centre of the ſun is exactly in the centre of the croſs wires; then follow the ſun, by moving both the equatoreal and declination circles, if neceſſary, till he is at his greateſt altitude; the nonius of the declination circle will then give you his meridian altitude.

Problem II. *To find the Meridian by one Obſervation only.*

To do this, elevate the equatoreal (or hour) circle to the co-latitude of the place, and ſet the declination circle to the ſun's declination for the day and hour of the day required; then move the azimuth and hour circles, both at the ſame time, either in the ſame direction, or the contrary, till you bring the centre of the croſs wires in the teleſcope exactly to cover the centre of the ſun: that being done, the index of the hour will give the apparent, or ſolar time at the inſtant of obſervation. Thus you get the time, though the ſun be at a diſtance from the meridian; then turn the hour circle till the index points preciſely at 12 o'clock, and lower the teleſcope to the horizon in order to obſerve ſome point there, in the centre of your glaſs, and that point is your meridian mark found by one obſervation only. The beſt time of the day for this operation of finding your meridian, is three or four hours before, or three or four hours after twelve at noon.

Problem III. *To obſerve a Star or Planet in Broad Day-light, at any Time when it is above the Horizon.*

N. B. The table of right aſcenſions, declinations, &c. of the principal fixed ſtars, gives you the times of their tranſits over the meridian.

Elevate the equatoreal circle to the co-latitude of the place, and ſet the nonius of the declination circle to the ſtar's declination; look into the table for the time of its tranſit immediately preceding your obſervation; then take the interval of time ſince that tranſit to the time of your obſervation as given by the clock, and and add to it the ſtar's acceleration, correſponding to that interval of time, this ſum is the hour to which you muſt ſet the hour index of the equatoreal circle, and the ſtar will then appear in the teleſcope.

Problem IV. *To find the Right Aſcenſion, and Declination of a fixed Star, Planet, Comet, or the Moon, by an Obſervation made with the Equatoreal.*

The equatoreal circle being elevated as before to the complement of the latitude of the place, move the declination and equatoreal circulations, till the moon, ſtar, or comet, is in the centre of the croſs wires in the teleſcope; the nonius of the declination circle, will give you the hour of the ſtar, &c. then your regulator or clock will give you the ſun's time, or hour of the day. Take the difference between the ſun's time, and the ſtar's time; and if the ſtar's time is leſs than the ſun's time, add that difference, to the ſun's right aſcenſion at the time of obſervation, the ſum (rejecting 24 hours, if it exceeds that number) is the right aſcenſion of the ſtar, &c. Again, if the ſtar's time exceeds the ſun's time, ſubtract the difference from the ſun's right aſcenſion; the remainder (adding 24 hours, to the ſun's right aſcenſion, if neceſſary) is the right aſcenſion of the ſtar, &c.

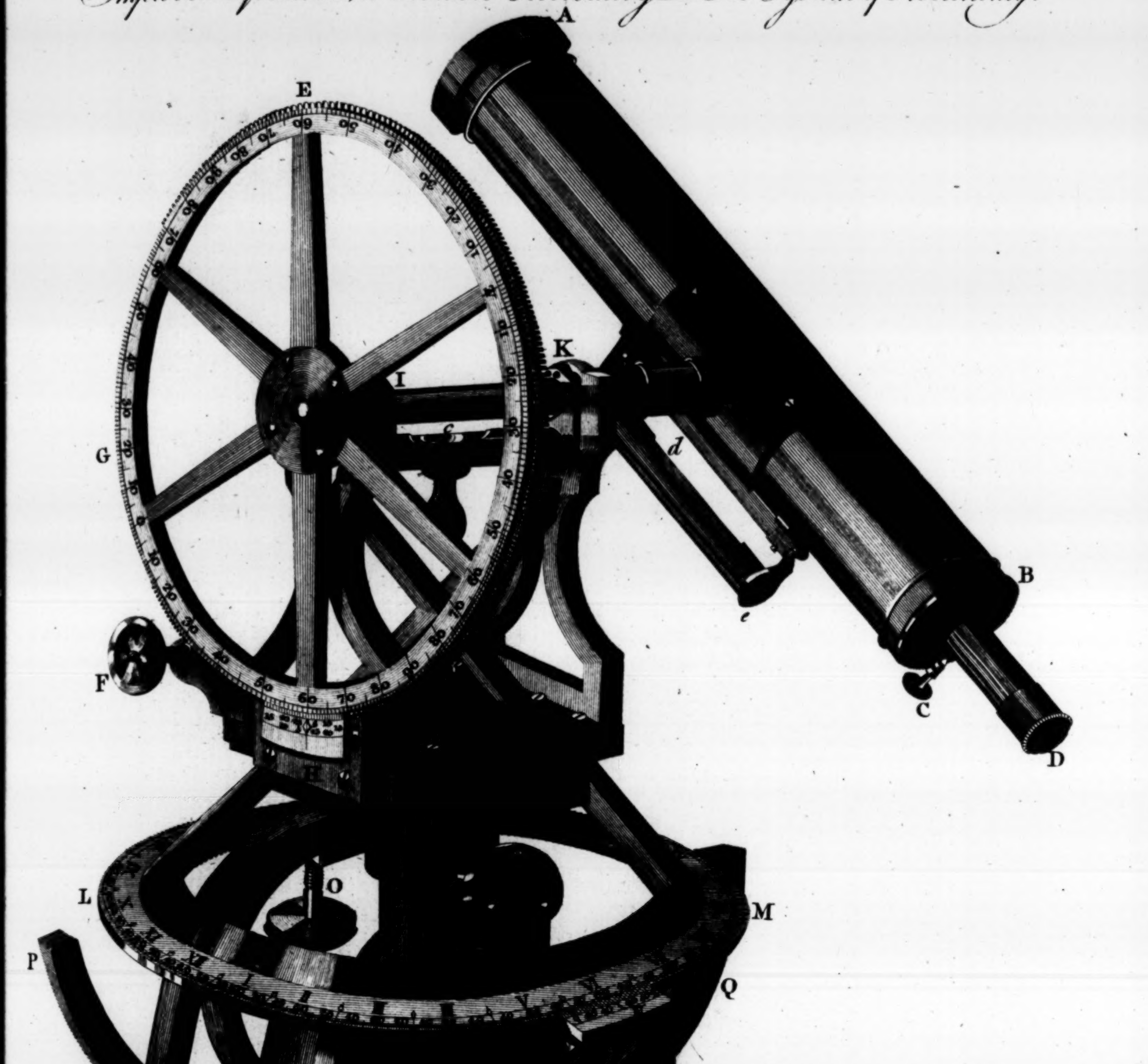
Problem V. *To find the Longitude at Land.*

Obſerve the difference of the right aſcenſion of two celeſtial bodies; for inſtance, of the moon, and a known fixed ſtar; at any given time, either on, or out of the meridian, and from that difference, infer the moon's right aſcenſion, at the moment of obſervation; that being obtained, find what is the preciſe time, at any place whoſe longitude is well aſcertained; for inſtance, at Greenwich, when the moon has that right aſcenſion, which you have now obſerved; the difference between that time at Greenwich, and the time with you, is the difference of longitude, in time, between Greenwich, and your place of obſervation, which is Eaſt of Greenwich, if the time with you be later than the time at Greenwich, and is Weſt of Greenwich, if the time with you be earlier than that of Greenwich.

OF THE PLANETARIUM, TELLURIAN, AND LUNARIUM.

The Planetarium (Plate II. *Figure* 1.) is an inſtrument made by Mr. Adams of Fleet Street, London, who has paid conſiderable attention to thoſe ſort of machines, in order to reduce them to their greateſt degree of ſimplicity and perfection. It repreſents in a general manner, by various parts of its machinery, all the motions and phænomena of the planetary ſyſtem. This machine conſiſts of, the Sun (in the centre), with the planets, Mercury, Venus, the Earth and Moon, Mars, Jupiter and his four moons, Saturn and his five moons; and to it is occaſionally applied an extra long arm for the Georgian planet and his two moons. To the earth and moon is applied a frame, containing only four wheels and two pinions, which ſerve to preſerve the earth's axis in its proper paralleliſm in its motion round the ſun, and to give the moon her due revolution about the earth at the ſame time. Theſe wheels are connected with the wheel work in a round box below, and the whole is ſet in motion by a winch. The arm that carries round the moon, points out her age and phaſes for any ſituation in her orbit, as alſo her geocentric place in

Improved Equatorial, or Portable Observatory — See System of Astronomy. Plate 1.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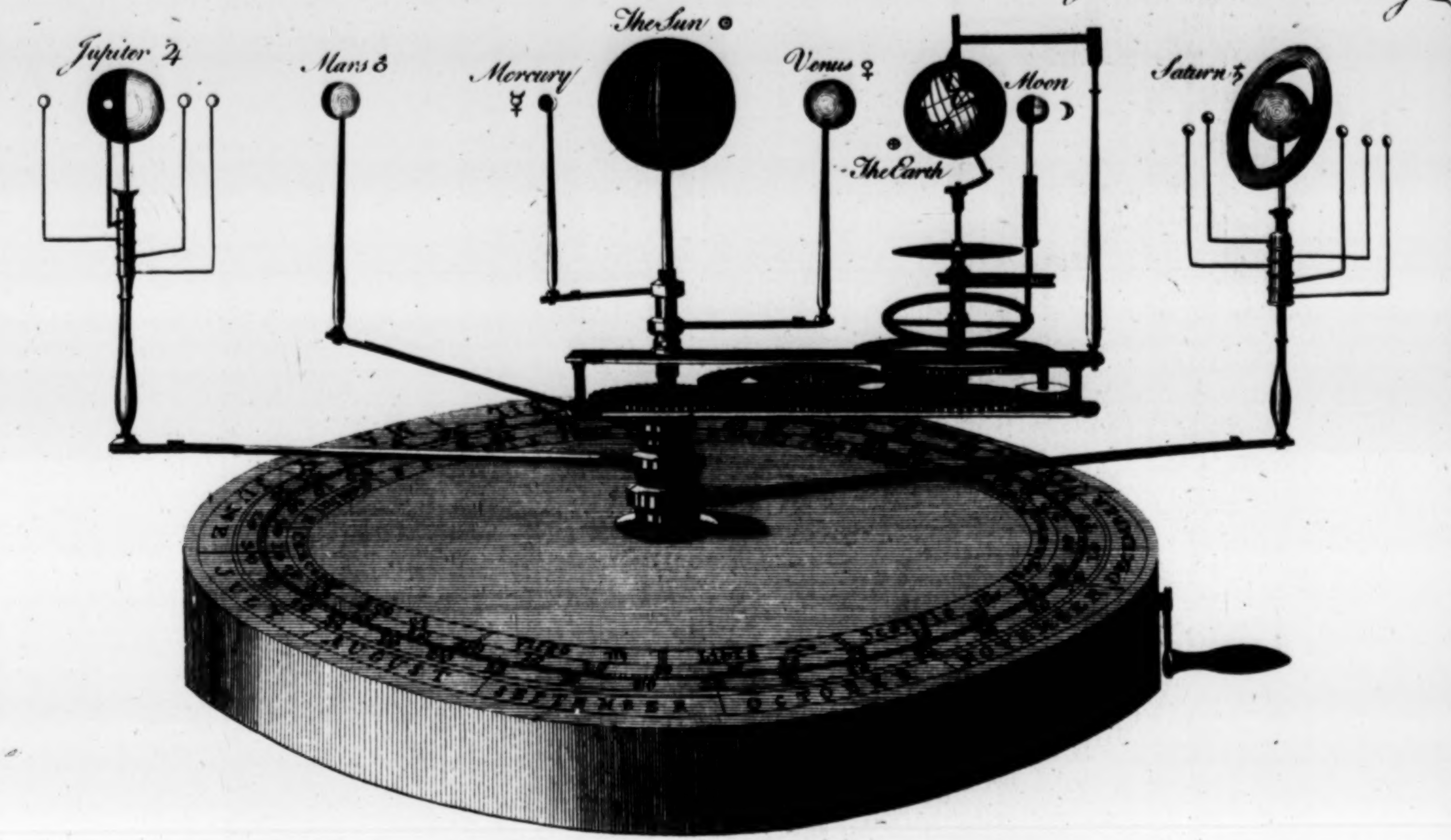
An Improved Planetarium Tellurian and Lunarium — See System of Astronomy Plate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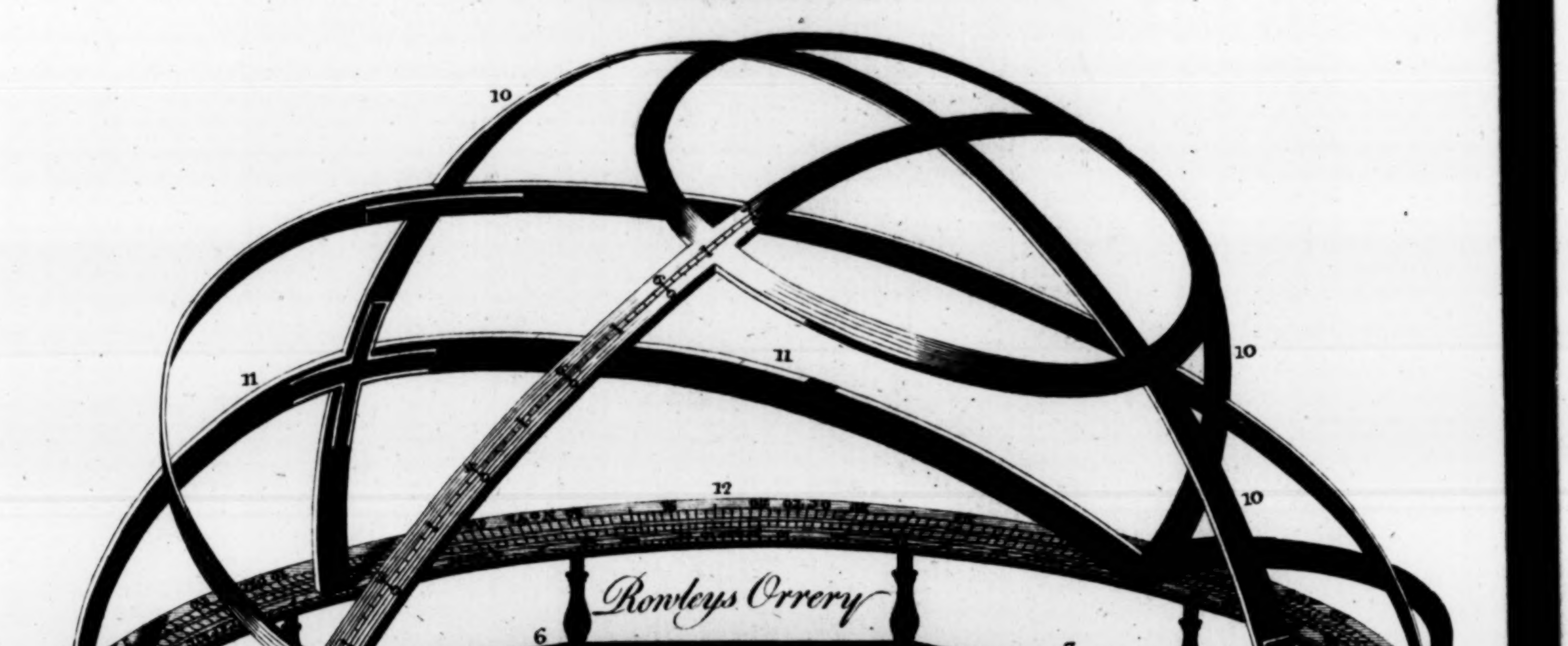
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in the ecliptic, in ſigns and degrees. The moon's orbit is repreſented by a flat rim; the two joints upon which it turns, denoting her nodes. This orbit is made to incline to any deſired angle. The earth of this inſtrument is uſually made of a three-inch or 1½ globe, papered, &c. for the purpoſe; and by means of the terminating wire that goes over it, points out the changes of the ſeaſons, and the different lengths of days and nights more conſpicuouſly. This machine is alſo made to repreſent the Ptolemaic Syſtem, or ſuch as is vulgarly received; which places the earth in the centre, and the planets and ſun revolving about it. (It is done by an auxiliary ſmall ſun and an earth, which change their places in the inſtrument.) At the ſame time, it affords a moſt manifeſt confutation of it: for it is plainly obſerved in this conſtruction, (1.) That the planets Mercury and Venus, being both within the orbit of the ſun, cannot at any time be ſeen to go behind it; whereas in nature we obſerved them as often to go behind as before the ſun in the heavens. (2.) It ſhows, that as the planets move in circular orbits about the central earth, they ought at all times to be of the ſame apparent magnitude; whereas, on the contrary, we obſerve their apparent magnitude in the heavens to be very variable, and ſo far different, that, for inſtance, Mars will ſometimes appear as big as Jupiter nearly, and at other times you will ſcarcely know him from a fixed ſtar. (3.) It ſhows that any of the planets might be ſeen at all diſtances from the ſun in the heavens; or, in other words, that when the ſun is ſetting, Mercury or Venus may be ſeen not only in the ſouth but even in the eaſt; which circumſtances were never yet obſerved. (4.) You ſee by this planetarium that the motions of the planets ſhould always be regular and uniformly the ſame; whereas, on the contrary, we obſerve them always to move with a variable velocity, ſometimes faſter, then ſlower, and ſometimes not at all. (5.) By the machine you ſee the planets move all the ſame way, viz. from weſt to eaſt continually: but in the heavens we ſee them move ſometimes direct from weſt to eaſt, ſometimes retrograde from eaſt to weſt, and at other times to be ſtationary. All which phænomena plainly prove this ſyſtem to be a falſe and abſurd hypotheſis.

The truth of the Copernican or Solar Syſtem of the world is hereby moſt clearly repreſented. For taking the earth from the centre, and placing thereon the uſual large braſs ball for the ſun, and reſtoring the earth to its proper ſituation among the planets, then every thing will be right and agree exactly with celeſtial obſervations. You will obſerve Mercury never to be more than a certain angular diſtance, 21°, and Venus 47°, from the ſun. That the planets, eſpecially Mars, will be ſometimes much nearer to the earth than at others, and therefore muſt appear larger at one time than at another. And that they cannot appear at the earth to move with an uniform velocity; for when neareſt they appear to move faſteſt, and ſlower when moſt remote. You will alſo obſerve their motions to be ſometimes direct, and ſometimes retrograde, when after a time they become ſtationary. Which particulars all correſpond exactly with obſervations, and fully prove the truth of this excellent ſyſtem.

Wherefore by this machine you at once ſee all the planets in motion about the ſun, with the ſame reſpective velocities and periods of revolution which they have in the heavens; the wheel-work being calculated to a minute of time, from the lateſt diſcoveries.

The diurnal rotation of the earth about its axis, the different ſeaſons of the year, and the different lengths of days and nights, are likewiſe here completely exhibited.

In ſhort by this inſtrument every phænomenon in nature is repreſented as it actually appears in the heavens.

ROWLEY's GRAND ORRERY.

The machine repreſented by (Plate II. *Figure* 2.) is the Grand Orrery, firſt made in this kingdom by Mr. Rowley for king George I. The frame of it, which contains the wheel-work, &c. and regulates the whole, is made of ebony, and about four feet in diameter; the outſide thereof is adorned with 12 pilaſters. Between theſe the 12 ſigns of the zodiac are neatly painted with gilded frames. Above the frame is a broad ring ſupported with 12 pillars. This ring repreſents the plane of the ecliptic; upon which are two circles of degrees, and between theſe the names and characters of the 12 ſigns. Near the outſide is a circle of months and days, exactly correſponding to the ſun's place at noon each day throughout the year. Above the ecliptic ſtand ſome of the principal circles of the ſphere, agreeable to their reſpective ſituations in the heavens: viz. N° 10. are the two colures, divided into degrees and half degrees, N° 11. is one half of the equinoctial circle, making an angle of 23½ degrees. The tropic of Cancer and the arctic circle are each fixed parallel at their proper diſtance from the equinoctial. On the northern half of the ecliptic is a braſs ſemicircle, moveable upon two points fixed in ♈ and ♎. This ſemicircle ſerves as a moveable horizon to be put to any degree of latitude upon the north part of the meridian, and the whole machine may be ſet to any latitude without diſturbing any of the internal motions, by two ſtrong hinges, (N° 13) fixed to the bottom frame upon which the inſtrument moves, and a ſtrong braſs arch, having holes at every degree, through which a ſtrong pin is put at every elevation. This arch and the two hinges ſupport the whole machine when it is lifted up according to any latitude; and the arch at other times lies conveniently under the bottom frame. When the machine is ſet to any latitude (which is eaſily done by two men, each taking hold of two handles conveniently fixed for the purpoſe), ſet the moveable horizon to the ſame degree upon the meridian, and hence you may form an idea of the reſpective altitude or depreſſion of the planets both primary and ſecondary. The ſun (N° 1.) ſtands in the middle of the whole ſyſtem upon a wire, making an angle with the ecliptic of about 82 degrees. Next the ſun is a ſmall ball (2.), repreſenting Mercury. Next to Mercury is Venus (3.), repreſented by a larger ball. The earth is repreſented (N° 4.) by an ivory ball, having ſome circles and a map ſketched upon it. The wire which ſupports the earth makes an angle with the ecliptic of 66½ degrees, the inclination of the earth's axis to the ecliptic. Near the bottom of the earth's axis is a dial plate (N° 9.), having an index pointing to the hours of the day as the earth turns round its axis. Round the earth is a ring ſupported by two ſmall pillars, repreſenting the orbit of the moon; and the diviſions upon it anſwer to the moon's latitude. The motion of this ring repreſents the motion of the moon's orbit according to that of the nodes. Within this ring is the moon (N° 5.), having a black cap or caſe, by which its motion repreſents the phaſes of the moon according to her age. Without the orbits of the earth and moon in Mars (N° 6.). The next in order to Mars is Jupiter and his four moons (N° 7.). Each of theſe moons is ſupported by a wire fixed in a ſocket which turns about the pillar ſupporting Jupiter. Theſe ſatellites may be turned by the hand to any poſition, and yet when the machine is put into motion they will all move in their proper times. The outermoſt of all is Saturn, his five moons, and his ring (N° 8.). Theſe moons are ſupported and contrived ſimilar to thoſe of Jupiter. The machine is put into motion by turning a ſmall winch (N° 14.); and the whole ſyſtem is alſo moved by this winch, and by pulling out and puſhing in a ſmall cylindrical pin above the handle. When it is puſhed in, all the planets, both primary and ſecondary, will move according to their reſpective periods by turning the handle. When it is drawn out, the motion of the ſatellites of Jupiter and Saturn will be ſtopped, while all the reſt move without interruption. There is alſo a braſs lamp having two convex glaſſes to be put in room of the ſun; and alſo a ſmaller earth and moon, made ſomewhat in proportion to their diſtance from each other, which may be put on at pleaſure. The lamp turns round at the ſame time with the earth, and the glaſſes of it caſt a ſtrong light upon her.

And when the ſmaller earth and moon are placed on, it will be eaſy to ſhow when either of them will be eclipſed. When this machine is intended to be uſed, the planets muſt be duly placed by means of an ephemeris, and you may place a ſmall black patch or bit of wafer upon the middle of the ſun.

Right againſt the firſt degree of ♈, you may alſo place patches upon Venus, Mars, and Jupiter, right againſt ſome noted point in the ecliptic. Put in the handle, and puſh in the pin which is above it. One turn of this handle anſwers to a revolution of the balls which repreſents the earth about its axis; and conſequently to 24 hours of time, as ſhewn by the hour-index (9.), which is marked and placed at the foot of the wire on which the ball of the earth is fixed. Again, when the index has moved the ſpace of ten hours, Jupiter makes one revolution round its axis, and ſo of the reſt. By theſe means the revolutions of the planets, and their motions round their own axes, will be repreſented to the eye. By obſerving the motions of the ſpots upon the ſurface of the ſun and of the planets in the heavens, their diurnal motions were firſt diſcovered, after the ſame manner as we in this machine obſerve the motions of their repreſentatives by that of the marks placed upon them.

ADAMS's SMALL QUADRANT.

PLATE V. FIGURE I.

This is a very ſimple and uſeful inſtrument of this kind. ABC is the quadrant mounted on an axis and pedeſtal: (by means of the axis, it may be immediately placed in any vertical poſition, and the pedeſtal being moveable in the axis of the circle EF, ſerves to place it in the direction of any azimuth, or towards any point of the compaſs.) The limb AB is divided into degrees and halves, numbered from A; and upon the radius BC are fixed two ſights, of which be is perforated with a ſmall hole, and is provided with a dark glaſs, to defend the eye from the ſun's light; and the other ſight C has a larger hole, furniſhed with croſs wires, and alſo a ſmaller, which is of uſe to take the ſun's altitude by the projection of the bright image of that luminary upon the oppoſite ſight. From the center C hangs a plumb line CP. The horizontal circle FE is divided into four quadrants of 90 degrees; and an arm E, connected with the pedeſtal, moves along the limb, and conſequently ſhews the poſition of the place of the quadrant, as will hereafter be more minutely explained. Laſtly, the ſcrews G,H,I, render it very eaſy to ſet the whole inſtrument ſteadily and accurately in its proper poſition, notwithſtanding any irregularity in the table or ſtand it may be placed upon.

The rationale of this inſtrument is very clear and obvious. It is uſed to meaſure the angular diſtance of any body, or appearance, either from the zenith or point immediately above our heads, or from the horizon or level. The plumb line CP, if continued upwards from C, would be directed to the zenith Z; and the line CL, ſuppoſed to be drawn from the centre of the quadrant to an object L, will form an angle LCZ, which is the zenith diſtance, and is equal to the angle BCP, formed between the oppoſite parts of the ſame lines. We ſee, therefore, that the degrees on the arc, comprehended on the limb of the quadrant, between the plumb line and the extremities next the eye, meaſure the angle of zenith diſtance.

Again, the line CK (forming a right angle with the perpendicular CZ) is level, or horizontal; the angle LCK muſt therefore be the altitude or elevation of L above the horizon: and this laſt angle muſt be equal to the angle meaſured between the plumb line and the end A fartheſt from the eye; becauſe both theſe are equal to the quantity which would be left, after taking the zenith diſtance from a right angle, or the whole quadrant.

FIGURE II.

BIRD's TWELVE INCH QUADRANT.

The Method of adopting this Quadrant.

For performing this, there are three principal parts to be adjuſted, 1. The pillar is to be ſet perpendicular to the horizon. 2. One ſide of the quadrant is to be ſet perpendicular. 3. The axis of the teleſcope, or line of ſight, is to be made parallel to the horizontal radius of the quadrant.

I. *To ſet the Pillar perpendicular.*

Set the braſs pedeſtal on a firm ſupport. Then hang the quadrant on the pillar, and by the ſpirit-level and ſcrews in the feet, the pillar may be ſet perpendicular in the following manner: Turn the quadrant till the upper ſide is parallel to two oppoſite feet, and with one hand unſcrew that ſcrew of the foot towards which the buble inclines, and, at the ſame time, with the other hand ſcrew in the oppoſite ſcrew, till the buble reſts equally between the two marks, or ſcratches, on the glaſs tube; then turn the quadrant, horizontally, half round; and if the buble does not reſt exactly between the ſcratches as before, by unſcrewing that ſcrew towards which the buble inclines, and at the ſame ſcrewing in the other, make the buble move over half the ſpace in the tube by which they differ, and remember toward which end it inclines. Then turn the quadrant one quarter round, till its upper ſide is parallel to the other two feet; and if the buble does not reſt in the ſame place, with reſpect to the ſcratches, as it did before, make it do ſo by the ſcrews in the feet; and then bring it equally between the ſcratches, by lowering that end of the tube toward which the buble ſtood, or raiſing the other end. For doing this, there are three ſcrews at each end of the tube. To lower one end, ſlacken the right and left, or puſhing ſcrews, and ſcrew in the middle ſcrew, till the buble reſts equally between the two ſcratches: then the pillar and level are right, or nearly ſo. To prove if they are exact, or to make them ſo, if they are not; begin the ſame proceſs over again, by firſt turning the quadrant half round, and if the buble reſts not equally between the ſcratches, move it half the difference by the ſcrews in the feet; and then quarter round, and adjuſting the level firſt ſo far by the ſcrews in the feet, and next by raiſing or lowering one end of the tube as before directed; till you get the buble to ſtand in the ſame part of the glaſs when the quadrant is turned half round and quarter round; and the pillar and level will then be right.

II. *To make one Side of the Quadrant perpendicular.*

This is done by making the plumb-line hang firſt over the fine point at the arrow-head, on the center plate; and next to cover the other fine point on the arch below.

It is made to hang over the upper point, by ſcrewing the elaſtic bit of braſs (over which the wire of the plummet goes) out, or in, by its upper ſcrew-nail. It is made to hang over the lower point, by the adjuſting ſcrew within the quadrant, which is turned by a round brotched braſs-button on its head.

The plummet ſhould be made to hang in a ſmall cup, or veſſel, filled with water, to make it more ſteady, and reſt ſooner; and if the veſſel is faſtened by an arm to the pillar of the pedeſtal, ſo as to move round along with the quadrant, it will be the more convenient.

The plumb-line ſhould be made to hang very near the plane of the quadrant, at the lower arrow, but not to touch it: which is done by preſſing with the hand the elaſtic bit of braſs before mentioned, a little backward or forward.

III. *To adjuſt the Teleſcope, or to make its Axis horizontal, when the Index is at 90 Degrees.*

Set the index to 90, keeping the plummet and level right: then direct the teleſcope to ſome diſtant object above a mile off, (but the farther the better) till you ſee a remarkable part of it exactly at the horizontal wire: then take off the quadrant from the pillar, by unſcrewing the two large iron-ſcrews; and invert the quadrant, by ſcrewing it on again with the arc uppermoſt: then ſcrew to the arc of the quadrant a crooked bit of braſs, with a notch in it, as near the arrow as you can, and hang the plummet over that bit of braſs, moving it on one ſide or the other, till the line covers the point on the arc; and if it does not then cover the point on the centre plate alſo, make it do ſo by the ſcrews in the feet: then look through the teleſcope; and if the horizontal wire cuts the ſame part of the object it did before inverſion, the teleſcope is right. If the object appears higher or lower, the wire in the teleſcope muſt be moved half the difference, by the two ſteel ſcrews near the eye end of the teleſcope: if the object appears higher than the horizontal wire, eaſe the lower ſcrew, and ſcrew in the upper one; if the object appears below, eaſe the upper ſcrew, and ſcrew in the lower one; till the horizontal wire cuts the diſtant object at half the difference it did before inverting it: then it is adjuſted for obſervation.

The wire in the teleſcope that is applied to the limb of the ſun, in taking its altitude, ought to be exactly horizontal when the plane of the quadrant is perpendicular. To find if it is ſo: adjuſt the quadrant by the level and plummet, as before directed; then point the teleſcope to ſome ſmall diſtinct object at a diſtance, as the top of a rock, a chimney-head, &c. and remark a particular part of it which the wire croſſes: turn the quadrant a little about gently, towards one ſide; and if all parts of the wire paſs over the ſame part of the object, the wire is truly horizontal. But if one end of the wire croſſes the object higher, or lower, than the other, preſs the two ſmall ſcrews that govern the wire between your finger and thumb, and at the ſame time turn them ſide wiſe, but in oppoſite directions, till, upon looking again, and turning the quadrant, you find all parts of the wire paſs over the ſame part of the object; then it is truly horizontal.

MURAL QUADRANT.

FIGURE III.

Repreſents the inſtrument as fixed to a wall. It is of copper, and of about 5 feet radius. The frame is formed of flat bars, and ſtrengthened by edge bars affixed underneath perpendicularly to them. The radii HB, HA, being divided each into four equal parts, ſerves to find out the points D and E, by which the quadrant is freely ſuſpended on its props or iron ſupports that are faſtened ſecurely in the wall.

One of the ſupports E is repreſented ſeparately in *e* on one ſide of the quadrant. It is moveable by means of a long ſlender rod EF or *ef*, which goes into a hollow ſcrew in order to reſtore the inſtrument to its ſituation when it is diſcovered to be a little deranged. In order to prevent the unſteadineſs of ſo great a machine, there ſhould be placed behind the limb four copper ears with double cocks, I, K, I, K. There are others along the radii HA, and HB. Each of theſe cocks contain two ſcrews, into which is faſtened the ears that are fixed behind the quadrant.

Over the wall or ſtone which ſupports the inſtrument, and at the ſame height as the centre, is placed horizontally the axis PO. This axis turns on two pivots P. On this axis is fixed at right angles another branch ON, loaded at its extremity with a weight N, capable of equipoiſing with its weight that of the teleſcope LM; whilſt the axis, by its extremity neareſt the quadrant, carries the wooden frame PRM, which is faſtened to the teleſcope in M.

The lower extremity (V) of the teleſcope is furniſhed with two ſmall wheels, which take the limb of the quadrant on its two ſides.

When the teleſcope is to be ſtopped at a certain poſition, the copper hand T is to be made uſe of. It is fixed by a ſetting ſcrew, which faſtens it to the limb. Then, in turning the regulating ſcrew, the teleſcope will be advanced; which is continued until the ſtar or other object, whoſe altitude is obſerving, be on the horizontal fine thread in the teleſcope. Then on the plate X, ſupporting the teleſcope, and carrying a vernier or nonius, will be ſeen the number of degrees and minutes, &c. that the angular height of the object obſerved is equal to.

FIGURE IV.

HADLEY's SEXTANT.

For a deſcription of which the reader is referred to the Syſtem of NAVIGATION.

Having gone through the eſſential parts of Aſtronomy, it only remains that I inform the ſubſcribers to the Encyclopædia, that in ſome of the calculative Tables, I have been favoured with the aſſiſtance of Mr. Moody, whoſe mathematical abilities render him extremely capable of undertaking a buſiveſs of this nature; and that in digeſting the whole, recourſe has been had to every valuable work on this ſubject, that has come to our knowledge; the principal of which are the Treatiſes of Dr. Gregory, Keil, Dr. Halley, M. De la Caille, Dr. Long, Robertſon, Heath, Emerſon, De la Lande, &c. together with the Improvements of Dr. Herſchell, &c. collected from the Tranſactions of the Royal Society, and a variety of other miſcellaneous publications.

It has been our ſtudy to make this Syſtem full and comprehenſive, ſo that, with due attention, a perſon may attain a competent knowledge of Aſtronomy, without any other Treatiſe; and by purchaſing a good ſet of Aſtronomical Tables, he will be thoroughly qualified for making actual Calculations of the Motions of the celeſtial Bodies, ſuch as calculating the places of the Sun, Moon, and Planets, for any propoſed time; their conjunctions and oppoſitions with each other; predicting Eclipſes, &c.

I cannot take leave of this ſubject, without expreſſing how much we have been indebted to Mr. ADAMS, (*Mathematical and Aſtronomical Inſtrumental Maker, in Fleet-ſtreet*) *for his encouragement of our undertaking, by ſending us ſeveral of his inſtruments to have drawings from; as it is a point of no ſmall conſequence to practitioners in Aſtronomy, that they ſhould have the moſt neceſſary, and thoſe the moſt accurate Inſtruments that can be made.*

The Uſe of the Globes will be given in the Syſtem of GEOGRAPHY; *alſo other matters relating to Aſtronomy will be inſerted in the* Syſtems of PHILOSOPHY and NAVIGATION, *and under their reſpective Heads in different parts of the* ENCYCLOPÆDIA.

T. BANKES.

Various improved Quadrants, with Hadley's Sextant
(See the Systems of Astronomy & Navigation.)

Fig.1

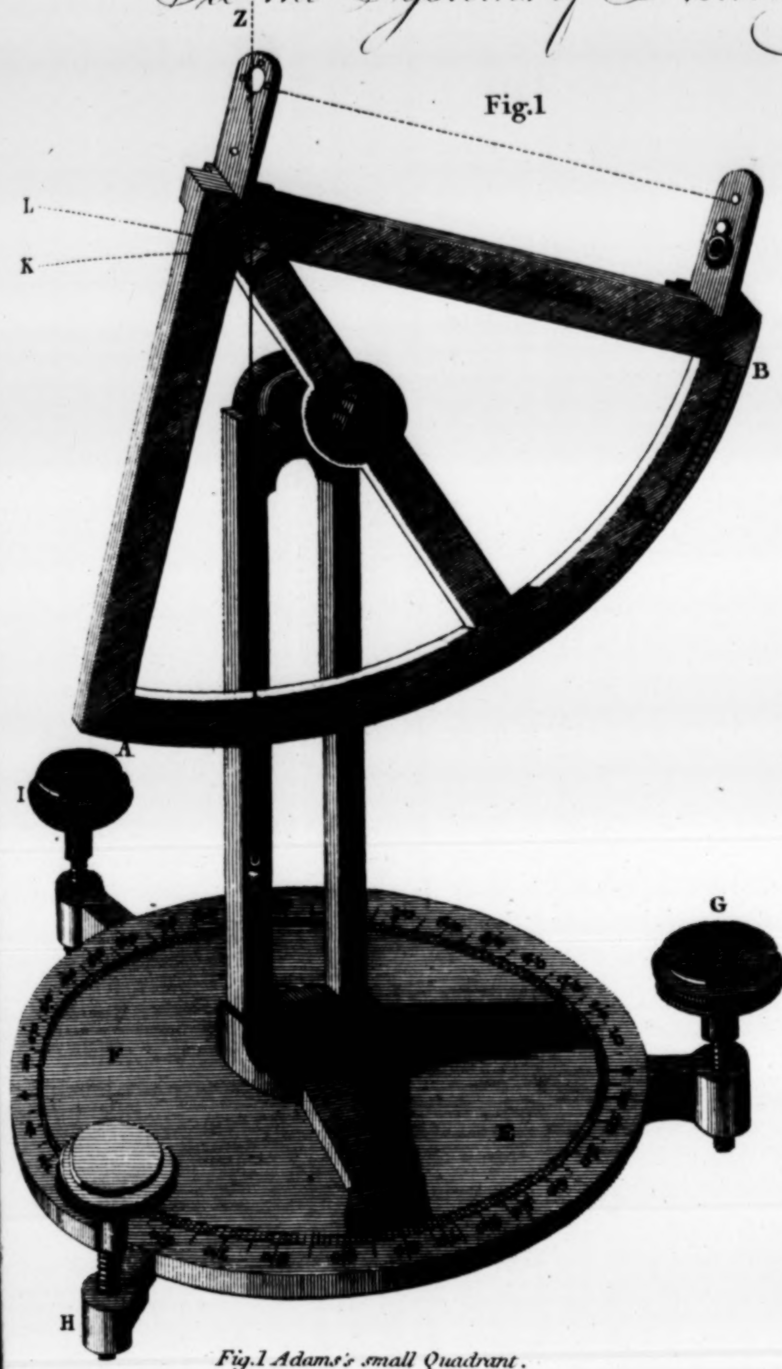
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Fig.1 Adams's small Quadrant.

Fig.2

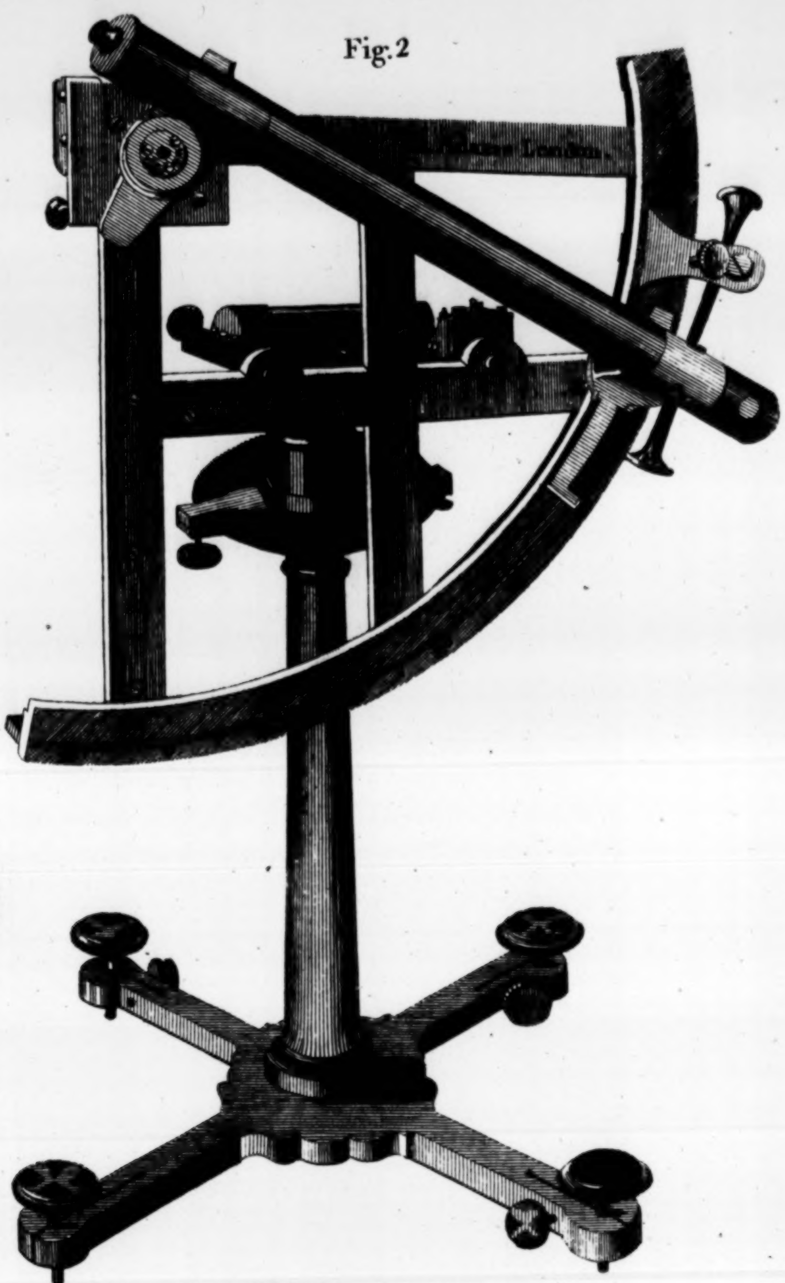
G. Adams London

Fig.2 Bird's twelve inch Quadrant.

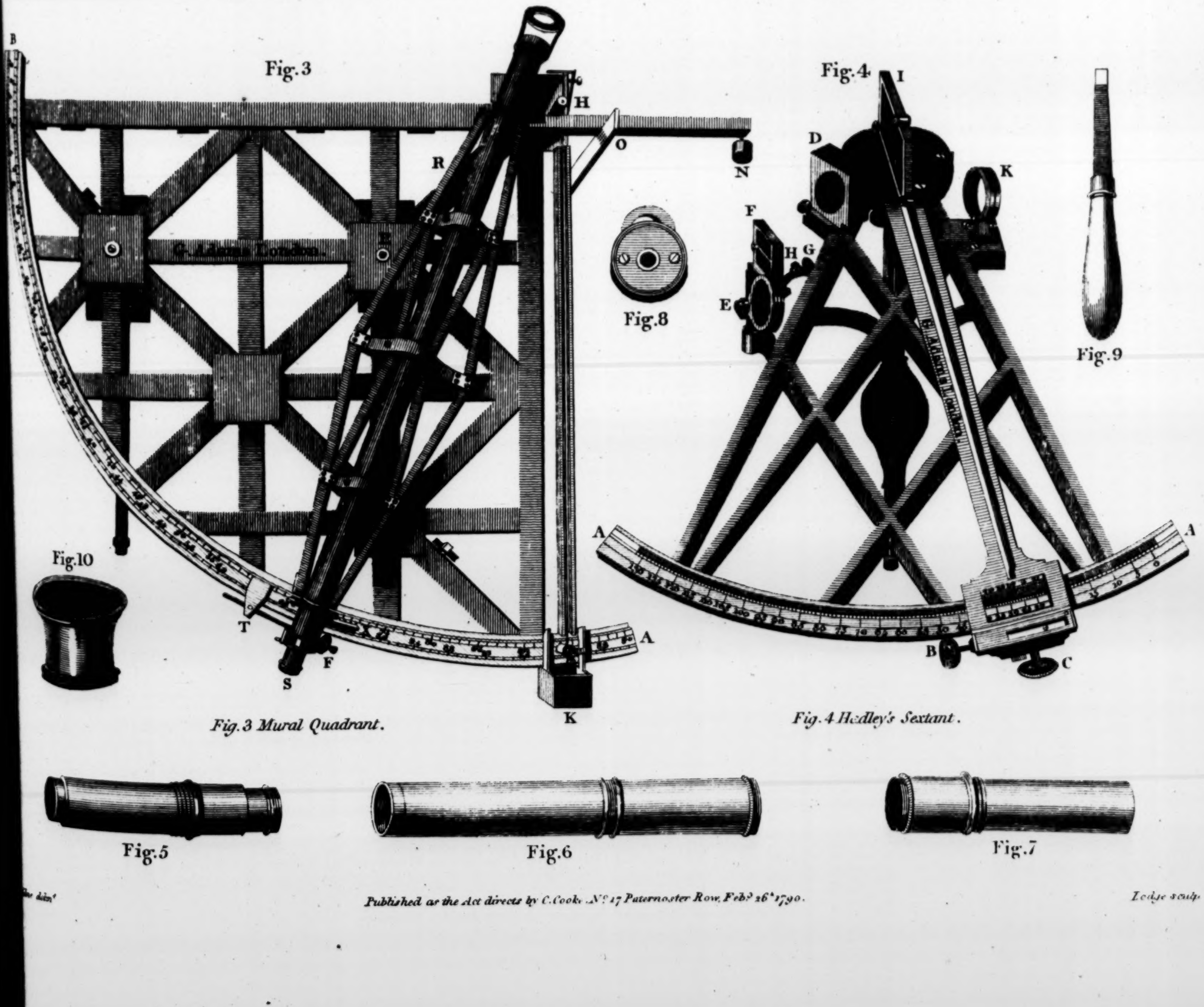
Fig.3
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G. Adams London
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Fig.4
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H
G
E
A
A
B
C
Fig.8
Fig.9
Fig.10

Fig.3 Mural Quadrant.

Fig.4 Hedley's Sextant.

Fig.5

Fig.6

Fig.7

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Lodge sculp.

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13 MR 63
MUSEUM

ASTYNOMI, in Grecian antiquity, were magiſtrates in Athens. correſponding to the ædiles of the Romans; they were ten in number.

ASYLUM, a ſanctuary, or place of refuge, where criminals ſhelter themſelves from the hands of juſtice.

The aſyla of altars and temples were very ancient; and likewiſe thoſe of tombs, ſtatues, and other monuments of conſiderable perſonages.

Thus, the temple of Diana at Epheſus was a refuge for debtors, the tomb of Theſeus for ſlaves. Among the Romans, a celebrated aſylum was opened by Romulus, between the mounts Palatine and Capitoline, in order to people Rome, for all ſorts of perſons indiſcriminately, fugitive ſlaves, debtors, and criminals of every kind. The Jews had their aſylæ; the moſt remarkable of which were, the ſix cities of refuge, the temple, and the altar of burnt-offerings.

It was cuſtomary among the Heathens to allow refuge even to the vileſt and moſt flagrant offenders; and it was by this means, and with ſuch inhabitants, that Thebes, Athens, and Rome, were firſt ſtocked.

The emperors Honorius and Theodoſius granted the like immunities to convents; ſo that convents in a little time became a ſort of fortreſſes; where the moſt notorious villains were in ſafety, and braved the power of the magiſtrate.

Theſe privileges were extended not only to the churches and church-yards, but alſo to the biſhops houſes; whence the criminal could not be removed, without a legal aſſurance of life, and an entire remiſſion of the crime alledged to his charge.

But at length theſe aſylæ or ſanctuaries were ſtripped of their immunities, as they tended only to make guilt and libertiniſm more bold and daring.

ASYMMETRY, implies the want of proportion between the parts of any thing; being contrary to ſymmetry.

ASYMPTOTE, in geometry, is a line which continually approaches nearer to another; but, though continued infinitely, will never meet with it.

In a ſtrict ſenſe the term aſymptotes is appropriated only to right lines, which approach very near to curves of which they are ſaid to be aſymptotes; but if they and their curves are indefinitely continued, they will never meet.

ASYNDETON, in grammar, is a figure which omits the conjunctions in a ſentence.

As in *veni, vidi, vici,* where ET is left out: or in that of Cicero concerning Catiline, *abiit, exceſſit, evaſit, erupit.*

Aſyndeton ſtands oppoſed to polyſyndeton, where the copulatives are multiplied.

ATABULUS, in phyſiology, ſignifies a provincial wind in Apulia, of a dry pinching quality, and very noxious in its effects.

ATAMASCO, in botany, is a ſynonyme of the amaryllis or lily.

ATANTA, in botany, implies the African ſumach.

ATARAXY, was a term uſed by the ſtoics and ſceptics, to denote that calmneſs of mind which ſecures us from all emotions ariſing from vanity and ſelf-conceit.

ATAXY in a general ſenſe, implies the want of order: with phyſicians, it ſignifies irregularity of criſes and paroxyſms of fevers.

ATCHE, in commerce, is a ſmall ſilver coin uſed in Turkey, and of the value of one-third of the Engliſh penny.

ATCHIEVEMENT, in heraldry, denotes the arms of a perſon or family, with all the exterior ornaments of the ſhield; as helmet, mantle, creſt, ſcrolls, and motto, together with ſuch quarterings as may have been acquired by alliances, all marſhalled in order.

ATCHIEVE, ſignifies to perform great actions or exploits.

ATELLANÆ, in Roman hiſtory and antiquities, indicate a kind of theatricals uſually repreſented at Rome; partaking alike of the Greek ſatyræ and the Engliſh farce: hence, thoſe entertainments are denominated ludicrous treats of wit, or burlettas.

ATELEIA, in polity, denotes an exemption from all manner of public taxes or other impoſitions.

ATEMPO Giusto, in muſic, ſignifies to ſing or play in an equal, true, and juſt time.

ATH, Atha, or Athe, in Engliſh hiſtory, denotes the oath taken by the Anglo Saxons, on appointments in government as the ſolemn faith of office. A practice worthy of imitation.

ATHAMADULET, is the title of the prime miniſter of the Perſian empire, as the grand vizir is of the Turkiſh empire. He is great chancellor of the kingdom, preſident of the council, ſuperintendent of the finances, and charged with all foreign affairs.

ATHAMANTA, Spignel, in botany, is a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, Umbellatæ. The fruit is oblong and ſtraited; and the petals are inflected and emarginated. There are nine ſpecies; but none of them merit particular notice, except the cretenſis, daucus creticus, which grows wild in the Levant and the warmer parts of Europe. The flower-ſtalk riſes about two feet high, and ſends forth many branches, terminated at the top by compound umbels, compoſed of near 20 ſmall ones. Theſe have white flowers with five petals, which are ſucceeded by oblong, hairy, channelled fruit, divided into two parts, containing one oblong hairy ſeed, which have a warm biting taſte, with an agreeable aromatic ſmell. They are kept in the ſhops as a medicine, and are carminative, and diuretic; but are little uſed in practice.

ATHANASIA, Tanzy, Goldilocks, in botany, is a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ diſcoides. The receptacle is chaffy; as is the pappus; the calyx is imbricated. There are 20 ſpecies, all tender plants except one; and none of them poſſeſſed of beauty, or any remarkable property.

ATHANATE, in Engliſh antiquity, implies the act of raiſing or enobling a perſon, as the reward of merit; which in former ages was ſo rigidly and ſcrupulouſly attended to, that the former life of the candidate was examined into, leaſt any impediment ſhould lay in the way, to eclipſe the honour conferred by the royal hand.

Was the ſame method now to be purſued, the third eſtate of national repreſentation would, in all probability, be very few in number when compared with the preſent body politic.

ATHANATI, in Perſian antiquity, ſignifies a body of cavalry, conſiſting of 10,000 men, always complete. They were called immortal, becauſe, when one of them happened to die, another was immediately appointed to ſucceed him.

ATHANOR, in chemiſtry, implies a furnace ſo conſtructed that it always maintains an equal heat, which laſts a long time without addition of fuel.

The body of the athanor has nothing in it particular, and is conſtructed like ordinary furnaces. But at one of its ſides, there is an upright hollow tower, which communicates with the fire-place, by one or more ſloping openings. This tower ought to have a lid which exactly cloſes its upper opening.

When the athanor is to be uſed, as much lighted coal is put in the fire-place as is judged neceſſary, and the tower is filled to the top with unlighted fuel. The tower is then to be exactly cloſed with its lid. As faſt as the coal in the fire-place is conſumed, that in the tower falls down and ſupplies its place. As the coal contained in the tower has no free communication with the external air, it cannot burn till it falls into the fire-place.

ATHEISM, implies the diſbelief of a diety.

ATHEIST, denotes a perſon who does not believe in the exiſtence of a deity.

ATHELING, Adeling, Edling, Ethling, or Etheling, among Anglo-Saxons, was a title of honour properly belonging to the heir apparent, or preſumptive, to the crown.

This honourable appellation was firſt conferred by king Edward the confeſſor on Edgar, to whom he was great uncle, when, being without any iſſue of his own, he intended to make him his heir.

ATHENÆA, in antiquity, was a feaſt celebrated by the ancient Greeks in honour of Minerva, who was called Athene.

ATHENÆUM, in antiquity, denoted a public place in which the profeſſors of the liberal arts held their aſſemblies; the rhetoricians declaimed, and the poets rehearſed their performances.

Thoſe places, of which there were a great number at Athens, and Rome, were built in the manner of amphitheatres, encompaſſed with ſeats, called *cunei.*

ATHENATORIUM, in chemiſtry, denotes a thick glaſs cover, generally uſed to encloſe a curcubit.

ATHENIPPÆ, among oculiſts, denote the ſeveral collyriums the eye is ſubject to.

ATHERINA, in ichthyology, is a genus of fiſhes of the order of abdominales.

The characters are, the upper jaw, plain, the rays of the branchioſtege membrane are ſix, with ſhining ſide belts.

There are two ſpecies, viz.

1. The hepſetus with 12 rays in the hinder fin. A native of the Engliſh channel and the mediterranean, uſually denominated a ſmelt. The length is above 4¼ inches, and tail forked. The fiſh is ſemipellucid, covered with ſcales; the colour ſilvery, tinged with yellow: beneath the ſide-line is a row of ſmall black ſpots.

2. The menidea, with 24 rays in the fin next the anus. This is a very ſmall pellucid fiſh, with many black points interſperſed; it has many teeth in the lips, but none in the tongue or jaws. It is found in the freſh waters of Carolina, and ſpawns in April.

ATHEROMA, in medical language, implies a tumor without pain or diſcoloration of the ſkin, containing, in a membranous bag, matter reſembling pap, intermixed with hard and ſtony particles. Theſe kind of tumors are eaſily cured by inciſion.

ATHLETÆ, in antiquity, were perſons of ſtrength and agility, diſciplined to perform in the public games.

Under Athletæ were comprehended wreſtlers, boxers, runners, leapers, throwers of the diſk, and thoſe practiſed in other exerciſes exhibited in the Olympic, Pythian, and other ſolemn ſports; for the conquerors in which there were eſtabliſhed prizes.

ATHLETIC Habit, denotes a ſtrong conſtitution of body. Anciently it ſignified a full fleſhy corpulent ſtate, ſuch as the athletæ endeavoured to arrive at.

The athletic habit is eſteemed the higheſt pitch of health: yet is it dangerous, and the next door to diſeaſe; ſince, when the body is no longer capable of being improved, the next alteration muſt be for the worſe.

ATHLOPHETÆ, in antiquity, were officers who preſided at public games to adjudge the prizes to the victors.

ATHWART, in navigation, is ſynonimous with acroſs the line of the courſe.

Athwart *the Fore-foot*, is a phraſe that denotes the flight of a cannon ball from one ſhip acroſs the courſe of another, to intercept the latter, and oblige her to ſhorten ſail, that the former may come near enough to examine her.

Athwart *Hauſe*, in ſea language, expreſſes the ſituation of a ſhip, when ſhe is driven by wind or tide, or any other accident, acroſs the fore-part of another.

Athwart *Ships*, ſignifies reaching acroſs ſhips from one ſide to the other.

ATIBAR, is the name by which the inhabitants of the kingdom of Gago in Africa call gold duſt; from which word Europeans, and eſpecially the French, have compoſed the word *tibir*, which alſo ſignifies gold duſt among thoſe who trade in that commodity.

ATLANTIDES, in aſtronomy, is a denomination given to the Pleiades, or ſeven ſtars, ſometimes alſo called Vergilliæ. They are ſo called, as being reputed by the poets to have been the daughters either of Atlas or his brother Heſperus, who were tarnſlated into heaven.

ATLAS, in matters of literature, denotes a book of univerſal geography, containing maps of all the known parts of the world.

Atlas, in commerce, implies a ſilk ſatin, manufactured in the Eaſt Indies. There are ſome plain, ſome ſtriped, and ſome flowered, the flowers of which are either gold or only ſilk.

There are atlaſſes of all colours; but moſt of them falſe, eſpecially the red and the crimſon.

The manufacture of them is admirable; the gold and ſilk being worked together after ſuch a manner as no workmen in Europe can imitate; yet they are very far from having that fine gloſs and luſtre which the French know how to give to their ſilk ſtuffs.

In the Chineſe manufactures of this ſort, they gild paper on one ſide with leaf gold; then cut it in long ſlips, and weave it into their ſilks; which makes them, with very little coſt, look very rich and fine. Theſe ſlips are twiſted about ſilk threads, ſo artificially, as to look finer than gold thread, though it is of no great value.

Atlas, in anatomy, is the name of the firſt vertebræ of the neck, which ſupports the head.

Atlas, in architecture, implies the figures which repreſent the human form, and bear up or ſupport a balcony or any member on their head or ſhoulders.

In ſculpture and ſtatuary, the ſame definition takes place.

Atlas, in geography, ſignifies an high mountain in Africa. Hence the mythological fable of Atlas, king of this ſtupendous mount, bearing the heavens on his ſhoulders. The alluſion is figurative, only implying its vaſt height.

ATMOSPHERE, a word generally uſed to ſignify the whole maſs of air, ſurrounding the earth to a conſiderable height.

ATOM, in philoſophy, denotes a particle of matter, ſo minute, as to admit of no diviſion. Atoms are the *minima naturæ*, and are conceived to be the firſt principles or component parts of all phyſical magnitude.

ATOMICAL Philosophy, or the doctrine of atoms, implies a ſyſtem which, from the hypotheſis that atoms are endued with gravity and motion, accounted for the origin and formation of things.

This philoſophy was firſt broached by Moſchus, ſome time before the Trojan war; but was much cultivated and improved by Epicurus; whence it is denominated the *Epicurean philoſophy*.

ATONEMENT, implies the ſame as Expiation, under which head this article is explained.

ATONICS, in grammar, imply unaccepted ſyllables.

ATONY, in medicine, denotes a defect of tune or tenſion, or a laxity or debility of the ſolids of the body.

ATRA Bilis, Black Bile, or Melancholy, in phyſic, according to the ancients it hath a two fold origin: 1ſt, From the groſſer parts of the blood, and this they called the *melancholy humour*. 2d, From yellow bile being highly concocted.

Dr. Percival, in his eſſays Med. and Exp. ſuggeſts, that it is the gall rendered acrid by a ſtagnation in the gall-bladder, and rendered viſcid by the abſorption of its fluid parts.

Bile in this ſtate diſcharged into the duodenum, occaſions an univerſal diſturbance and diſorder until it is evacuated.

Some deſcribe this kind of bile as being acid, harſh, corroding, and, when poured on the ground, bubbling up, and raiſing the earth after the manner of a ferment.

Dr. Percival ſays, that by the uſe of the *infuſ. ſenæ limoniet.* warmed with the *tinct. columb.* he had checked the vomitings occaſioned by this matter.

ATRACTYLIS, Distaff Thistle, in botany, a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, Compoſitæ capitatæ. The corolla is radiated; and each of the little corollæ of the radius has five points like teeth.

There are three ſpecies, viz. 1. The cancellata, or ſmall cnicus, is an annual plant riſing about nine inches high, with a ſlender ſtem, garniſhed with hoary leaves, having ſpines on their edges. At the top of theſe branches are ſent out two or three ſlender ſtalks, each terminated by a head of flowers like thoſe of the thiſtle. The empalement is curiouſly netted over, and is narrow at the top, but ſwelling below; and contains many florets of a pale purple colour. Theſe are each ſucceeded by a ſingle downy ſeed, which in cold years do not ripen in this country.

2. The humilis, or purple prickly cnicus, raiſes about a foot high, with indented leaves, having ſmall ſpines on their edges.

3. The gummifera, or prickly gum-bearing cnicus, known among phyſicians by the name of *carline thiſtle*.

Theſe thiſtles lie cloſe on the ground; and between them the flower is ſituated, without a ſtalk, and having many florets incloſed in a prickly empalement. Thoſe on the border are white; but ſuch as compoſe the diſk are of a yellowiſh colour.

All theſe plants are natives of the warm parts of Europe, as Spain, Sicily, and the Archipelago iſlands, from whence their ſeeds muſt be procured. They muſt be ſown upon an open bed of light earth, where the plants are to remain; and when the plants come up, they ſhould be thinned. ſo as to leave them three or four inches aſunder. The roots of the ſecond will laſt two or three years, and the third is a perennial plant.

The root of the third ſort was formerly uſed as a warm diaphoretic and alexipharmic; but it never came much into uſe in England, and the preſent practice has entirely rejected it.

ATRÆTI, in medicine, denote infants having no perforation in the anus, or perſons imperforated in the vagina or urethra.

ATRAGENE, in botany, is a genus of the polyandria order belonging to the polygamia claſs of plants.

The calyx has four leaves; the petals are 12; and the ſeeds are candated.

There are three ſpecies, all natives of the Eaſt, but merit no deſcription.

ATRAPHAXIS, in botany, is a genus of the diagynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 12th order, Holoraceæ. The calyx has two leaves; the petals are two, and ſinuated; and there is but one ſeed. There are two ſpecies, both natives of warm countries, but meriting no particular deſcription.

ATREBATII, in Engliſh hiſtory, imply a race of people ſeated next to the Bibroci, in part of Berkſhire and part of Oxfordſhire. This was one of thoſe Belgic colonies which had come out of Gaul into Britain, and there retained their ancient name. Atrebatii were a tribe of the Belgæ, who inhabited that country which is now called Artois.

ATRESIA, in medicine, implies perforation, or in other words, ſignifies the caſe of perſons wanting a natural aperture.

ATRETI, in ſcientific language, imply thoſe perſons in whom the anus or genitals are imperforate.

ATRICILLA, in ichthyology, denotes a variety of the larus, of which it is a ſynonyme.

ATRIDALLIS, in ſcience, implies the knowledge of things, conſidered in an abſtracted ſenſe. Hence the theory of arts is ſaid to be atridalliſiac.

ATRIENSES, in antiquity, were upper ſervants in great families at Rome, who had the care and inſpection of the atria and the things lodged in it: they acted as procurators, or agents, of their maſter, in ſelling goods, &c. To their care were committed the ſtatues and images of the maſter's anceſtors, &c. which were placed round the atrium; and which they carried in proceſſion at funerals, &c. They were cloathed in a ſhort white linen habit, to diſtinguiſh them, and prevent their loitering from home.

ATRIP, in nautical language, is a term applied either to the anchor or top ſails. The anchor is atrip, when it is drawn out of the ground in a perpendicular direction, either by the cable or buoy rope. The top ſails are atrip, when they are hoiſted up to the maſt head, or to their utmoſt extent.

ATRIPLEX, Orach, or Arach, in botany, is a genus of the monœcia order, belonging to the polygamia claſs of plants; and, in the natural method, ranking under the 12th order, Holoraceæ. The calyx of the hermaphrodite flower has five leaves; there is no corolla; the ſtamina are five, and the ſtylus is byfid; the ſeed is one, and depreſſed. There are 12 ſpecies.

1. The hortenſis, or garden orach, was formerly cultivated in gardens, and uſed as a ſubſtitute for ſpinage, to which it is ſtill preferred by ſome, though in general it is diſliked by the Engliſh; though it ſtill maintains its credit in France and Ireland. There are three or four varieties of this plant, whoſe only difference is their colour; one is a deep green, another a dark purple, and a third with green leaves and purple borders.

2. The halimus, or broad leaved orach, was formerly cultivated in gardens as a ſhrub.

3. The petulacoides, or ſhrubby ſea-orach, grows wild by the ſea ſide in many parts of this kingdom. It is a low under ſhrub, ſeldom riſing above two feet and an half, or at moſt three feet high; but becomes very buſhy.

The firſt ſort is annual, ſo muſt be propagated by ſeeds. This ſpecies is an article of the materia medica; a decoction of the leaves is recommended in coſtiveneſs, where the patient is of a bilious diſpoſition. The ſecond ſort may be propagated by cuttings. The third ſort requires very little culture. It may be alſo propagated from cuttings, and is to be planted in a poor gravelly ſoil.

ATRIUM, in eccleſiaſtical antiquity, denotes an open place or court before a church, making part of what was called the narthex or antetemple. The atrium in the ancient churches was a large area or ſquare plat of ground, ſurrounded with a portico or cloyſter, ſituate between the porch or veſtible and the body of the church.

Atrium, is alſo uſed, in the canon law, to ſignify the cemetry or church yard.

ATROPA, Deadly Night Shade, in botany, is a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 25th order, Luridæ. The corolla is campanulated; the ſtamina are diſtant; the berry is globular, and conſiſts of two cells.

There are five ſpecies, of which the three following are the moſt remarkable, viz.

1. The belladonna which grows wild in many parts of Britain. It hath a perennial root, which ſends out ſtrong herbaceous ſtalks of a pale purple colour, which riſe to the height of five feet, garniſhed with entire oblong leaves, which towards autumn change to a purple colour. The flowers are large, and come out ſingly between the leaves, upon long foot ſtalks; bell ſhaped, and of a duſky colour on the outſide, but purpliſh within. After the flower is paſt, the germen turns to a large round berry a little flated at the top. It is firſt green; but when ripe, turns to a ſhining black, ſits cloſe upon the empalement, and contains a purple juice of a nauſeous ſweet taſte, and full of ſmall kidney ſhaped ſeeds.

2. The fruteſcens is a native of Spain, and riſes with a ſhrubby ſtem to the height of eight feet; dividing into many branches garniſhed with round leaves, in ſhape like thoſe of the ſtorax tree.

The flowers come out between the leaves on ſhort foot ſtalks, ſhaped like thoſe of the former, but much leſs; of a dirty yellow colour, with a few brown ſtripes: but theſe are never ſucceeded by berries in this country.

3. The herbacea, with an herbaceous ſtalk, is a native of Campeachy. This hath a perennial root, which puts forth ſeveral channelled herbaceous ſtalks riſing about two feet.

4. The mandragora, or mandrake, which has been diſtinguiſhed into the male and female. The male mandrake has a very large, long, and thick root; it is largeſt at the top or head, and from thence gradually grows ſmaller.

The female mandrake perfectly reſembles the other in its manner of growth; but the leaves are longer and narrower, and of a darker colour, as are alſo the ſeeds and roots. It grows naturally in Spain, Portugal, Italy, and the Levant.

The firſt ſpecies, which is markable for its poiſonous qualities, is very ſeldom admitted in gardens, nor ſhould it ever be cultivated or allowed to grow in thoſe places to which children have acceſs. The other kinds are propagated by ſeeds, and placed in a ſtove, as is requiſite for the more tender plants.

Moſes informs us, (Gen. xxx. 14.) that Reuben, the ſon of Leah, being in the field, happened to find mandrakes, which he brought home to his mother. Rachel had a mind to them, and obtained them from Leah, upon condition that ſhe ſhould conſent that Jacob ſhould be Leah's bedfellow the night following. The term דודאים *dudaim*, here made uſe of by Moſes, is one of thoſe words of which the Jews at this day do not underſtand the true ſignification. Some tranſlate it *violets*, others *lilies*, or *jeſſamine*. Junius calls it *agreeable flowers*; Codurquus makes it *truffle*, or *muſhroom*; and Calmet will have it to be the *citron*. Thoſe that would ſupport the tranſlation of *mandrakes* plead, that Rachel being barren, and having a great deſire to conceive, coveted Leah's mandrakes, it may be preſumed, with a view to its prolific virtues. The ancients have given to mandrakes the name of the *apples of love*, and to Venus the name of *mandragoritis*; and the Emperor Julian, in his epiſtle to Calixenes, ſays, that he drinks the juice of mandrakes to excite amorous inclinations.

ATROPHY, in medicine, implies a diſeaſe which the body, or ſome of its parts, do not receive the neceſſary nutriment, but waſte and decay inceſſantly.

ATROPOS, in mythology, was the name of the third of the Parcæ, or Fates, whoſe buſineſs it was to cut the thread of life.

ATTACHMENT, in the Engliſh law, implies the taking or apprehending a perſon by virtue of a writ or precept. It is diſtinguiſhed from an arreſt, by proceeding out of a higher court by precept or writ; whereas the latter proceeds out of an inferior court by precept only. An arreſt lies only on the body of a man; but an attachment lies againſt the goods or againſt both the body and goods.

An attachment by writ differs from diſtreſs, in not extending to lands, as the latter does; nor does a diſtreſs touch the body, as an attachment does.

Attachment *out of the High Court of Chancery*, is obtained upon an affidavit made, that the defendant was ſerved with a ſubpœna, and made no appearance; or it iſſues upon not performing ſome order or decree. Upon the return of this attachment by the ſheriff, *quod non eſt inventus in balliva ſua*, another attachment, with a proclamation, iſſues; and if he ſtill refuſes to appear, then a commiſſion of rebellion.

Attachment *of the Foreſt*, is one of the three courts held in the foreſt. The loweſt court is called the *court of attachment*, or *wood mote court*; the mean, *ſwan mote*; and the higheſt, the *juſtice in eyre's ſeat*. The court of attachments has its name from the verdurers of the foreſt having no other authority in it, but to receive the attachments of offenders againſt vert and veniſon taken by the foreſters, and to enroll them, that they may be preſented or puniſhed at the next juſtice in eyre's ſeat. This attachment is by three means: 1. by goods and chattels; 2. by body, pledges, or main prize; 3. or by the body only. This court is held every 40 days throughout the year; and is from thence called the *forty days court*.

Foreign Attachment, implies an attachment of money or goods found within a liberty or city, to ſatisfy ſome creditor within the ſame. By the cuſtom of London, and ſeveral other places, a man can attach money or goods in the hands of a ſtranger, to ſatisfy himſelf provided he can produce evidence, but not otherwiſe.

ATTACK, is a violent attempt upon any perſon or thing, an aſſault, or the act of beginning a combat or diſpute.

Attack, in the military art, implies an effort made to force a poſt, break a body of troops, &c.

Attack *of a Siege*, is a furious aſſault made by the beſiegers with trenches, covers, mines, &c. in order to make themſelves maſters of a fortreſs, by ſtorming one of its ſides.

ATTACOTTI, were an ancient people of Britain, mentioned by Ammianus, Marcellinus and St. Jerome, as well as in the Notitia Imperii.

They are repreſented as allies and confederates of the Scots and Picts, and therefore probably their neighbours: though their preciſe ſituation has not been determined by antiquaries.

ATTAINDER, in law, is ſaid to lay, when ſentence of death, the moſt terrible and higheſt judgment in our laws, is pronounced, the immediate inſeperable conſequence by the common law, is attainder. For then it is clear beyond all diſpute, that the criminal is no longer fit to live, but is to be cut off as a bane to ſociety, the law ſets a note of infamy upon him, puts him out of its protection, and takes no farther care of him than barely to ſee him executed. He is then called attaint, attinctus, ſtained, or blackened. He no longer has any credit or reputation; nor can he be a witneſs in any court; neither is he capable of performing the functions of another man: for by an anticipation of his puniſhment, he is already dead in law. This is after judgment: for there is great difference between a man convicted, and attainted. After conviction only, a man is liable to none of theſe diſabilities: for there is ſtill in contemplation of law a poſſibility of his innocence. Something may be offered in arreſt of judgment: the indictment may be erroneous, which will render his guilt uncertain, and upon which the preſent conviction may be quaſhed: he may obtain a pardon, or be allowed the benefit of clergy.

Attainders may be reverſed or falſified, (i. e. proved to be falſe) by writ of error, or by plea. If by writ of error, it muſt be by the king's leave, &c. and when by plea, it may be by denying the treaſon, and pleading a pardon by act of parliament.

Perſons may be attainted by act of parliament. Acts of attainder of criminals have been paſſed in ſeveral reigns, on the diſcovery of plots and rebellions, from the reign of king Charles II. when an act was made for the attainder of ſeveral perſons of the murder of king Charles I.

Among acts of this nature, that for attainting Sir John Fenwick, for conſpiring againſt king William, is the moſt remarkable; it being made to attaint and convict him of high treaſon on the oath of one witneſs, juſt after a law had been enacted, "That no perſon ſhould be tried or attainted of high treaſon where corruption of blood is incurred, but by the oath of two lawful witneſſes, unleſs the party confeſs, ſtand mute, &c." Stat. 7. and 8. W. III. cap. 3. But in the caſe of Sir John Fenwick there was ſomething extraordinary; for he was indicted of treaſon on the oaths of two witneſſes, though but only one could be produced againſt him on his trial; this argues a partial and unjuſt procedure, much to the diſgrace of the reign which permitted ſuch a flagrant breach of the laws for the protection of the ſubject, merely to gratify miniſterial influence and arbitrary meaſures of the crown.

ATTAINT, in law, is a writ that lies after judgment againſt a jury of twelve men that have given falſe verdict in a court of record, in an action real or perſonal, where the debt or damages amount to above 40s. Stat. 5. and 34 Ed. III. c. 7.

It is called attaint, becauſe the party that obtains it endeavours thereby to ſtain or taint the credit of the jury with perjury, by whoſe verdict he is grieved.

The jury who are to try this falſe verdict muſt be twenty four, and are called the grand jury; for the law wills not that the oath of one jury of twelve men ſhould be attainted or ſet aſide by an equal number, nor by leſs indeed than double the former. And he that brings the attaint can give no other evidence to the grand jury, than what was originally given to the petit jury. For as their verdict is now trying, and the queſtion is whether or no they did right upon the evidence that appeared to them, the law adjudged it the higheſt abſurdity to produce any ſubſequent proof upon ſuch trial, and to condemn the prior juriſdiction for not believing evidence which they never knew. But thoſe againſt whom it is brought are allowed, in the affirmance of the firſt verdict, to produce new matter: becauſe the petit jury may have formed their verdict upon evidence of their own knowledge, which never appeared in court; and becauſe very terrible was the judgment which the common law inflicted upon them, if the grand jury found their verdict a falſe one. The judgment was; 1. That they ſhould loſe their liberam legem, and become for ever infamous.

2. That they ſhould forfeit all their goods and chattels.

3 That their lands and tenements ſhould be ſeized into the king's hands.

4. That their wives and children ſhould be thrown out of doors.

5. That their houſes ſhould be raſed to the ground.

6. That their trees ſhould be rooted up.

7. That their meadows ſhould be ploughed.

8. That their bodies ſhould be caſt into jail.

9. That the party ſhould be reſtored to all that he loſt by reaſon of the unjuſt verdict.

But as the ſeverity of this puniſhment had its uſual effect, in preventing the law from being executed, therefore by the ſtatute 11 Hen. VII. c. 24. revived by 23 Hen. VIII. c. 3. and made perpetual by 13 Eliz. c. 25. it is allowed to be brought after the death of the party, and a more moderate puniſhment was inflicted upon attainted jurors; viz perpetual infamy, and if the cauſe of action were above 40l. value, a forfeiture of 20l. a piece by the jurors; or, if under 40l. then 5l. a piece; to be divided between the king and the party injured. So that a man may now actually bring an attaint either upon the ſtatute or at common law, at his election; and in both of them may reverſe the former judgment. But the practice of ſetting aſide verdicts upon motion, and granting new trials, has ſo ſuperſeded the uſe of both ſorts of attaints, that there is hardly any inſtance of an attaint later than the 16th century. Vide Blackſtone's Commentaries on the Laws of England.

Attaint, among farriers, is a knock or hurt in a horſe's leg, proceeding either from a blow with another horſe's foot, or from an over reach in froſty weather, when a horſe, being rough-ſhod, or having ſhoes with long caulkers, ſtrikes his hinder feet againſt his fore leg.

ATTAINTED, in law, implies a perſon's being under attainder.

ATTALICÆ Vestes, in antiquity, were garments made of a kind of cloth of gold. They took the denomination from Attalus, ſurnamed Philometer, a wealthy king of Pergamus, who was the firſt, according to Pliny, who procured gold to be woven into cloth.

ATTELABUS, in entomology, is a genus of inſects belonging to the order of coleoptera or beetle kind. It has four wings, of which the ſuperior are cruſtaceous, and ſerve as a ſheath or cover to the inferior, which are membranous. The head tapers behind, and is inclined; the feelers turn thicker towards the apex. The ſpecies are 13; viz.

1. The coryli is black, with red elytra or cruſtaceous wings.

2. The avellana is black, with the breaſt, feet, and elytra red.

3. The curculionoides is black, with red elytra and breaſt. The above three ſpecies frequent the leaves of the hazel and fillbert nut trees.

4. The ſurinamenſis has a double indentation or two teeth in the top of the elytra. It is a native of Surinam.

5. Then penſilvanicus is black, with red elytra, a black belt round the middle, and another towards the apex of the elytra. It is a native of Philadelphia and parts adjacent.

6. The melanurus is black, with teſtaceous elytra, black at the apex. It is a native of Sweden.

7. The betula has ſaltatory or ſpringy legs, and the whole body is of a dark red colour. It frequents the leaves of the birch tree.

8. The formicarius is black, with red elytra, and a double white belt towards the baſe. It is a native of Europe.

9. The ſipylus is green, with a hairy breaſt, and a double yellow belt upon the elytra.

10. The apiarius is bluiſh, with red elytra, and three black belts. It is a native of Germany.

11. The mollis is yellowiſh and hairy, with pale elytra, and three belts. It is a native of Europe.

12. The ceramboides is of a blackiſh red colour, and the elytra is furrowed. It frequents the ſpongy boletus, a ſpecies of muſhroom.

13. The bupreſtoides is of a dark red colour, with a globular breaſt, and nervous elytra. It is a native of all parts of Europe.

ATTENTION, implies a due application of the ear, or the mind, to any thing ſaid or done, in order to acquire a knowledge of it. The word is compounded of *ad*, to, and *tendo*, I ſtretch.

Attention of mind is not properly an act of the underſtanding; but rather of the will, by which it calls the underſtanding from the conſideration of other objects, and directs it to the thing in hand. Yet nevertheleſs, our attention is not always voluntary: for an intereſting object ſeizes and fixes it beyond the power of controul.

Attention, or *Attentio*, in reſpect of hearing, is the ſtretching or ſtraining of the membrana tympani, ſo as to make it more ſuſceptible of ſounds, and better prepared to catch even a feeble agitation of the air.

According to the degree of attention, objects make a ſtronger or weaker impreſſion.

" Sounds, ſays Lord Bacon, are meliorated by the intenſion of the ſenſe, where the common ſenſe is collected moſt to the particular ſenſe of hearing, and the ſight ſuſpended. Therefore ſounds are ſweeter, as well as greater, in the night than in the day; and I ſuppoſe they are ſweeter to blind men than to others; and it is manifeſt, that between ſleeping and waking, when all the ſenſes are bound and ſuſpended, muſic is far ſweeter than when one is fully waking."

Attention is requiſite even to the ſimple act of ſeeing: the eye can take in a conſiderable field at one look; but no object in the field is ſeen diſtinctly but that ſingly which fixes the attention, but in a profound reverie that totally occupies the attention, we ſcarce ſee what is directly before us.

In a train of perceptions, no particular object makes ſuch a figure as it would do ſingly, and apart; for when the attention is divided among many objects, no particular object is intitled to a large ſhare. Hence, the ſtillneſs of night contributes to terror, there being nothing to divert the attention.

ATTENUANTS, or Attenuating *Medicines*, are ſuch as ſubtilize and break the humours into finer parts; and diſpoſe them for motion, circulation, and excretion.

They are of very extenſive uſe in phyſic, and come under different denominations, according to the different effects they produce. When tenacious and viſcid juices ſtagnate in the cavities of the veſſels, and obſtruct the minute ducts of the viſcera emunctories, theſe medicines by their inciding and attenuating quality, diſcharge the humours, and remove the obſtructions; for which reaſon they are not improperly called aperients.

Thoſe medicines produce ſo great a variety of effects, that it is proper we ſhould be well acquainted with their ſeveral kinds, when apprporiated to their ſeveral diſorders, and know which will prove moſt ſerviceable in each.

Hoffman ſays, the diſſolving and attenuating of viſcid crudities in the ſtomach and primæ viæ, is well anſwered by the roots of arum, acorus, pepper, ginger, and the like; as alſo by ſal ammoniac, vitriolated tartar, fixed alkaline ſalts, and the ſimple or dulcified ſpirit of ſalt.

When crude unconcocted humours are to be evacuated by ſtool, this intention is very well anſwered by the neutral ſalts, as the ſalts of the purging waters, and the ſal polycreſtum, with a ſufficient quantity of a watery vehicle.

When viſcid humours, which occaſion diſorders of the breaſt, are to be attenuated and expectorated, the intention is moſt effectually anſwered by elecampane and orice roots; gum ammoniacum, myrrh, or benjamin, and balſam of Peru; or by regenerated tartar, oxymel of ſquills, a ſolution of crabs eyes in diſtilled vinegar, and the ſyrups of tobacco, and the like.

But when the maſs of blood is tainted by thick and tenacious ſordes, and the emunctories are by that means obſtructed, the humours contaminated by a ſaline ſulphureous and ſcorbutic dyſcracy, the moſt efficacious of the attenuants are the horſe radiſh, ſcurvy graſs, water and garden creſſes, muſtard, gum ammoniacum, benjamin, myrrh, the oil of fixed nitre, oil of tartar per deliquium, ſolutions of nitre, ſpirit of ſal ammoniac, ſalt of wormwood with lemon juice, and the ſalts of the medicinal or mineral ſprings.

Likewiſe when grumous or coagulated blood is occaſioned by contuſions, the intention is ſure to be anſwered by the roots of Solomon's ſeal, vinegar, and crabs eyes, regenerated tartar, and nitre prepared with antimony.

And alſo in caſes where the lymph has acquired a preternatural thickneſs and viſcidity, particularly in venereal caſes, the curative intention is moſt effectually anſwered by guaiacum, the acrid tincture of antimony, or calomel æthops mineral; which, when ſkilfully uſed, are of ſingular efficacy in diſſolving and attenuating the viſcid juices impacted in the glands of the liver.

ATTENUATION, in the materia medica, implies the act of attenuating; or making a fluid thinner than it was before.

It is alſo defined the dividing or ſeparating of the minute parts of any body, which before, by their mutual nexus or implication, formed a more continuous maſs.

ATTENUATION, among alchemiſts, ſignifies pulverization, or the act of reducting a body into an impalpable powder.

ATTESTATION, in law, ſignifies the ſignature of a witneſs who thereby becomes an evidence of legal acceptance; ſo that in courts of record the atteſtator is bona fide ſubſtantial evidence on behalf of either party, ſo as to prove the tranſaction to have actually taken place agreeably to the words of the deed or writing.

ATTESTED, in a general ſenſe, denotes the ſign manual of a perſon who was an eye witneſs to the performance of a thing.

ATTIC, in compoſition, implies the very eſſential parts of ſpeech, ſo as to collect the ſalt as it were of active underſtanding.

Attic, in architecture, implies a little kind of embelliſhment to any order, finiſhed on the coronating parts of a building.

Attic *Story*, among builders, denotes the higheſt loft in a houſe which is capable of being inhabited.

ATTILUS, in ichthyology, is a ſpecies of the ſturgeon genus, of which it is a ſynonymed variety.

ATTINGA, in amphibiology, indicates a variety of ſpecies of the diodon, in the order of Nantes; which, according to the claſſification and arrangement of the natural hiſtory of this work, will have a place in the Syſtem of Ichthyology, inſtead of the order it has hitherto occupied.

ATTIRE, in the menage, ſignifies the head or horns of a deer.

The attire of a ſtag, conſiſts of bur, pearls, beam, gutters, antler, ſur-antler, royal, ſur-royal, and crotches; but of a buck, of the bur, beam, brow-antler, advancer, palm, and ſpellers.

ATTITUDE, in painting and ſculpture, implies the geſture of a figure or ſtatue; ſo as to expreſs the action and ſentiments of the perſon repreſented.

ATTOLLENS, in anatomy, is an appellation given to ſeveral muſcles, otherwiſe called *levatores* and *elevatores*.

ATTORNEY *at Law*, ſignifies an officer in common law, of equal authority with a Procurator or Proctor of the civilians and canoniſts: one who is put in the place and ſtead of another, to manage his matters in law.

Formerly every ſuitor was obliged to appear in perſon, to proſecute or defend his ſuit, unleſs exempted by ſpecial licence under the king's letters patent, which is ſtill obſerved in criminal caſes.

And an idiot cannot to this day appear by attorney, but in perſon; as he is not competent in law to appoint a proper ſubſtitute: and upon his being brought before the court in ſo defenceleſs a condition, the judges are bound to take care of his intereſts, and admit the beſt plea in his behalf that any one preſent can ſuggeſt.

By divers ancient ſtatutes, of which the firſt is ſtatute Weſt. 2. c. 10. attornies may be made to proſecute or defend any action in the abſence of the parties to the ſuit. Attornies are in all points officers of the reſpective courts in which they are admitted at Weſtminſter hall, or elſewhere; and as they have many privileges on account of their attendance, ſo they are peculiarly ſubject to the cenſure and animadverſion of the judges.

No perſon can practiſe as an attorney in any court, but ſuch as are admitted and ſworn attornies of that particular court, unleſs by proxy; or in other words, deputed by one admitted of the court in which the record is made up for iſſue; in which caſe the acting attorney ſigns his own name by ſuch a perſon (ſigning the name of the ſuppoſed principal agent of the ſuit.)

To practice in chancery, it is neceſſary to be admitted a ſolicitor in that court: and by the ſtatute 22 Geo. II. c. 46. no perſon ſhall act as an attorney at the quarter-ſeſſions, but ſuch as have been regularly admitted into ſome ſuperior court of record.

Attornies in the exchequer are called agents.

Attornies are to take out certificates annually; and if reſident in London, Weſtminſter, or within the bills of mortality, or in Edinburgh, they are obliged to pay 5l. for the ſame; and in every other part of Great Britain 3l.

Theſe duties are under the management of the commiſſioners of ſtamps: and every acting ſolicitor, and other perſon as above, ſhall annually deliver in a note of his name and reſidence, to the proper officer of the court in which he practiſes; the entering officers are to certify notes delivered, and iſſue annual certificates, ſtamped as above, which muſt be renewed ten days before they expire. Refuſing to iſſue certificates, or iſſuing them improperly, is a penalty of 50l. with coſts and damages to the party aggrieved.

Acting without a certificate, or giving in a falſe place of reſidence, is alſo a penalty of 50l. and an incapacity to ſue for fees due. A ſtamped memorandum muſt be given to the proper officer, of the names of the parties in every action; and in ſuch caſes as uſed to require precipes with precipes alſo.

Officers who receive ſtamped memorandums, are to file the ſame, on penalty of 50l. and perſons not acting conformable to this act forfeit 5l.

Attorney *General*, in law, is a great officer under the king, made by letters patent. It is his province to exhibit informations or examinations, and proſecute for the crown, in matters of a criminal nature; and to file bills in the exchequer, for any thing concerning the profits of the crown; and others may bring bills againſt the king's attorney. It is the buſineſs of the attorney general upon any ſpecial matter of a criminal nature, in which his attendance is required, to ſit under the judges on the left hand of the clerk of the crown: but this is only upon ſolemn and extraordinary occaſions; for uſually he ſits within the bar in the face of the court.

ATTOURNMENT, or **Attornmene**, in law, ſignifies a transfer from one lord to another of the homage and ſervices of tenants, as an acknowledgement of duty to the new landlord.

ATTRACTION, in natural philoſophy, imports a general term uſed to denote the cauſe by which bodies tend towards each other, and cohere till ſeparated by ſome other power.

The firſt author in this country who adopted the notion of attraction was Dr. Gilbert, and the next the celebrated Lord Bacon. In France it was received by Fermat and Roberval; and in Italy by Galileo and Borelli. But till the famous Sir Iſaac Newton appeared, this principle was very imperfectly defined and applied.

There are divers particular kinds of attraction; as, gravity, magnetiſm, electricity, &c. which are ſo many different principles acting by different laws, and only agreeing in this, that we do not ſee any phyſical cauſes of the phænomena; but that, as to our ſenſes, they may really ariſe from ſome power or efficacy in ſuch bodies, by which they are enabled to act even upon diſtant bodies.

Attraction may be properly divided into two ſorts, viz.

1. That which extends to a ſenſible diſtance. Such are the attraction of gravity, found in all bodies; and the attraction of magnetiſm and electricity, found in particular bodies.

The attraction of gravity, called by mathematicians the centripetal force, is one of the greateſt and moſt univerſal principles in nature. From this ariſes all the motion, and conſequently all the mutation, in the great world. By it heavy bodies deſcend, and light ones aſcend; projectiles are directed, vapours, and exhalations riſe, and rains, &c. fall. By it alſo, rivers glide, the air preſſes, the ocean ſwells, &c. In effect, the motions ariſing from this principle make the ſubject of that extenſive branch of mathematics, called mechanics or ſtatics, with the parts or appendages of it, uſually called hydroſtatics, pneumatics, &c.

2. That which does not extend to ſenſible diſtances. Such is found to obtain in the minute particles of which bodies are compoſed, and which attract each other at or extremely near the point of contact, with a force much ſuperior to that of gravity, but which at any diſtance from it decreaſes much faſter than the power of gravity.

This latter kind of attraction was diſcovered by Sir Iſaac Newton, by whom the former was greatly improved.

ATTRIBUTE, in rhetoric, in a general ſenſe, implies that which agrees with ſome perſon or thing; or a quality determining ſomething to be performed after a certain manner.

Thus underſtanding is an attribute of mind, and extenſion an attribute of body.

That attribute which the mind conceives as the foundation of all the reſt, is called its eſſential attribute: thus extenſion is by ſome, and ſolidity by others, eſteemed the eſſential attributes of corporeal ſubſtances.

ATTRIBUTES, in theology, are the ſeveral qualities or perfections of the Divine nature of the Deity.

Attributes, in logic, are the predicates of ſubject, ſo that it may be affirmed or denied.

Attributes, in painting and ſculpture, are ſymbols added to ſeveral figures, to intimate their particular office and character. Thus the eagle is an attribute of Jupiter; a peacock, of Juno; a caduce, of Mercury; a club, of Hercules; and a palm, of Victory; a croſs, the enſign of Chriſtian faith, &c. &c.

ATTRIBUTIVES, in grammar, are ſuch words as are ſignificant of attributes; and thus include adjectives, verbs, and particles, which are attributes of ſubſtances; and adverbs, which denote the attributes of attributes.

Mr. Harris has introduced this diſtribution of words, and denominates the former *attributives of the firſt order*, and the latter *attributives of the ſecond order*.

ATTRITION, in mechanics, implies the rubbing or ſtriking of bodies one againſt another, ſo as to throw off ſome of their ſuperficies by exerciſe.

ATTROW, in botany, is a variety of the knotted graſs called kali, under which name the genus is explained. The ſynonymed epithet is only peculiar to the Guieneſe Africans, where it is uſed with ſucceſs to remove tumors and ſwellings.

ATTRUMMAPHOC, in botany, is a ſynonyme of the colutea. The former name is only uſed by the oculiſts of Guinea in Africa, where this plant is in high eſtimation as a preſervative againſt blindneſs.

AVA Ava, in botany, is a plant ſo called by the inhabitants of Otaheite, in the South ſea, from the leaves of which they expreſs an intoxicating juice. It is drank very freely by the chiefs and other conſiderable perſons, who vie with each other in drinking the greateſt number of draughts, each draught being about a pint; the women are reſtrained from the uſe of it.

AVADOUTAS, are a ſect of Indian Bramins, who in auſterity ſurpaſs all the reſt. The other ſects retain earthen veſſels for holding their proviſions, and a ſtick to lean on: but none of theſe are uſed by the Avadoutas, or ſtrolling mendicants. They only cover their nakedneſs with a piece of cloth; beſmearing their bodies with cow-dung. When hungry, ſome go into houſes, and, without ſpeaking, hold out their hand; eating on the ſpot whatever is given them. Others of this order retire to the ſides of holy rivers, and there eat the proviſions, which the peaſants bring to them.

AVALANCHES, in modern hiſtory, imply prodigious ſnow-balls that frequently roll down the mountains in Savoy, particularly Mount Blanc, to the extreme danger of ſuch adventurous travellers as attempt to aſcend thoſe ſtupendous heights. Some of theſe avalanches are 200 feet in diameter; being fragments of the ice-rocks which break by their own weight from the tops of the precipices.

AVANIA, in the Turkiſh legiſlature, denotes a fine for crimes of almoſt every denomination paid to the governor of the place. A Turkiſh governor takes this profitable method of puniſhing all crimes among the Chriſtians or Jews, unleſs it be for the murder of a Turk.

AVANTURINE, in foſſilogy, demonſtrates a ſort of ſtone of ſhining particles in its contextures. Hence the various compoſitions of glaſs and the filings of copper, ſteel and ſilver, in imitation of this curious production of nature; which, when grated, has a pleaſing effect upon writings inſtead of ſand.

AVARAMO Temo, in botany, ſignifies a ſiloquoſe tree, a native of South America, the bark of which is ſaid to be good againſt cancers, and alſo an aſtringent, and powerful in invigorating relaxed parts.

AVARIA, in the Turkiſh polity, indicates the doceur taken by the Mahometan governors as a conciliating fee, when falſe reports are given of the conduct of Chriſtian ſubjects; a mode not unfrequent in the Turkiſh cities of note.

AVAST, in the ſea-language, is a term requiring to ſtop, keep off, or ſtand aloof.

AVAUNCHERS, in the menage, are the ſecond branches of a deer's horns.

AUBAINE, in the cuſtoms of France, is a right veſted in the king as heir to all foreigners that die within his dominions.

By this right the French king is ſole legatee of all foreigners that die within his dominions, notwithſtanding any teſtament the deceaſed can or may make.

An ambaſſador is not ſubject to the right of aubaine; the Swiſs, Savoyards, Iriſh, Scots, and Portugueſe, are alſo exempted, being deemed natives and regnicoles.

AUBIN, in horſemanſhip, ſignifies a broken gait of going between an amble and a gallop, and accounted as a defect.

AUCTION, implies a public ſale, now very much in uſe for diſpoſing of houſehold goods, books, plate, &c.

By this method of ſale the higheſt bidder is always the buyer. This method was originally a kind of ſale among the ancient Romans, performed by the public crier *ſub haſta*, i. e. under a ſpear ſtuck up on that occaſion, by a magiſtrate, who made good the ſale by the delivery of the goods.

AUDEANISM, in eccleſiaſtical hiſtory, is the ſame with anthropomorphiſm, or anthroporphites.

AUDIENCE, in a general ſenſe, implies hearing, or the aſſemblage of perſons who are diſpoſed to hear ſomething to be ſaid or ſpoken.

In polity, it implies a ceremony obſerved in courts on the admiſſion of ambaſſadors or public miniſters to the preſence of a king, &c.

In England, an audience is given to ambaſſadors in the preſence-chamber; to envoys and reſidents, in a gallery, cloſet, or in any place where the king happens to be. Upon being admitted, as is the cuſtom of all courts, they make three bows; after which they cover and ſit down; but not before the king is covered and ſat down, and has given them the ſign to put on their hats. When the monarch does not chuſe to have them covered, and ſit, he himſelf ſtands uncovered; which is taken as diſreſpect.

At Conſtantinople, miniſters uſually have audience of the prime vizier, inſtead of the ſultan.

Audience is alſo the name of a court of juſtice eſtabliſhed in the Weſt-Indies belonging to the Spaniards, anſwering in effect to the parliament of France. Theſe courts comprehend ſeveral provinces, called alſo audiences from the names of the tribunal to which they belong.

Audience is alſo the name of an eccleſiaſtical court held by the archbiſhop of Canterbury, in which differences upon elections, conſecrations, inſtitutions, marriages, &c. are heard and determined.

AUDIENDO & Terminando, in law, is a writ of commiſſion to certain perſons, when an inſurrection or riot is committed in any place, for the appeaſing of the populace, and the puniſhment of the ring leaders.

AUDIENTES, or Auditores, in church hiſtory, were an order of catechumens; conſiſting of thoſe newly inſtructed in the myſteries of the Chriſtian religion, and not yet admitted to baptiſm.

AUDIT, implies a regular hearing and examination of an account by proper officers, appointed for that purpoſe.

AUDITOR, in a general ſenſe, ſignifies a hearer, or one who liſtens or attends to any thing.

Auditor, in law, is an officer of the king, who examines yearly the accounts of the under officers, or clerks, makes up a general book, with the difference between their receipts and charges, and their allowances to allocations.

Auditor *of the Receipts*, in government, is an officer of the exchequer who files the tellers bills, makes an entry of them, and gives the lord treaſurer a certificate of the money received the week before. He alſo makes debentures to every teller, before they receive any money, and takes their accounts. He keeps the black book of receipts, and the treaſurer's key of the treaſury, and ſees every teller's money locked up in the new treaſury.

Auditors *of the Revenue*, or properly ſpeaking, of the exchequer, are officers who take the accounts of thoſe who collect the revenues and taxes raiſed by parliament, and receive the accounts of the ſheriffs, eſcheators, collectors, tenants, and cuſtomers, and ſet them down in a book, and perfect them by diſtinguiſhing their ſeveral amounts.

Auditors *of the Preſt and Impreſt*, were officers of the exchequer, who took and made up the accounts of Ireland, Berwick, the mint, and of any money impreſſed to any man for the king's ſervice. They received poundage on all accounts paſſed by them, which amounted to a prodigious ſum, eſpecially in time of war. But the office is now aboliſhed, and 7000l. a year given to the incumbents.

Auditors *Collegiate, Conventual*, &c. were officers formerly appointed in colleges, &c. to examine and paſs their accounts.

AUDITORIUM, in the ancient churches, was that part of the church where the audientes ſtood to hear and be inſtructed.

The auditorium was that part now called *navis eccleſiæ*. In the primitive times, the church was ſo ſtrict in keeping the people together in that place, that the perſon who went from thence in ſermon time was ordered by the council of Carthage to be excommunicated.

AUDITORY, in a general ſenſe, implies ſomething relating to hearing, whether vocal or inſtrumental.

Auditory, or Audience, ſignifies an aſſembly of people who attend to hear a perſon that ſpeaks in public.

Auditory is alſo uſed for the bench on which a magiſtrate or judge hears cauſes.

Auditory *Paſſage*, in anatomy, is the entrance of the ear.

AVELLANDA, in botany, is a name given to the roots of the tarſi, or ſweet cyprus. It is a native of South America. They are eſculent and highly palateable. This ſpecies ſeems to be a variety of the avellana nux. The Spaniards eſteem theſe roots as ſalutary in many medical preſcriptions.

AVELLANE, in heraldry, a croſs, the quarters of which ſomewhat reſemble a filbert-nut. Sylvanus Morgan ſays, that it is the croſs which enſigns the mound of authority, or the ſovereign's globe.

AVE-MARIA, or Hail Mary, ſignifies the angel Gabriel's ſalutation of the Virgin Mary, when he brought her the tidings of the incarnation. It is become a prayer or form of devotion in the Romiſh church. Their chaplets and roſaries are divided into ſo many ave-marias, and ſo many pater-noſters, to which the Papiſts aſcribe a wonderful efficacy!

AVENA, Oats, in botany, is a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, Gramina. The calyx has a double valve, and the awn on the back is contorted.

There are 13 ſpecies, ſix of which are natives of Great Britain: viz.

1. The nuda, or naked oats.
2. The fatua, or bearded oat-graſs.
3. The pratenſis, or meadow oat-graſs.
4. The pubeſcens, or rough oat-graſs.
5. The elatior, or tall oat-graſs.
6. The flaveſcens, or yellow oat-graſs.

It is ſomewhat remarkable, that the native place of the ſativa, or common oats, cultivated in our fields, is totally unknown. Lord Anſon in his Voyage round the World, has obſerved that he ſaw it growing wild or ſpontaneouſly in the iſland of Juan Fernandez.

Oats is an article of the materia medica. Gruels made from it have a kind of ſoft mucilaginous quality: by which they obtund acrimonious humours, and prove uſeful in inflammatory diſeaſes, coughs, hoarſeneſs, and exulcerations of the fauces.

AVENACEOUS, technically implies, ſomething belonging to, or partaking of the nature of oats.

AVENAGE, in law, is a certain quantity of oats paid by a tenant to a landlord, inſtead of rent or ſome other duties.

AVENEA, in the menage, implies the rouſing of the ſlot. Hence, avening, or the buck hounds cry, when in full view of the chace.

AVENII, in ancient hiſtory, ſignify thoſe who publicly offered their ſervices for hire, to perform the gambols of the amphitheatres. They were univerſally held in diſrepute, as profligate and diſſolute; beings unfit for any ſociety but among their own claſs: and who were no better than gladiators.

AVENOR, ſignifies an officer belonging to the king's ſtables, who provides oats for the horſes. He acts by warrant from the maſter of the horſe.

AVENS, in botany, is the ſame as Cariophillus.

AVENTURE, in law, implies a miſchance cauſing the death of a perſon without felony, uſually called chance medley.

AVENUE, in gardening, is a walk planted on each ſide with trees, and leading to an houſe, garden-gate, wood, &c. and generally terminated by ſome diſtant object to form a perſpective view.

AVERA, in law, ſignifies the dooms day books, technical term for the day's work of a ploughman, which the king's tenants in his demeſne lands were obliged to pay to the ſheriff.

AVERAGE, in commerce, ſignifies the accidents and misfortunes which happen to ſhips and their cargoes, from the time of their loading and ſailing, their return and unloading; which may be divided into three kinds, viz.

1. The ſimple average, which conſiſts in the extraordinary expences incurred for the ſhip alone, or for the merchandizes alone. Such is the loſs of anchors, maſts, and rigging, occaſioned by the common accidents at ſea; the damages which happen to merchants by ſtorm, prize, ſhipwreck, wet, or rotting; all which muſt be borne and paid by the thing which ſuffered the damage.

2. The large and common average, being thoſe expences incurred, and damages ſuſtained, for the common good and ſecurity both of the merchandizes and veſſels, conſequently to be borne by the ſhip and cargo, and to be regulated upon the whole. Of this number are the goods or money given for the ranſom of the ſhip and cargo, things thrown overboard for the ſafety of the ſhip, the expences of unloading for entering into a river or harbour, and the proviſions and hire of the ſailors when the ſhip is put under an embargo.

3. The ſmall aver ages, which are the expences for towing and piloting the ſhip out of or into harbours, creeks, or rivers, one third of which muſt be charged to the ſhip, and two thirds to the cargo.

Average, in a more reſtrained ſenſe, implies the contribution that merchants make proportionably to their loſſes, who have had their goods caſt into the ſea in the time of a tempeſt. It alſo ſignifies a ſmall duty which thoſe merchants, who ſend goods in another man's ſhip, pay to the maſter for his care of them over and above the freight. Hence it is expreſſed in the bills of lading, paying ſo much freight for the ſaid goods, with primage and average accuſtomed.

Average, in mercantile tranſactions, denotes the rating of goods which run from low to high numbers in the invoice, and from low to high prices, at ſo much per cent. ſo as to rate the like profits on the ſales of each. This mode is ſcrupulouſly purſued in every great commercial fair throughout Europe.

AVERDUPOIS, is the ſame as Avoirdupois.

AVERIA, in law, indicates a plurality of plough cattle, or horſes for that uſe. As *bos* and *equus* are in the ſingular, of each kind; averia, implies the plural of both.

AVERIIS, *Captis in Withernam*, in law, is a writ, which is allowed to be granted to any one whoſe cattle have been diſtrained wrongfully, ſo as to reimburſe his ſtock, by the cattle of him who has defrauded him of his right.

This writ has no juriſdiction out of the county; in which the tranſaction, in the firſt inſtance took place.

AVERMENT, in law, ſignifies the proofs adduced in bar of exceptions, which are in the courſe of the pleadings propounded, as a legal ſtatement of facts; ſo that in the ſtrict ſenſe of juſtice, the averror ſpeaks according to the dictates of his conſcience.

AVERRHOA, in botany, is a genus of the decandria order, belonging to the pentagynia claſs of plants; and in the natural method ranking under the 14th order, Gruinales. The calyx has five leaves, the petals are five, opening at top; and the apple or fruit is pentagonus, and divided into five cells.

There are three ſpecies, viz. the blimbi, the carambola, and the acida, all natives of the Indies.

The moſt diſtinguiſhed of theſe is the carambola, called in Bengal the *camrue* or *camrunga*, is remarkable for poſſeſſing a power ſomewhat ſimilar to the ſpecies of Mimoſa which are termed *ſenſitive plants*; its leaves, on being touched, moving very perceptibly.

AVERRUNCI Dei, in mythology, certain gods, whoſe buſineſs it was, to avert misfortunes. Apollo and Hercules were of the number of thoſe gods, among the Greeks; and Caſtor and Pollux, among the Romans.

AVERRUNCIATION, in huſbandry, denotes the act of pruning, or lopping off ſuperfluous branches or ſuckers from the ſtock. The word is ſynonymous with pruning of trees.

AVERSION, is one of the human paſſions, that according to Lord Kames, is oppoſed to affection, and not to deſire, as it commonly is. We have an affection to one perſon; and an averſion to another: the former diſpoſes us to do good to its object, the latter to do evil.

AVERTI, in horſemanſhip, is applied to a regular ſtep or motion enjoined in the leſſons.

The word is French, and ſignifies adviſed.

AVERY, ſignifies the royal granary for repoſiting corn, neceſſary for the king's horſes. In a general ſenſe, it implies ſtores of oats.

AVES, *Birds*, is the name of Linnæus's ſecond claſs of animals. But in this work it makes a complete Syſtem, called Ornithology, which is improved into the modern method of claſſification, according to the arrangement of Mr. Latham, of Dartford. The diviſions, orders, genera, ſpecies, varieties and denominated peculiarities are arranged not only in ſyſtematical order, but alſo under each article in the alphabet, which include an individual race of this numerous claſs of feathered animals; ſo that the deſcriminating naturaliſt will find the moſt ſcrupulous attention to ſcientific demonſtration, whether detached or ſyſtematic.

AUGES, in aſtronomy, are two points in the orbit of a planet, uſually called the apogee, and perigee.

AUGITES, in foſſilogy, implies an inferior ſort of rough topaz, not advanced to the clearneſs of its water, and requires time for maturation.

AUGMENTATION, in a general ſenſe, is the act of adding or joining ſomething to another with a deſign of making it more conſiderable.

Augmentation was alſo the name of a court erected 27 Hen. VIII. ſo called from the augmentation of the revenues of the crown, by the ſuppreſſion of religious houſes; and the office ſtill remains, which there are many curious records, though the court has been diſſolved many years.

Augmentation, in heraldry, implies additional charges to a coat-armour, frequently given as particular marks of honour, and generally borne either in the eſcutcheon or a conton; as have all the baronets of England, who have borne the arms of the province of Ulſter in Ireland, which diviſion of that kingdom contains nine counties; ſo that the emblem is of the greateſt degree of honor in the baronetage.

AUGRE, or Awgre, is an inſtrument uſed by carpenters, joiners, and various other mechanics, to bore round holes; it conſiſts of a wooden handle, and an iron blade terminated at bottom with a ſteel bit, in the form of a ſingle ſcrew.

AUGSBURG *Confeſſion*, in eccleſiaſtical hiſtory, denotes a celebrated confeſſion of faith drawn up by Luther and Melancthon, on behalf of themſelves and other antient reformers, and preſented in 1530 to the emperor Charles V. at the diet of Auguſta or Augſburg, in the name of the evangelic body. This confeſſion contains 28 chapters; of which the greateſt part is employed in repreſenting, with perſpicuity and truth, the religious opinions of the proteſtants, and the reſt in pointing out the errors and abuſes that occaſioned their ſeparation from the church of Rome.

AUGSTORY, in naval architecture, ſignifies the quarter deck, or eminence which adjoins the main deck. The word implies the grand loft or higheſt floor from the water's edge.

AUGUR, denoted an officer among the Romans appointed to foretel future events, by the chattering, flight, and feeding of birds. There was a college or community of them, conſiſting originally of three members, who ever afterwards increaſed to nine, four of whom were patricians and five plebeians. They bore an augural ſtaff or wand, as the enſign of their authority; and their dignity was ſo much reſpected, that they were never depoſed, nor any ſubſtituted in their place, though they ſhould be convicted of the moſt enormous crimes.

Augury is a very ancient work of ſuperſtition. We know from Heſiod, that huſbandry was in part regulated by the arrival and migration of birds; and moſt probably it had been in uſe long before his time, as aſtronomy was then in its infancy. In proceſs of time, theſe birds ſeem to have gained great authority, ſo that no affair of conſequence was undertaken without conſulting their motions.

They were looked upon as the interpreters of the gods; and thoſe who were qualified to underſtand their oracles were held among the chief men in the Greek and Roman ſtates, and became the aſſeſſors of kings. However abſurd ſuch an inſtitution as a college of Augurs may appear in our eyes, yet, like all other extravagant inſtitutions, it had in part its origin from nature. When men conſidered the wonderful migration of birds, how they diſappeared at once, and appeared again at ſtated times, and could give no gueſs where they went, it was almoſt natural to ſuppoſe, that they retired ſomewhere out of the ſphere of this earth, where they might converſe with the gods, and thence be enabled to predict events.

It was natural for a ſuperſtitious people to imagine this extravaganza, as ſoon as ſome impoſtor was wicked enough to aſſert it. Added to this, the diſpoſition in ſome birds to imitate the human voice, might contribute much to the confirmation of ſuch a doctrine.

From what has been obſerved, it ſeems probable that natural augury gave riſe to artificial augury, the mind of man making a very eaſy tranſition from a little truth to a great deal of error.

Augury, according to Varro, may be diſtinguiſhed into four parts, viz.

1. Pyromancy,	or, Augury, by	Fire.
2. Hydromancy,		Water.
3. Acromancy,		Air.
4. Geomancy,		Earth.

Each of which formed a doctrine of divination in itſelf, as deſcribed under each Article.

AUGUST, in a general ſenſe, implies ſomething majeſtic, venerable, or ſacred. The appellation was firſt conferred by the Roman ſenate upon Octavius, after his being confirmed by them in the ſovereign power. It was conceived as expreſſing ſomething divine, or elevated above the pitch of mankind.

August, in chronology, is the eighth month of the year, and containing 31 days. It was dedicated to the honour of Auguſtus Cæſar, becauſe, in the ſame month, he was created conſul, thrice triumphed in Rome, ſubdued Egypt to the Roman empire, and made an end of civil wars.

AUGUSTALES, in Roman antiquity, was an epithet given to the flamens or prieſts appointed to ſacrifice to Auguſtus after his deification; and alſo to the ludi or games celebrated in honour of the ſame prince on the fourth of the ides of October.

AUGUSTALIA, was a feſtival inſtituted by the Romans in honour of Auguſtus Cæſar, on his return to Rome, after having ſettled peace in Sicily, Greece, Syria, Aſia, and Parthia; on which occaſion they likewiſe built an altar to him, inſcribed Fortunæ reduci.

AUGUSTALIS Præfectus, was a title peculiar to a Roman magiſtrate, who governed Egypt with a power much like that of a proconſul in other provinces.

AUGUSTEUM Marmor, in mineralogy, ſignifies the two coloured marble uſually denominated Egyptian marble. The term is antique, and is ſynonymous with green and white marble.

AUGUSTUS, was the appellation conferred upon Cæſar Octavianus, the firſt Roman emperor: and implies the ſame as Auguſt.

AVIARY, denotes a place ſet apart for feeding and propagating birds.

AVICENIA, *Eaſtern Anacardium*, in botany, is a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, Perſonatæ.

The calyx is quinquepartite; the corolla is bilabiated, the upper lip ſquared; the capſule is leathery, romb-like, and monoſpermous.

There are two ſpecies; the tomentoſa or downy, and the nitida or ſhining.

AVIGNON Berry, ſignifies the fruit of a ſpecies of lycium; growing plentifully near Avignon and in other parts of France. The berry is ſomewhat leſs than a pea; and of a green colour, approaching towards yellow; it is of an aſtringent quality and bitter taſte.

It is uſed by dyers and painters, who make of it a fine golden yellow.

AVIS, in ornithology; ſignifies a bird; hence the various exotics are ranged under the ſpecies of avis pennipulchra, when they are novel to the naturaliſt.

Nieremberg deſcribes the avis pennipulchra, as a diminutive variety of the peacock genus; and of the ſize of a pigeon; a native of America.

All deſcriptions of the feathered race, which are enumerated under the name of bird, commonly begin with the term avis; as, avis tropicorum; avis paradiſi, &c. tropic bird, bird of paradiſe, &c.

Avis, *or Knights d'Avis*, was an order of knighthood in Portugal, eſtabliſhed about the year 1162.

Hiſtory records the occaſion of their inſtitution to be as follows: when the city of Evora was taken from the Moors, in the reign of the firſt king of Portugal, it was garriſoned by ſeveral perſons, who aſſumed the title of knights of St. Mary of Evora, which was ſoon after changed for that of knights d'Avis, which the king gave them, and whither they removed from Evora.

The badge of the order is a green croſs flory; in diſcipline they obſerve the rule of St. Benedict.

Avis Longa, in ornithology, is a running bird, common in the Carolinas. Latham deſcribes it as partaking of the vulture genus. Neiremberg ſuppoſes it to be of the falcon ſpecies, and degenerated variety.

AVISI, in the menage, indicates a flock of game, ſo formed in their haunt, as to give the ſportſman an opportunity of diſcharging his fowling piece to advantage.

AVISIE, in muſic, denotes a band of wind inſtruments belonging to the military department; contradiſtinguiſhed from arriſery or ſtringed inſtruments.

AVISO, is a term in commerce, which denotes an advertiſement, an advice, or of intelligence of any kind.

AULA *Regia*, or *Regis*, was a court eſtabliſhed by William the conqueror in his own hall, compoſed of the great officers of ſtate, who reſided in his palace, and were uſually attended on his perſon.

This court was regulated by the article which forms the eleventh chapter of Magna Charta, and eſtabliſhed in Weſtminſter-hall, where it has ever ſince continued.

AULETES, in antiquity, denotes a flute-player.

AULIC, is an epithet given to certain officers of the German empire, who compoſe a court which decides, without appeal, in all ceſſes entered in it. Thus we ſay, aulic council, aulic chamber, aulic counſellor.

The aulic council is compoſed of a preſident, who is a Catholic; of a vice chancellor, preſented by the archbiſhop of Mentz; and of 18 counſellers, nine of whom are proteſtants and nine catholics. They are divided into a bench of lawyers, and always follow the emperor's court; for which reaſon they are called juſtitium imperatoris, the emperor's juſtice, and aulic council.

The aulic court ceaſes at the death of the emperor; whereas the imperial chamber of ſpire is perpetual, repreſenting not only the deceaſed emperor, but the whole Germanic body, which is reputed never to die.

Aulic *Doctrine*, in the Sorbonne and foreign univerſities, implies an act which a young divine maintains upon being admitted to the degree of a doctor of divinity.

It begins by an harangue of the chancellor, addreſſed to the young doctor, after which he receives the cap, and precides at the aulic, or diſputation, to confirm his doctrine.

AULOS, in ichthyology, ſignifies a variety of the ſpecies ſolen, or ſword fiſh.

Aulos ſignifies a Grecian long meaſure, the ſame with ſtadium; uſual in the ſurveys of Atica.

AUMBRY, a provincial word denoting a cup-board.

AUME, ſignifies a Dutch meaſure for Rheniſh wine, containing 40 Engliſh gallons.

AUMONE, in church government, ſignifies the ſums that are collected at places of divine worſhip, for the benefit of the poor of the pariſh, and diſtributed at Eaſter and Chriſtmas.

AUNCEL *Weight*, in many parts of England, ſignifies meat ſold by the hand, without weighing.

AUNE, is a long meaſure uſed in France to meaſure cloths, ſtuffs, ribbons, &c.

AVOCATORIA, is a mandate of the emperor of Germany, addreſſed to ſome prince, in order to ſtop his unlawful proceedings in any cauſe, appealed to him.

AVOIDANCE, in the canon law, is underſtood when a benefice becomes void of an incumbent; which happens either in fact, by the death of the perſon; or in law, by ceſſion, deprivation, reſignation, &c.

In the firſt of theſe caſes, the patron muſt take notice of the avoidance at his peril; but in avoidance by law, the ordinary is obliged to give notice to the patron, in order to prevent a lapſe.

AVORDUPOIS *Weight*, in merchandize, is uſed for the larger and coarſer commodities, ſuch as groceries, cheeſe, wool, lead, &c.

Bakers, who do not live in corporation towns, are to make their bread by avoirdupois weight, but thoſe in corporations by troy weight.

Apothecaries buy by avoirdupois weight, but ſell by troy weight. The proportion of a pound avoirdupois to a pound troy is as 17 to 14.

AVOWEE, in civil law, implies a perſon who has a right to preſent to a benefice. He is thus called in contradiſtinction to thoſe who only have the lands to which the advowſon belongs for a term of years, or by virtue of intruſion or diſſeiſin.

AVOWRY, in law, is to be underſtood where a perſon diſtrained ſues out a replevin; for then the diſtrainer muſt vow, and juſtify his plea, which is called his avowry.

AURA, among phyſiologiſts, indicates an airy exhalation, or vapour.

Aura, in ornithology, is a ſynonymous term with that of vulture.

Aura, in chemiſtry, implies the ſublimate ſpirit contained both in the animal and vegetable kingdoms of nature. In the materia medica, it denotes a ſpecies of remedies which are taken as noſtrums for all impurities of the blood.

AURELIA, in natural hiſtory, is the ſame with what is more uſually called chryſalis, and ſometimes nymph. But it is defined under the former.

AURELIANA, in botany, is a ſynonyme of the panax and ginſeng.

AUREOLA, in its original ſignification, ſignifies a jewel, which is propoſed as a reward of victory in ſome public diſpute. Hence the Roman ſchoolmen applied it to denote the reward beſtowed on martyrs, virgins, and doctors, on account of their works of ſupererogation; and painters uſe it to ſignify the crown of glory with which they adorn the heads of ſaints, confeſſors, &c.

AUREUS, was a Roman gold coin, equal in value to 25 denarii. According to Ainſworth, the aureus of the higher empire weighed near five pennyweights; and in the lower empire, little more than half that weight.

We learn from Suetonius, that it was cuſtomary to give aurei to the victors in the chariot races.

AURICLE, in anatomy, ſignifies that part of the ear which is prominent from the head, called by many authors auris externa.

AURICLES are likewiſe two muſcular bags ſituated at the baſis of the heart, and intended as diverticula for the blood during the diaſtole.

AURICULA, in botany, is the ſame as Primula.

Auricula, in entomology, ſignifies the ſame as that well known inſect, called the ear-wig.

AURICULAR, in a general ſenſe, implies ſomething relative to the ear, or organs of hearing: hence,

Auricular *Confeſſion*, private confeſſion.

Auricular *Witneſs*, an ear witneſs.

Auricular *Report*, an hearſay rumour.

Auricular *Medicines*, ſuch as are ſuited to cure the diſtempers of the ear.

AURICULATED *Leaf*, in botany, ſignifies that which has a lobe on each ſide towards the baſe.

AURIFLAMMA, in the French hiſtory, properly denotes a flag or ſtandard belonging to the abbey of St. Dennis, ſuſpended over the tumb of that ſaint, which the religious orders in an occaſion of war in defence of their lands or rights, took down, with great ceremony, and gave it to their protector or advocate, to be borne at the head of their forces.

Auriflamma is alſo ſometimes uſed to denote the chief flag or ſtandard in any army.

AURIGA, *the Waggoner*, in aſtronomy, ſignifies a conſtellation of the northern hemiſphere, conſiſting of 23 ſtars, according to Tycho Brahe; 40, according to Hevelius; and 68, in the Britannic catalogue.

AURIGRAPHUS, in hiſtory, denotes a calligrapher, or one who recorded tranſactions in gold letters.

The word is compounded of *aurum*, gold, and γραφω, I write.

AURIPIGMENTUM, *Orpiment*, in natural hiſtory, is defined under the article Orpiment.

AURISCALPIUM, in ſurgery, is an inſtrument to clean the ears, and ſerving alſo for other operations in diſorders of thoſe parts.

AURORA, ſignifies the morning twilight, or that faint light which appears in the morning when the ſun is within 18 degrees of the horizon.

Aurora, in mythology, implied the goddeſs of the morning. It was under this name that the ancients deified the light which foreruns the riſing of the ſun above our hemiſphere.

Aurora Borealis, ſignifies the northern twilight, or ſtreamers; a kind of meteor appearing in the northern part of the heavens, moſtly in the winter-time, and in froſty weather. In the arctic regions it appears in perfection, during the ſolſtice.

In the Schetland iſlands, (the merry dancers, as they are there called,) are the conſtant attendants of clear evenings, and prove great reliefs amidſt the gloom of the long winter nights. They commonly appear at twilight near the horizon, of a dun colour, approaching to yellow; ſometimes continuing in that ſtate for ſeveral hours without any ſenſible motion; after which they break out into ſtreams of ſtronger light, ſpreading into columns, and altering ſlowly into ten thouſand different ſhapes, varying their colours from all the tints of yellow to the obſcureſt ruſſet. They often cover the whole hemiſphere, and then make the moſt brilliant appearance. Their motions at theſe times are amazingly quick; and they aſtoniſh the ſpectator with the rapid change of their form. They break out in places where none were ſeen before, ſkimming briſkly acroſs the ſky, and are ſuddenly extinguiſhed, and leave behind an uniform duſky track. This again is brilliantly illuminated in the ſame manner, and as ſuddenly left a dull blank.

In certain nights they aſſume the appearance of vaſt columns, on one ſide of the deepeſt yellow, on the other declining away till it becomes undiſtinguiſhed from the ſky. They have generally a ſtrong tremulous motion from end to end, which continues till the whole vaniſhes. In a word, we who only ſee the extremities of theſe northern phænomena, have but a faint idea of their ſplendor and their motions.

According to the ſtate of the atmoſphere, they differ in colours, and their appearance terrifies the ruſtic ſpectators with the dread of war, peſtilence, and famine.

AUSCULTARE, in eccleſiaſtical hiſtory, denotes the muſical moderator, or liſtener, who taught the monks the pitch of voice, to ſing and chant in cathedrals and other churches.

AUSI, in hiſtory, were an ancient ſavage people of Libya.

They celebrated annually a feaſt in honour of Minerva, in which the girls divided into two companies, fought with ſticks, and thoſe who died of their wounds were concluded not to have been virgins.

AUSPEX, was a title originally given to thoſe who were afterwards denominated augurs.

AUSTERE, ſignifies rough, aſtringent. Thus an auſtere taſte is ſuch a one as conſtringes the mouth and tongue; as that of unripe fruits, harſh wines, &c.

AUSTERITY, in morality, implies ſeverity and rigour.

AUSTRAL, **Australis**, ſignifies the ſame as ſouthern. Thus auſtral ſigns are the ſix laſt ſigns of the zodiac; ſo called becauſe they are on the ſouth ſide of the equinoctial line.

AUSTRALIS Piscis, the Southern fiſh, in aſtronomy is a conſtellation of the ſouthern hemiſphere, not viſible in our latitude; whoſe ſtars in Ptolemy's catalogue are 18, and in the Britannic catalogue 24.

AUSTROMANCY, **Austromantia**, properly denotes ſoothſaying, or a vain method of predicting futurity, from obſervations of the winds.

AUTER Vie, in law, ſignifies a tenant for life, dependant on the demiſe of the grantor.

Auter *Droit*, in law, denotes a ſuit inſtituted in the right of another's perſon, as executor, adminiſtrator, &c.

AUTHENTICATING, in civil law, was the ancient form of publicly whipping an adultreſs: then if her huſband was not reconciled ſhe was confined for two years in a convent, at the expiration of which period, ſhe was again offered, and if then refuſed, was afterwards confined for life.

AUTHENTIC, denotes ſomething of acknowledged and received authority. In law, it ſignifies ſomething clothed in all its formalities, and atteſted by perſons to whom credit has been regularly given. Thus we ſay, authentic papers, authentic inſtruments, authentic intelligence.

AUTHOR, properly ſignifies one who created or produced any thing. Thus God, by way of eminence, is called the author of Nature, the author of the Univerſe.

Author, in matters of literature, ſignifies a perſon who has compoſed ſome book or writing.

AUTHORITY, in a general ſenſe, denotes a right to command. In which ſenſe, we ſay, the royal authority, the epiſcopal authority, the authority of a father, &c.

It denotes alſo the teſtimony of an author of eminence, quoted in a diſcourſe by way of proof of the facts ſtated by another.

Authority is repreſented, in painting, like a grave matron ſitting in a chair of ſtate, richly clothed in a garment embroidered with gold, holding in her right-hand a ſword, and in her left a ſceptre. By her ſide is a double trophy of books and arms.

AUTOCHTHONES, is an appellation aſſumed by ſome nations, importing that they ſprung, or were produced, from the ſame ſoil which they ſtill inhabited. In this ſenſe, Autochthones amounts to the ſame with Aborigines.

The proper Autochthones were thoſe primitive men who had no other parent beſide the earth. But the name was alſo aſſumed by the deſcendents of theſe men, provided they never changed their ancient ſeat, nor ſuffered other nations to mix with them. In this ſenſe it was that the Greeks, and eſpecially the Athenians, pretended to be Autochthones; and, as a badge thereof, wore a golden graſshopper woven in their hair, an inſect ſuppoſed to have the ſame origin.

AUTOCRATOR, in hiſtory, was a perſon veſted with an abſolute independent power, by which he was rendered unaccountable to any other for his actions.

AUTO Da fe, ſignifies the act of faith.

AUTODIDACTUS, ſignifies a perſon ſelf-taught, or who has had no maſter, or aſſiſtant of his ſtudies, beſides himſelf.

AUTOGRAPH, denotes a perſon's hand-writing, or the original manuſcript of any book, &c.

AUTOCEPHALUS, in eccleſiaſtical hiſtory, were ſuch of the biſhops as acknowledged no ſuperior. In a general ſenſe, it implies a perſon who has no maſter, but is ſolely his own director and governor.

AUTOMATON, in mechanics, indicates a ſelf-moving machine, conſtructed ſo as to move for a conſiderable time, as though endued with animal life. According to this deſcription, clocks, watches, and all machines of that kind, are automata.

M. Le Droz of La Chaux de Fonds in the county of Neufchattel, hath executed ſome very curious pieces of mechaniſm, which well deſerve to be ranked high in the liſt of Automata. One was a clock, which was preſented to the king of Spain; and had, among other curioſities, a ſheep, which imitated the bleating of a natural one; and a dog watching a baſket of fruit: when any one attempted to purloin the fruit, the dog gnaſhed his teeth and barked; and if it was actually taken away, he never ceaſed barking till it was reſtored. Beſides this, he made a variety of human figures, which exhibited motions truly ſurpriſing; but all inferior to Mr. Kempell's cheſs-player, which is deſcribed under the article Androides, and which may juſtly be looked upon as the greateſt maſter-piece in mechanics ever invented.

AUTONOMIA, in polity, is a power of living or being governed by our own laws and magiſtrates. The liberty of the cities which lived under the faith and protection of the Romans, conſiſted in their autonomia, i. e. they were allowed to make their own laws, and elect their own magiſtrates; by whom juſtice was to be adminiſtered, and not by Roman preſidents or judges, as was done in other places which were not indulged with the autonomia.

AUTOPSY, in oratory, ſignifies ocular demonſtration; i. e. are eye witneſs of the tranſaction in queſtion.

AUTOUR, in dyeing, ſignifies a ſort of bark imported from the Levant, well known in commercial entries, as a carmine dye ſtuff.

AUTUMN, ſignifies the third ſeaſon of the year, when the harveſt and fruits are gathered in.

Autumn is repreſented, in painting, by a man at perfect age, clothed like the vernal, and likewiſe girded with a ſtarry girdle; holding in one hand a pair of ſcales equally poiſed, with a globe in each: in the other hand, a bunch of divers fruit and grapes. His age denotes the perfection of this ſeaſon; and the balance, that ſign of the zodiac which the ſun enters when our autumn begins.

It commences on the day that the ſun's meridian diſtance from the zenith begins to decreaſe, and is a mean between the greateſt and the leaſt; which in theſe countries is ſuppoſed to happen when the ſun enters Libra.

Several nations have computed the years by autumns; as the Engliſh Saxons did by winters.

AUTUMNAL Point denotes that part of the equinox from which the ſun begins to deſcend towards the ſouth pole.

Autumnal *Signs*, in aſtronomy, are the three ſigns Libra, Scorpio, and Sagittarius, through which the ſun paſſes during the autumn.

Autumnal *Equinox*, ſignifies the time in which the ſun enters the autumnal point.

AUVERNAS, in commerce, is a very deep-coloured heady wine, made of black raiſins ſo called, which comes from Orleans. It is not fit to drink until it is above a year old; but if kept two or three years, it becomes excellent.

AUX, in aſtronomy, ſignifies the arc of the ecliptic intercepted between the firſt point of Aries, and the point in which the ſun or any other planet is, at its greateſt diſtance from the earth.

AUXESIS, in rhetoric, is a figure by which any thing is magnified too much, and is ſyhonymous with hyperbole.

AUXILIARY, in morality and law, ſignifies whatever is aiding or helping to another.

Auxiliary *Verbs*, in grammar, are ſuch as help to form or conjugate others; that is, ſuch as are prefixed to them, to form or denote the moods or tenſes: as, *to have* and *to be*, in the Engliſh; *etre* and *avoir*, in the French; *ho* and *ſono* in the Italian, &c. In the Engliſh language, the auxiliary verb *am* ſupplies the want of paſſive verbs.

AWAIT, in crown law, denotes to way-lay, or take a perſon by ſurprize ſo as to put him in bodily fear, or deprive him of his goods, chattels, or life. By ſtat. 13. R. 2. c. 1. This offence is capital, without benefit of clergy.

AWARD, in law, is the judgment of an arbitrator, or of one who is not appointed by the law a judge, but choſen by the parties themſelves for terminating their difference.

AWEIGH, in tactics, ſignifies the ſame with the ſea phraſe, a trip.

AWL is an inſtrument which ſhoe-makers uſe to bore holes through the leather, to facilitate the ſtitching or ſewing of ſhoes and boots.

AWME, or Aume, is a Dutch liquid meaſure containing eight ſteckans, or 20 verges or verteels, equal to the tierce in England.

AWN, in botany, is the ſame as the Arista.

AWNING, in the ſea-language, ſignifies the hanging of a ſail, tarpawling, or the like, over any part of the ſhip, to ſhade off the ſun, rain or wind.

AX, is a carpenter's inſtrument, ſerving to hew wood. The ax differs from the joiner's hatchet, being made larger and heavier, ſerving to hew large ſtuff; and its edge tapering into the middle of its blade. It is furniſhed with a long handle or helve, as being to be uſed with both hands in felling timber.

Battle-Ax, deſcribed under Celt.

AXAYACATL, is the name of a ſpecies of fly, common in Mexico, about the Lake; the eggs of which being depoſited in immenſe quantities, upon the ruſhes and corn-flags, from large maſſes, which are taken up by fiſhermen and carried to market for ſale. This caviare, called *ahuauhtli*, which has much the ſame taſte with the caviare of fiſh, uſed to be eat by the Mexicana, and is now a common diſh among the Spaniards. The Mexicans eat not only the eggs, but the flies themſelves, made up together in a maſs, and prepared with ſaltpetre.

AXILLA, in anatomy, denotes the arm-pit, or the cavity under the upper part of the arm.

Axilla, in botany, is the ſpace comprehended between the ſtems of plants and their leaves. Hence we ſay thoſe flowers grow in the axillæ of the leaves; i. e. at the baſe of the leaves, or juſt within the angle of their pedicles.

AXILLARY, implies ſomething belonging to or lying near the axilla. Thus, axillary artery is that part of the ſubclavian branches of the aſcending trunk of the aorta which paſſes under the arm-pits; axillary glands are ſituated under the arm-pits, enveloped in fat, and lie cloſe by the axillary veſſels; and axillary vein is one of the ſubclavians which paſſes under the arm-pit, dividing itſelf into ſeveral branches, which are ſpread over the arm.

AXINOMANCY, Axinomantia, from αξινη, *ſecuris*, and μαντεια, *divinatio*; was an ancient ſpecies of divination, or method of foretelling future events by means of an ax or hatchet. This diabolical art was in conſiderable repute among the ancients; and was performed by laying an agate ſtone on a red hot hatchet; or fixing a hatchet on a round ſtake ſo as to be exactly poiſed; then the names of thoſe that were ſuſpected were repeated, and he at whoſe name the hatchet moved was pronounced guilty.

AXIOM, Axioma, in a general ſenſe, comprehends a ſelf-evident truth, or propoſition whoſe truth every perſon receives at firſt ſight. It may alſo be defined an eſtabliſhed principle in ſome art or ſcience. Thus, it is an axiom in phyſics, that nature does nothing in vain; that effects are proportional to their cauſes, c&.

In geometry, it ſignifies, that things equal to the ſame third are alſo equal to one another; that if to equal things are added equals, the ſums will be equal, &c.

In optics, it ſignifies, that the angle of incidence is equal to the angle of reflection, &c.

AXIOSIS, in rhetoric, comprehends the third of an exordium to a diſcourſe. It is uſually made an introductory explanation of the mode and form; and the inient and deſign of the buſineſs in hand.

AXIS, in geometry, is the ſtraight line in a plain figure, about which it revolves, to produce or generate a ſolid. Thus, if a ſemicircle be moved round its diameter at reſt, it will generate a ſphere, the axis of which is that diameter.

Axis, in aſtronomy, is an imaginary right line, ſuppoſed to paſs through the centre of the earth and the heavenly bodies, about which they perform their diurnal revolutions.

Axis, in conic ſections, is a right line dividing the ſection into two equal parts and cutting all its ordinates at right angles.

Axis, in mechanics, may be defined thus:

1. The axis of a balance is that line about which it moves, or rather turns about.

2. Axis of oſcillation is a right line parallel to the horizon, paſſing through the centre about which a pendulum vibrates.

Axis *in Peritrochio*, is one of the ſix mechanical powers, conſiſting of a peritrochium or wheel concentric with the baſe of a cylinder, and moveable together with it about its axis.

Axis, in optics, is that particular ray of light coming from any object which falls perpendicularly on the eye.

Axis, in architecture, may be thus defined:

1. Spiral axis, is the axis of a twiſted column drawn ſpirally, in order to trace the circumvolution without.

2. Axis of the Ionic capital, is a line paſſing perpendicularly through the middle of the eye of the volute.

Axis *of a Veſſel*, is an imaginary right line paſſing through the middle of it, perpendicularly to its baſe, and equally diſtant from its ſides.

Axis, in botany, is a taper column placed in the centre of ſome flowers or catkins, about which the other parts are diſpoſed.

Axis, in anatomy, is the name of the ſecond vertebra of the neck; it hath a tooth which goes into the firſt vertebra, and this tooth is by ſome called the axis.

AXLETREE, in mechanics, is the ſame as axis.

AXOLOTI, in ichthyology, is a moſt ſingular fiſh found in the lake of Mexico; it has feet like a lizard, a matrix like a woman, and is ſubject to a menſtrual diſcharge. It is eſteemed good and wholeſome food, notwithſtanding its irregular order in nature.

AXUNGIA, in a general ſenſe, denotes old lard, or the drieſt and hardeſt of any fat in the bodies of animals: but more properly in medical preſcriptions, it ſignifies only hog's lard.

Axungia *Vitri*, *Sandiver*, or *Salt of Glaſs*, is a kind of ſalt which ſeparates from the glaſs, while it is in fuſion. It is of an acrimonious and biting taſte.

Farriers uſe it for cleanſing the eyes of horſes. It is alſo made uſe of for cleanſing the teeth; and it is ſometimes applied to running ulcers, the herpes, or the itch, by way of deſiccative.

AXYRIS, in botany, is a genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 12th order, Holoraceæ.

The calyx of the male is tripartite; it has no corolla. The calyx of the female conſiſts of two leaves; it has two ſtyli and one ſeed.

There are four ſpecies none of which are natives of Great Britain.

AYEL, in law, is a writ to reinſtate the heir at law to his demeſne, of which is legally ſeized in fee, of which he has been diſpoſſeſſed by fraud or other illegal means.

AYENIA, in botany, is a genus of the pentandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 37th order, Columniferæ.

The calyx has two leaves; the petals are in the form of a ſtar, with long ungues; and the capſule has five cells.

There are three ſpecies, all natives of the Weſt Indies.

AYGULA, in the claſs of Mammalia, and order of Primates, and genus Simia, denotes an American variety of the ape of the larger ſpecies.

AYTONIA, in botany, is a genus of the monodelphia order, belonging to pentandria claſs of plants.

The calyx is quinquepartite; the corolla conſiſts of four petals; the berry is dry, quadrangular, unilocular, and many-ſeeded.

There is but one ſpecies, the capenſis, a native of the Cape of Good Hope.

AZAB, in the Turkiſh armies, denotes a diſtinct body of ſoldiery, who are great rivals of the Janizaries.

AZABE Kaberi, in the Mahometan bible or alcoran, ſignifies the purgatory of thoſe believers, who after a ſlight trial by fire, are made quite pure, and received by Mahomet into Paradiſe.

AZALEA, American Upright Honeysuckle, in botany, is a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 18th order, Bicornes,

The corolla is bell-ſhaped; the ſtamina inſerted in the receptacle; and the capſule has five cells.

There are ſix ſpecies, of which the moſt remarkable are:

1. The viſcoſa, with a white flower, is a low ſhrub, ariſing with ſeveral ſtems to the height of two or three feet. The leaves come out in cluſters without any order. The flowers are in cluſters between leaves, and have much the appearance and ſcent of honeyſuckle.

2. The nudiflora, or red American upright honeyſuckle, grows taller than the firſt; and in its native country will ſometimes arrive at the height of 12 feet.

Theſe two ſpecies require a moiſt ſoil and a ſandy ſituation, and can only be propagated from ſlips, as they never produce good ſeeds in England. The autumn is the beſt time to remove the plants, and their roots ought to be covered in winter. They are moſt beautiful plants, and well worth cultivating.

AZARAM, or AZARUM, in farriery, denotes a root much in uſe by the French farriers, for the cure of the farcy in horſes.

AZED, in medicine, is a ſynonymous term for camphor.

AZERECAH, is a ſect of muſſulmen, who deny any place of puniſhment for the ſouls of deceaſed perſons.

AZELFOGE, in aſtronomy, is a fixed ſtar of the ſecond magnitude, in the Saxon's tail.

AZIMUTH, in aſtronomy, is an arch of the horizon, intercepted between the meridian of the place and the azimuth, or vertical circle paſſing through the centre of the object, which is equal to the angle of the zenith, formed by the meridian and virtical circle: or it is found by this proportion, as the radius is to the tangent of the latitude of the place, ſo is the tangent of the ſun's or ſtar's altitude; for inſtance, to the coſine of the azimuth from the ſouth, at the time of the equinox.

Magnetical AZIMUTH, is an arch of the horizon intercepted between the azimuth, or virticle circle, paſſing through the centre of any heavenly body, and the magnetical meridian. This is found by obſerving the object with an azimuth compaſs.

AZIMUTH *Compaſs*, is an inſtrument for finding either the magnetical azimuth or amplitude of an heavenly object.

Dr. Knight has invented an accurate ſea compaſs, which is now uſed in the navy; this inſtrument, with the following contrivance added by the ingenious Mr. Smeaton, anſwers the purpoſes of an azimuth and amplitude compaſs.

The cover of the wooden box being taken off, the compaſs is in a condition to be made uſe of in the binnacle, when the weather is moderate: but if the ſea runs high, as the inner box is hung very free upon its centre, it will be neceſſary to ſlacken the milled nut, placed upon one of the axes that ſupport the ring, and to lighten the nut on the outſide that correſponds to it. By this means the inner box and ring will be lifted up from the edges, upon which they reſt, when free; and the friction will be increaſed, and that to any degree neceſſary, to prevent the too great vibrations, which otherwiſe would be occaſioned by the motion of the ſhip.

To make the compaſs uſeful in taking the magnetic azimuth or amplitude of the ſun and ſtars, as alſo the bearings of headlands, ſhips, and other objects at a diſtance, the braſs edge, deſigned at firſt to ſupport the card, and throw the weight of it as near the circumference as poſſible, is itſelf divided into degrees and halves; which may be eaſily eſtimated into ſmaller parts, if neceſſary. The diviſions are determined by means of a catgut line, ſtretched perpendicularly with the box, as near the braſs edge as may be, ſo that the parallax, ariſing from a different poſition of the obſerver, may be as little as poſſible.

Underneath the card are two ſmall weights, ſliding on two wires, placed at right angles to each other; which being moved nearer to, or farther from, the centre, counterbalance the dipping of the card in different latitudes, or reſtore the equilibrium of it, where it happens by any other means to be got too much out of level.

There is alſo added an index at the top of the inner box, which may be put on and taken off at pleaſure: and ſerves for all altitudes of the object. It conſiſts of a bar, equal in length to the diameter of the inner box, each end being furniſhed with a perpendicular ſtile, with a ſlit parallel to the ſides thereof: one of the ſlits is narrow. to which the eye is applied; and the other is wider, with a ſmall catgut ſtretched up the middle of it, and from thence continued horizontally from the top of one ſtile to the top of the other. There is alſo a line drawn along the upper ſurface of the bar. Theſe four, viz. the narrow ſlit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the ſame plane, which diſpoſes itſelf perpendicular to the horizon, when the inner box is at reſt, and hangs free. This index does not move round, but is always placed on, ſo as to anſwer the ſame ſide of the box.

When the ſun's azimuth is deſired, and his rays are ſtrong enough to caſt a ſhadow, turn about the wooden box, till the ſhadow of the horizontal thread, or till that of the perpendicular thread, in one ſtile, or the light through the ſlit on the other, falls upon the line in the index bar, or vibrates to an equal diſtance on each ſide of it, gently touching the box, if it vibrates too far: obſerve, at the ſame time, the degree for the azimuth, or any other angle that is reckoned from the meridian, make uſe of the outward circle of figures upon the braſs edge; and the ſituation of the index bar, with regard to the card and needle, will always direct upon what quarter of the compaſs the object is placed.

But if the ſun does not ſhine out ſufficiently ſtrong, place the eye behind the narrow ſlit in one of the ſtiles, and turn the wooden box about, till ſome part of the horizontal or perpendicular thread appears to interſect the centre of the ſun, or vibrate to an equal diſtance on each ſide of it, uſing ſmoked glaſs next the eye. if the ſun's light is too ſtrong.

In this method, another obſerver will be generally neceſſary, to note the degree cut by the nonius, at the ſame time that the firſt gives notice that the thread appears to ſplit the object.

The azimuth of the ſtars may alſo be obſerved by night; a proper light ſerving equally for one obſerver to ſee the thread, and the other the degree upon the card.

AZOGA SHIPS, are thoſe Spaniſh ſhips commonly called the quickſilver ſhips, from their carrying quickſilver to the Spaniſh Weſt Indies, in order to extract the ſilver out of the mines of Mexico and Peru. Theſe ſhips, ſtrictly ſpeaking, are not to carry any goods unleſs for the king of Spain's account.

AZURE, in a general ſenſe, implies the blue colour of the ſky.

AZURE, among paniters, is a term which ſignifies in general a fine blue colour, and was formerly appropriated to Lapis Lazuli, called azure ſtone, and to the blue prepared from it. But ſince a blue has been extracted from Cobalt, cuſtom has applied to it the name of azure, although it differs conſiderably from the former, and is incapable of being uſed for the ſame purpoſes, and particularly for painting in oil.

The former at preſent is called lapis lazuli; or only lapis; and the blue prepared from it for painting in oil, is called ultramarine. The name azure is generally applied to the blue glaſs made from the earth of cubalt and vitrifiable matters. This glaſs, which is called ſmalt when in maſſes, is called azure only when it is reduced to a fine powder.

Several kinds of azure are diſtinguiſhed, according to their degrees of beauty, by the names of fine azure, powdered azure, and azure of four fires. But generally the more intenſe the colour, and the finer the powder, the more beautiful and high priced it is.

AZURE is employed to colour ſtarch; hence it has alſo been called ſtarch blue. It is uſed for painting with colours, and for a blue enamel.

AZURE, in heraldry, ſignifies the blue colour in the arms of any perſon below the rank of a baron. In the eſcutcheon of a nobleman, it is called ſapphire; and in that of a ſovereign prince, Jupiter.

In engraving, this colour is expreſſed by lines or ſtrokes drawn horizontally. It alſo ſignifies juſtice, perſeverance, and vigilance; but according to Mr. Leigh, if it is compounded with

Or	it ſignifies	Chearfulneſs.
Arg.		Vigilance.
Gul.		Readineſs.
Ver.		Enterpriſe.
Pur.		Goodneſs.
Sab.		Mournfulneſs.

The French herald, M. Upton, and his followers, rank this colour before gules.

AZYGOS, in anatomy, is a vein riſing within the thorax, on the right ſide, having no fellow on the left; whence it is called azygos, or vena ſine patri.

AZYMITES, in church hiſtory, were Chriſtians who adminiſtered the euchariſt with unleavened bread.

AZYMOUS, or AZYMUS, ſignifies ſomething unfermented, or made without leaven; as unleavened bread.

Sea-biſket is of this kind; and therefore, according to Galen, leſs wholeſome than bread that has been fermented.

Previous to the commencement of the letter B, *I think it neceſſary to remark to my numerous ſubſcribers, that the letter* A *could not, with any propriety, be brought into a leſs compaſs; and for theſe reaſons: Firſt, this Letter contains more Articles than any other in the Alphabet. And ſecondly, the number of Syſtems we have introduced, ſuch as Acouſtics, Aerology, Aeroſtation, Agriculture, Algebra, Anatomy, Annuities, Architecture, Arithmetic, and Aſtronomy, occupy at leaſt half the quantity of the letter* A. *But this circumſtance cannot again occur under any future Letter, as none contains more than* four, *and, upon an average, not more than* three Syſtems *throughout the remaining part of the Work, ſo that no unneceſſary curtail need be made to give room for them. It is therefore, for theſe reaſons, evident that we have not exceeded thoſe bounds to which our work is limited. Had we brought the letter* A *into a proportionate quantity with the reſt of the alphabet, we muſt have omitted ſome Syſtems, and contracted others. This would have been a material injury to the Work, eſpecially when it is conſidered that thoſe Syſtems are not, as in other Dictionaries, the compilation of an individual, but the real production of men of practical knowledge in the reſpective branches they have undertaken, and whoſe ſignatures and addreſſes are thereto affixed. I muſt alſo add, that I ſhall be particularly attentive to engage Gentlemen of the firſt abilities to execute the ſubſequent Syſtems, by which means I flatter myſelf it will form the moſt complete* Circle of Science *that can poſſibly be collected within the ſame compaſs, and juſtly be conſidered a valuable addition to Engliſh literature.*

With reſpect to the Plates in future, they ſhall be no leſs cautiouſly choſen than the former, as all the ſubjects ſhall, previous to their being engraved, undergo the inſpection of men particularly acquainted with that branch of knowledge to which each Plate will refer. It is my fixed determination they ſhall exceed any ſet of Plates that ever appeared in Europe, both with reſpect to novelty, abundant quantity of matter, judicious ſelection and arrangement, accuracy of drawing, and beauty of Engraving.

C. COOKE.

B

THE letter B is the ſecond not only of the Engliſh but of moſt other alphabets. It is the firſt conſonant, and firſt mute, which in its firſt pronunciation is ſuppoſed to reſemble the bleating of a ſheep; upon which account Pierius tells us in his hieroglyphics, that the Egyptians repreſented the ſound of this letter by the figure of that animal. It is alſo one of thoſe letters which the Eaſtern grammarians call labial, becauſe the principal organs employed in its pronunciation are the lips. It is pronounced by preſſing the whole length of them together, and forcing them open with a ſtrong breath.

It has a near affinity with the other labials P and V, and is often uſed for P both by the Armenians and other Orientals, as in Betrus for Petrus, apſens for abſens, &c.; and by the Romans for V, as in amabit for amavit, berna for verna, &c. whence aroſe that jeſt of Aurelian on the emperor Bonoſus, *Non ut vivat natus eſt, ſed ut bibat*.

Plutarch obſerves, that the Macedonians changed Φ into B, and pronounced Bilip, Berenice, &c. for Philip, Pherenice, &c.; and thoſe of Delphos uſed B inſtead of Π, as βαθεῖν for πυθειν, βικρον for πικρον, &c. The Latins ſaid *ſuppono*, *oppono*, for *ſubpono*, *obpono*; and pronounced *optinuit*, though they wrote *obtinuit*, as Quintilian has obſerved. They alſo uſed B for F or PH: thus, in an ancient inſcription mentioned by Gruter, Obrendario is uſed for Ofrendario.

As a numeral, B was uſed by the Greeks and Hebrews to denote 2; but among the Romans for 300, and with a daſh over it (thus $\bar{B}$) for 3000.

B is alſo uſed as an abbreviation. Thus B. A. ſtands for batchelor of arts; B. L. for bachelor of laws; and B. D. for bachelor of divinity. B. F. in the preface to the decrees, or ſenatus-conſulta of the old Romans, ſignified bonum factum. In muſic, B ſtands for the tone above A; as B♭, or ♭B, does for B flat, or the ſemitone major above A. B alſo ſtands for baſs; and B. C. for baſſo continuo, or thorough baſs.

BAAL, the ſame as BEL, or BELUS, was an idol of the Chaldeans, and Phœnicians, or Canaanites. The former worſhipped Mars under this name, according to Joſephus; who, ſpeaking of Thurus the ſucceſſor of Ninus, ſays, "To this Mars the Aſſyrians erected the firſt ſtatue, and worſhippid him as a god, calling him Baal."

It is probable the Phœnicians worſhipped the ſun under the name of Baal; for Joſiah, willing to make ſome amends for the wickedneſs of Manaſſeh, in worſhipping Baal and all the hoſt of heaven, "put down the idolatrous prieſts that burnt incenſe unto Baal, to the ſun, and to the moon, and to the planets, and to all the hoſt of heaven. And he took away the horſes that the kings of Judah had given to the ſun, and burned the chariots of the ſun with fire." 2 Kings c. xxiii. v. 5. 11.

The word Baal is often joined with the name of ſome falſe god, as Baal-berith, Baal-peor, Baal-zephon, and the like.

It paſſed from the Phœnicians to the Carthaginians, who were a colony of the Phœnicians; as appears from the Carthaginian names, Hannibal, Aſdrubal, &c. according to the cuſtom of the Eaſt, where kings and great men added to their own names thoſe of their gods.

It is frequently mentioned in Scripture in the plural number Baalim; which may ſignify, either that the name Baal was given to ſeveral different gods; or that there were many ſtatues, bearing different appellations, conſecrated to this idol.

BAAL BERITH, was the god of the Shechemites, and worſhipped by the idolatrous Iſraelites, Judges viii. 33.

BAAL GAD, BAGAD, or BEGAD, in mythology, was the idol of the Syrians, and ſignifies the god of chance, or fortune.

BAAL PEOR, BAAL PHEGOR, or BEEL PHEGOR, an idol of the Moabites and Midianites.

BAALZEBUB, BEELZEBUB, or BELZEBUB, was the idol, or god, of the Ekronites. In Scripture he is called the prince of devils. His name is rendered the lord of flies, or the god of flies, which ſome think was a mock appellation beſtowed on him by the Jews. He had a famous temple and oracle at Ekron.

Ahaziah king of Iſrael, having fallen from the terrace of his houſe into a lower room, and being dangerouſly hurt, ſent to conſult this deity, to know if he ſhould be cured of his wounds, for which idolatry the prophet was ſent to reprove him, and warn him of the judgment of God for his backſliding.

BAANITES, in church hiſtory, ſignify the followers of Baanes, a ſtrict diſciple of Menichea, in the beginning of the 9th century.

BABBLING, among hunters, is when the hounds are too buſy when they have got a good ſcent.

BABBLING, in the menage, ſignifies when the hounds or beagles have got a good ſcent, and are too buſy to purſue it.

BABOON, in tetrapodology, ſignifies a larger ſpecies of the Simia genus of quadrupeds in the order of primates, under which genera the various ſorts will be fully explained.

BABYLONICA TEXTA, a rich ſort of weavings, or hangings, denominated from the city Babylon, where the practice of interweaving divers colours in their hangings was firſt obtained: hence Babylonic garments, Babylonic ſkins, Babylonic carpets, houſings, &c.

Babylonica ſolana, coverings laid over couches, &c. painted with gold, purple, and other colours.

BABYLONICS, BABYLONICA, in literary hiſtory, ſignify fragments of the ancient hiſtory of the world, ending 267 years before Chriſt; and compoſed by Beroſſus, a prieſt of Babylon, about the time of Alexander. Babylonics are frequently cited in ancient writers by the title of Caldaics. The Babylonics were very conſonant with Scripture, as Joſephus and the ancient Chriſtian chronologers aſſure; whence the author is uſually ſuppoſed to have conſulted the Jewiſh writers. Beroſſus ſpeaks of an univerſal deluge, an ark, &c. He reckons ten generations between the firſt man and the deluge; and marks the duration of the ſeveral generations by ſaroi, or periods of 223 lunar months; which, reduced to years, differ not much from the chronology of Moſes.

The Babylonics conſiſted of three books, including the hiſtory of the antient Babyloneans, Medes, &c. But only a few imperfect extracts are now remaining of the work; preſerved chiefly by Joſephus and Syncellus, where all the paſſages of citations of ancient authors out of Beroſſus are collected with great exactneſs.

BABYROUSSA, or INDIAN HOG, in tetrapodology, is a ſynonime of a ſpecies of ſus.

BAC, in navigation, ſignifies a praam, or ferry boat.

BAC, in brewing, is a large flat veſſel into which the wort is put to ſtand and cool before boiling. The ingredients of beer paſs through three different kinds of veſſels. They are maſhed in one, worked in another, and cooled in a third.

BAC, in diſtillery, is a veſſel into which the liquor to be fermented is pumped from the cooler, in order to be worked with yeaſt or barm.

BACCA, BERRY, in botany, ſignifies ſuch fruits as conſiſt of a pericarpium full of juice and ſeeds, without any valves or covers, except the rind.

BACCALARIA, in hiſtory, denotes a kind of country farms, conſiſting of ſeveral cottages, and their appurtenances.

BACCHÆ, in antiquity, were the prieſteſſes of Bacchus, who celebrated the orgia, or myſteries of that god. The word alſo implies the ivy crowns or garlands worn by the prieſts of Bacchus, in offering ſacrifices to him.

BACCHANALIA, were feaſts celebrated in honour of Bacchus by the ancient idolaters. The two moſt remarkable were called the greater and leſſer. The latter, was called Lunæa, from a word ſignifying a wine preſs, and held in the open fields about autumn; the greater, called Dioniſia, from one of the names of Bacchus, was celebrated in the city, about the ſpring time. Both theſe feaſts were accompanied with games, ſpectacles, and theatrical repreſentations, and it was at this ſeaſon the poets contended for the prize of poetry.

BACCHANALIAN *Song*, is a compoſition to promote jollity and mirth.

BACCHARIS, Ploughman's Spikenard, in botany, is a genus of the poligamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, compoſitæ diſcoides. It has a naked receptacle, and hairy pappus; a cylindrical imbricated calyx, and feminine florets mixed with hermaphrodite ones.

There are ſeven ſpecies, all natives of warm climates; but only merit notice, the two following, viz. 1. The ivæfolia, or African tree-groundſel, is a native of the Cape of Good Hope, as alſo of Peru and other warm parts of America.

It may be propagated either by cuttings or ſeeds, which ripen well in this country.

2. The halimifolia, or Virginian groundſel tree, is a native of Virginia and other parts of North America. It may be propagated by cuttings; and will live very well in the open air, though ſevere froſt will ſometimes deſtroy it.

BACCHIFEROUS PLANTS, in botany, denote all ſuch as bear berries; and are thus characterized; the fruit is covered with a thin membrane, in which is contained the pulp, which incloſes the ſeed within its ſubſtance.

BACCHUS, in mythology, denotes the god of wine; the ancient heathens worſhipped him in different countries under the following appellations: in Egypt, he was called Oſiris; in Myſia, Fanaces; in India, Dioniſius; Liber, throughout the Roman dominions; Adoneus, in Arabia; and Pantheus, by the Lucanians.

The great Bacchus, according to Sir Iſaac Newton, flouriſhed but one generation before the Argonautic expedition. This Bacchus, ſays Hermippus, was potent at ſea, conquered eaſtward as far as India, returned in triumph, brought his army over the Helleſpont, conquered Thrace, and left muſic, dancing, and poetry there. And, according to Diodorus Siculus, it was the ſon of Semele who invented farces and theatres, and who firſt eſtabliſhed a muſic ſchool, exempting from all military functions ſuch muſicians as diſcovered great abilities in their art; on which account, ſays the ſame author, muſicians formed into companies have ſince frequently enjoyed great privileges.

Bacchus was regarded by the Athenians not only as the god of wine, but of ſong; and it muſt be owned, that his followers, in their cups, have been much inclined to ſinging ever ſince. Indeed we are certain, that in none of the proceſſions, triumphs, and feſtivals, inſtituted by the ancients to the honour and memory of this prince of *bons vivans*, muſic was forgotten, as may be ſtill gathered from ancient ſculpture, where we find not only that muſicians, male and female, regaled him with the lyre, the flute, and with ſong; but that he was accompanied by fawns and ſatyrs playing upon timbrels, cymbals, bagpipes, and horns: theſe Suidas calls his minſtrels; and Strabo gives them the appellations of Bacchi, Sileni, Satyri, Bacchæ, Lenæ, Thyæ, Mamillones, Naiades, Nymphæ, and Tityri. Theſe repreſentations have furniſhed ſubjects for the fineſt remains of ancient ſculpture; and the moſt voluptuous paſſages of ancient poetry are deſcriptions of the orgies and feſtivals of Bacchus.

Bacchus, in ichthyology, denotes the mixon, or mullet, of which it is a ſynonyme.

BACCOFOE, or Crucifix plant, in botanp, is a variety of the banana, a native of Guinea in Africa, and yields a fruit of an excellent flavour. Phil. Tranſ. N° 108.

BACHELOR, or **Batchelor**, is a general term for a man not married, or who is yet in a ſtate of celibacy.

The Roman cenſors frequently impoſed fines on old bachelors. Dionyſſius Halicarnaſſus mentions an old conſtitution, by which all perſons of full age were obliged to marry. But the moſt celebrated law of this kind was that made under Auguſtus, called the *lex Julia de maritandis ordinibus*; by which bachelors were made incapable of legacies or inheritances by will, unleſs from their near relations. This law cauſed many to marry, according to Plutarch's obſervation, not ſo much for the ſake of raiſing heirs to their own eſtates, as to make themſelves capable of inheriting thoſe of other men.

The Jewiſh rabbins maintain, that, by the laws of Moſes, every man is obliged in conſcience to marry at 20 years of age: this makes one of their 613 precepts. The Chriſtian religion is more indulgent to the bachelor ſtate: for the ancient church recommended it in ſome circumſtances preferable to, the matrimonial ſtate. In the canon law, we find injunctions on bachelors, when arrived at puberty, either to marry or to turn monks and profeſs chaſtity in earneſt.

In England there was a tax on bachelors, after 25 years of age, 12l. 10s. for a duke, and proportionably down to a common perſon 1s. by 7 Will. III. 1695.

At preſent, they are taxed by an extra duty on their ſervants. Every man of the age of 21 years and upwards, never having been married, who ſhall keep one male ſervant or more, ſhall pay 1l. 5s. for each above or in addition to the ordinary duties leviable for ſervants. Every man of the age of 21 years and upwards, never having been married, keeping one female ſervant, ſhall pay 2s. 6d. in addition to the former 2s. 6d.; 5s. in addition for each, if he has two female ſervants; and 10s. in addition for each for three or more female ſervants.

Knights **Bachelors**, were the moſt ancient, but the loweſt order of knights in England; known by the name of knights only.

Bachelors, in an univerſity ſenſe, are thoſe perſons that have attained to the baccalaureate, or who have taken the firſt degree in the liberal arts and ſciences.

The degree of bachelor was firſt introduced in the 13th century by Pope Gregory IX. but it remains ſtill unknown in Italy.

At the univerſity of Oxford, before a perſon is intitled to the degree of bachelor of arts, he muſt have ſtudied there four years; three years more are requiſite to become maſter of arts; and then ſeven more to commence a bachelor of divinity.

At Cambridge, to commence bachelor of arts, a perſon muſt have been admitted near four years; and above three years more before he can commence maſter; and then ſeven more to become a bachelor of divinity. He may commence bachelor of law after having ſtudied it ſix years.

At Paris, to paſs bachelor in theology, a perſon muſt have ſtudied two years in philoſophy and three years in theology, and held two acts of examination in the Sorbonne.

Bachelors in the canon law are admitted after two years ſtudy in the ſame, and ſuſtaining an act according to the forms.

A bachelor of phyſic muſt have ſtudied two years in medicine after having been four years maſter of arts in the univerſity, and ſtood an examination; after which he is inveſted with the fur, in order to be licenſed.

BACILLA, **Baccilli**, or **Baculi**, in pharmacy, is of a ſynonymous meaning with lozenge. Hence, all medicines made up in the form of a lozenge, are called baculics.

BACK, **Back Bone**, in anatomy, is the ſame as Spine.

Back Gammon, an ingenious game played with dice, upon a table, by two perſons.

Back Painting, ſignifies the method of painting mezzotinto prints, paſted on glaſs, with oil colours. The art of which conſiſts chiefly in laying the print upon crown glaſs, of ſuch a ſize ſo as to fit the print. In order to which take the print, and put it in clean water until it is quite ſoaked through, then take it out and lay it on two ſheets of paper, and cover it with two more; and let it lie there a little time to ſoak out the moiſture. In the mean time take the glaſs and ſet it near the fire to warm; then take the Straſburg turpentine, warm it over the fire till it is grown fluid, then with a hog's hair bruſh ſpread the turpentine very ſmoothly and evenly on the glaſs. When this has been done, take the mezzotinto print from between the papers, and lay it upon the glaſs; beginning firſt at one end, rubbing it down gently as you go on, till it lies quite cloſe. Then, with your fingers, rub or roll off the paper from the back ſide of the print, till it looks black, i. e. till you can ſee nothing but the print, like a thin film, left upon the glaſs, then lay it to dry. When it is quite dry, varniſh it over with ſome white tranſparent varniſh, that the print may be ſeen through it; and then it is fit for painting. Having thus far proceeded, and your oil-colours prepared, ground very fine, and tempered up very ſtiff, lay on the back ſide of the tranſparent prints ſuch colours as each particular part requires; letting the maſter lines of the print ſtill guide your pencil, and ſo each particular colour will lie fair to the eye on the other ſide of the glaſs, and look as well as a painted piece, if it be done neatly. The ſhadows of the print are generally ſufficient for the ſhadow of every colour; but if you have a mind to give a ſhadow by your pencil, then let the ſhadows be laid on firſt, and the other colours afterwards. In laying on the colours you need not be curious as to their ſmoothneſs, as it is not at all requiſite here, where the chief aim, is only to have the colours appear well on the fore ſide of the print; and therefore the only care to be uſed in this work, is to lay the colours on thick enough, that its body may ſtrike the colour of it plainly through the glaſs.

Back Stays, of a ſhip, are the ropes belonging to the main and fore-maſt, and likewiſe to the maſts belonging to them; ſerving to keep them from pitching forwards or overboard.

BACKING *of a Colt*, in horſemanſhip, ſignifies the operation of breaking him to the ſaddle, or bringing him to endure a rider.

Backing *the Sails*, in navigation, is to arrange them in a ſituation that will force the ſhip to retreat, or move backwards. This is, however, only done in narrow channels, when a ſhip is carried along ſidewiſe by the tide or current, and wants to avoid any thing that may interrupt her progreſs, as ſhoals, veſſels at anchor, &c. or in the line of battle, when a ſhip wants to be immediately oppoſite to another with which ſhe is engaged.

BACKS, in curriery, denote the thickeſt and beſt tanned hides, uſed chiefly for ſoles of ſhoes, commonly called butt leather.

BACULARIUS, is an eccleſiaſtical apparitor, or verger, who carries a ſtaff, baculus, in his hand, as an enſign of his office.

BACULE, in fortification, is a kind of portculis, or gate, made like a pit fall with a counterpoiſe, and ſupported by two great ſtakes. It is uſually made before the corpade-guard, not far from the gate of a fortified place.

BACULOMETRY, in geometry, ſignifies the art of meaſuring acceſſible or inacceſſible heights, by the help of one or more baculi, ſtaves, or rods.

BADGE, in naval architecture, ſignifies a ſort of ornament placed on the outſide of ſmall veſſels, whether ſhips, ſnows, brigs, or ſloops, very near the ſtern, containing either a window for the convenience of the cabin, or a repreſentation of it. It is commonly decorated with marine figures, martial inſtruments, or ſuch like emblems.

BADGER, in tetrapodology, is the Engliſh name of a ſpecies of urſus.

Badger, in old law books, ſignifies one that was licenſed to buy corn in one place and carry it to another to ſell, without incurring the puniſhment of an engroſſer.

BADIAGA, in the meteria medica, is the name of a ſort of ſpongy plant, common in the ſhops at Moſcow, and ſome other northern kingdoms. The uſe of it is the taking away the livid marks from blows and bruiſes, which the powder of this plant is ſaid to do in a night's time.

BADIAN, **Badiana**, or **Bandian**, is the ſeed of a tree which grows in China, and ſmells like aniſe-ſeed. The Chineſe, and the Dutch in imitation of them, ſometimes uſe the badiane to give their tea an aromatic taſte.

BADIGEON, among artiſts, is a mixture of plaſter and free ſtone, well ground together, and ſifted; and uſed by ſtatuaries to fill up the little holes, and repair the defects in ſtones, out of which they make their ſtatues, and other works.

The ſame term is alſo uſed by joiners, for ſaw duſt mixed with ſtrong glue, with which they fill up the chaps and other defects in wood, after it is wrought.

BADOUSE, in botany, is a ſynonyme of a ſpecies of the gooſeberry tree. The name is peculiar to the Chineſe and Eaſt Indians. The ſize is from that of a walnut to a large apple. It is clear and tranſparent, and of ſalutary effect in the act of digeſtion.

BÆCKEA, in botany: is a genus of the octandria order, belonging to the monogynia claſs of plants. The calyx is a permanent perianthium, conſiſting of a ſingle funnel ſhaped leaf, cut into five ſegments at the brim; the corolla conſiſts of five roundiſh ſpreading petals inſerted into the calyx; the pericarpium is a globoſe capſule, and made up of four valves, containing four cells, in which are a few roundiſh angular ſeeds.

BAFFETAS, or **Bastas**, in commerce, is a kind of cloth made of coarſe white cotton thread, which comes from the Eaſt Indies.

BAG, in commerce, is a term ſignifying a certain quantity of ſome particular commodity: as a bag of almonds, for inſtance, is about 300 weight; of aniſe-ſeeds, from 300 to 400, &c.

Bag, among farriers, is when, in order to retrieve a horſe's loſt appetite, they put in an ounce of aſa-fœtida, and as much powder of ſavin, into a bag, to be tied to the bit, keeping him bridled for two hours, thrice a day; as ſoon as the bag is taken off, he will fall to eating.

BAGADAT, in ornithology, ſignifies the columba tabellaria, or carrier pigeon. This name is derived from Bagdat, a city of Aſia in Irak Arabia, from whence this ſpecies were firſt imported into Europe.

BAGAUZE, in mercantile or manufacture, ſignifies the ſtate of the ſugar canes, after they have paſſed through the mill. In this ſtate, and under this denomination, they are dried, and then become curoſſes, and are uſed for boiling the ſugar.

BAGGAGE, in military matters, denotes the cloathes, tents, and utenſils of divers ſorts, proviſions, and other neceſſaries belonging to an army.

Before a march, the waggons with the baggage are marſhalled according to the rank which the ſeveral regiments bear in the army; being ſometimes ordered to follow the reſpective columns of the army, ſometimes to follow the artillery, and ſometimes to form a column by themſelves. The general's baggage marches firſt; and each waggon has a flag, ſhowing the regiment to which it belongs.

BAGNIO, an Italian word, ſignifying a bath. In England the term implies an houſe with conveniences for bathing, cupping, ſweating, and cleanſing the body; and alſo for brothels.

In Turky it is become a general name for the priſons where the ſlaves are incloſed, it being uſual in theſe priſons to have baths.

BAG-PIPE, is a muſical inſtrument of the wind kind, chiefly uſed in Scotland and Ireland. The peculiarity of the bag-pipe, and from which it takes its name, is, that the air which blows it is collected into a leathern bag, from whence it is preſſed out by the arm into the pipes. Theſe pipes conſiſt of a baſs, and tenor or treble; which are different according to the ſpecies of the pipe. The baſs is called the drone, and the tenor or treble the chanter.

BAGRE, in ichthyology, is a ſpecies of the ſilurus. There are many varieties, moſtly natives of the American ſeas.

BAGUETTE, in architecture, is a ſmall round moulding, leſs than an aſtragal, and ſo called from the reſemblance it bears to a ring. But when the baguette is enriched with ornaments, it changes its name, and is called a chaplet; and unornamented it is called a bead.

BAHAR, or Barre, in commerce, are weights uſed in ſeveral places in the Eaſt Indies.

There are two of theſe weights; one called the great bahar, with which they weigh pepper, cloves, nutmegs, ginger, &c. and contains 550 pounds of Portugal, or about 524 lb. 9 oz. avoirdupois weight. With the other called the little bahar, they weigh quickſilver, vermilion, ivory, ſilk, &c. It contains about 437 lb. 9 oz. avoirdupois weight.

BAHIR, is an Hebrew term, ſignifying famous or illuſtrious; but particularly uſed for a book of the Jews, treating of the profound myſteries of the cabbala, being the moſt ancient of the Rabbinical works.

BAHIRA, in Arabian antiquity, ſignifies a freed ſlave: yet we find that Calmet applies it only to the camel, who in return for ſeven years faithful ſervices, was wont to be freed from future labour. His ear was ſlit as a memorial; and thus he became a monument of veneration during the reſt of his life.

BAIJ, or Baija, in the menage, ſignifies the foxing or clipping of the ears of a horſe, in order to make him lively and ſuſceptible of feeling.

Poneys and dull varieties of the ſpecies are foxed merely to increaſe their ſenſibility, which proficients in menagerie aver, that this cuſtom takes the deſired effect.

BAIL, Ballium, (from the French bailler, which comes originally from the Greek βαλλειν, and ſignifies to deliver into hands), in law ſignifies the freeing or ſetting at liberty of one arreſted or impriſoned upon any action, either civil or criminal, on ſurety taken for his appearance at a certain day and place.

By this means the party reſtrained is delivered into the hands of thoſe that bind themſelves for his forthcoming, in order to a ſafe keeping and protection from priſon; and finally to ſatisfy the condemnation and coſts, or render the defendant into the hands of the plaintiff, or to priſon, as the caſe may be.

With reſpect to bail in civil caſes, it is to be obſerved, that it is either common or ſpecial. Common bail is in actions of ſmall concernment, being called common, becauſe any ſureties in that caſe are taken; ſpecial bail in cauſes of greater weight, as actions upon bonds, or ſpeciality, &c. where the debt is ſued for by ſpecial original in ſuch caſes ſubſidy men at leaſt, and thoſe according to the value: but modern practice calls all actions above 10l. ſpecial.

The commitment of a perſon being only for ſafe cuſtody, wherever bail will anſwer the ſame intention, it ought to be taken; as in moſt of the inferior crimes: but in felonies, and other offences of a capital nature, no bail can be a ſecurity equivalent to the actual cuſtody of the culprit.

Bail may be taken either in court, or at a judges chambers, but in ſome particular caſes, by the ſheriff or other magiſtrate; but moſt uſually by the juſtices of the peace. To refuſe or delay to bail any perſon bailable, is an offence againſt the liberty of the ſubject, in any magiſtrate, by the common law; as well as by the ſtatute Weſtm. 1. 3 Edw. I, c. 15. and the hæbeas corpus act, 31 Car. II. c. 2. And, leſt the intention of the law, ſhould be fruſtrated by the juſtices requiring bail to a greater amount than the nature of the caſe demands, it is expreſsly declared by ſtatute 1 W. & M, ſ. 2, c. 1. that exceſſive bail ought not to be required; though what bail ſhall be called exceſſive, muſt be left to the courts, on conſidering the circumſtances of the caſe, to determine. And on the other hand, if the magiſtrate takes inſufficient bail he is liable to be fined, if the criminal doth not appear.

In civil caſes, every defendant is bailable.

In criminal matters all offences either againſt the common or ſtatute law that are below felony, the offender ought to be admitted to bail, unleſs prohibited by ſome ſpecial act of parliament. By the ancient common law, before and ſince the conqueſt, all felonies were bailable, till murder was excepted by ſtatute: ſo that perſons might be admitted to bail almoſt in every caſe. But the ſtatute Weſt. 1. 3 Ed. I. c. 15. takes away the power of bailing in treaſon, and in divers inſtances of felony. The ſtatutes 23 Hen. VI. c. 9. and 1 and 2 Ph. & Mar. c. 13. gave farther regulations in this matter: and upon the whole we may collect that in the following inſtances no juſtices of the peace can bail. 1. Upon an accuſation of treaſon: 2. Of murder: 3. In caſe of manſlaughter, if the priſoner be clearly the ſlayer, and not barely ſuſpected to be ſo; or if any indictment be found againſt him: 4. Such as, being committed for felony, have broken priſon; becauſe it not only carries a preſumption of guilt, but is alſo ſuperadding one felony to another: 5. Perſons outlawed: 6. Such as have abjured the realm: 7. Perſons taken with the mainour, or in the fact of felony: 8. Perſons charged with Arſon: 9. Excommunicated perſons, taken by writ de excommunicato capiendo: all which are clearly not admiſſible to bail by the juſtices. But in caſes of a dubious nature, as, thieves openly defamed and known: perſons charged with other felonies, or manifeſt and enormous offences, not being of good fame: and, acceſſories to felony, that labour under the ſame want of reputation: theſe ſeem to be at the diſcretion of the juſtices. However perſons of good fame, charged with a bare ſuſpicion of manſlaughter, or other infamous homicide; or ſuch perſons being charged with petit larceny or any felony, not before ſpecified: or, with being acceſſory to any felony, they may be held to bail. Laſtly, the court of king's bench may bail for any crime whatſoever, whither treaſon, murder, or any offence, according to the circumſtances of the caſe. And herein the wiſdom of the law is very manifeſt. To allow bail to be taken commonly for ſuch enormous crimes, would greatly tend to elude the public juſtice: and yet there are caſes, though they rarely happen, in which it would be hard and unjuſt to confine a man in priſon, though accuſed even of the greateſt offence. The law has therefore provided only one court, which has a diſcretionary power of bailing in any caſe.

Clerk of the Bails, is an officer belonging to the court of the King's bench: he files the bail-pieces taken in that court, and attends for that purpoſe in court during its ſitting, and in the evening at the judges chambers, whoſe turn it is to take bail: for in term time the judges regularly attend in their turns. With reſpect to the order and practice of this office, ſee the Syſtem of Law.

Bail, or Bale, in the ſea language, is the ſeamen's throwing the water by hand baſkets out of the ſhip's or boat's hold, which is called *bailing*. They alſo call thoſe hoops that bear up the tilt of a boat, its *bail*.

BAILIE, is the name of a magiſtrate in royal boroughs, and of the judge appointed by a baron over lands erected into a barony.

BAILIFF, *Ballivus*, from the French word *bayliff*, that is, *præfectus provinciæ*: and as the names, for the office itſelf was anſwerable to that of France; were there are eight parliaments, which are high courts, from whence there lies no appeal, and within the precincts of the ſeveral parts of that kingdom which belong to each parliament there are ſeveral provinces to which juſtice is adminiſtered by certain officers called bailiffs; and in England there are ſeveral counties in which juſtice hath been adminiſtered to the inhabitants by the officer who is now called ſheriff.

In the ſtatute of Magna Charta, cap. 28, and 14 Ed. 3. c. 9. the word bailiff ſeems to compriſe as well ſheriffs as bailiffs of hundreds. As the realm is divided into counties, ſo every county is divided into hundreds; within which in ancient times the people had juſtice adminiſtered to them by the officers of every hundred. But now the hundred courts, except certain franchiſes, are included in the county-courts; and the bailiff's name and office is grown into diſrepute, they being generally officers to ſerve writs, &c. within their liberties. Though, in other reſpects, the name is ſtill in good eſteem; for the chief magiſtrates in divers towns are called bailiffs or bailies; and ſometimes the perſons to whom the king's caſtles are committed are termed bailiffs, as the bailiff of Dover caſtle, &c. &c.

Of the ordinary bailiffs there are ſeveral ſorts, viz. ſheriff's bailiffs, bailiffs of liberties, &c.

Sheriff's bailiffs, or ſheriff's officers, are either bailiffs of hundreds, or ſpecial bailiffs. Bailiffs of hundreds are officers appointed over thoſe reſpective diſtricts by the ſheriffs, to collect fines; ſummon juries; to attend the judges and juſtices at the aſſizes, and quarter ſeſſions; and alſo to execute writs and proceſs in the ſeveral hundreds.

Bailiffs of liberties are thoſe bailiffs who are appointed by every lord within his liberty, to execute proceſs, and do ſuch offices therein as the bailiff errant doth at large in the county; but bailiffs errant or itinerant, to go up and down the county to ſerve proceſs, are out of uſe in the practice of the common law.

There are alſo bailiffs of foreſts, and bailiffs of manors, who direct huſbandry, fell trees, gather rents, pay quit-rents, &c.

Water Bailiff, is an officer appointed in all port-towns, for the ſearching of ſhips, gathering the toll for anchorage, &c. and arreſting perſons for debt, &c. on the water.

BAILIWICK, Bailywick, or Baylywick, is that liberty, which is exempted from the ſheriff of the county; over which liberty the lord thereof appoints his own bailiff, with the like power within his precinct, as an under ſheriff exerciſes under the high ſheriff of the county.

Bailiwick alſo ſignifies the precinct of a ſheriff or a bailiff, or the place within which his juriſdiction is terminated: the return of writs ſpecify this.

BAILMENT, in law, ſignifies a delivery of goods in truſt, upon a contract, expreſſed or implied, that the truſt ſhall be faithfully executed on the part of the bailee: vide ſtatute 30 Geo. II. c. 24.

If a landlord diſtrains goods for rent, or a pariſh officer for taxes, theſe for a time are only a pledge in the hands of the diſtrainers; and they are bound by an implied contract in law to reſtore them on payment of the debt, duty, and expences, before the time of ſale; or when ſold, to render back the overplus.

BAILO, at Conſtantinople, ſignifies the ambaſſador of the republic of Venice, who reſides at the Porte. This miniſter, beſides his political charge, acts there the part of a conſul of Venice.

BAIOCCO, is a copper-coin, current at Rome, and throughout the whole ſtate of the church, ten of which make a julio, and an hundred a Roman crown.

BAIRAM, or Beiram, is a Turkiſh word which ſignifies a ſolemn feaſt. The Mahometans have two Bairams, the great and the leſſer. The leſſer Bairam is properly that held at the cloſe of the faſt Ramazan, beginning with the firſt full moon in the following month Shawal. This is called in Arabic *Id al Fetz, or the Feaſt of breaking the Faſt*; and by Europian writers, *the Turkiſh Eaſter*, becauſe it ſucceeds Ramazan, which is their Lent, more uſually the Great Bairam, becauſe obſerved with great ceremony and rejoicing at Conſtantinope, and throughout all Turkey, for three days, and in Perſia for five or ſix days, to make amends for the mortification of the preceding month. The feaſt commencing with the new moon, the Mahometans are very ſcrupulous in obſerving the time when the new moon commences; to which purpoſe, obſervers are ſent to the tops of the higheſt mountains, who the moment they ſpy the appearance of a new moon, run to the city, and proclaim Muzhdaluk, "welcome news;" as it is the ſignal for beginning the feſtivity. The Great Bairam, is properly that held by the pilgrims at Mecca, commencing on the tenth of Dhu Ihajia, when the victims are ſlain, and laſting three days. This is called by the Arabs, *Id al alha*, that is, *the feaſt of ſacrifice*, as being celebrated in memory of the intended ſacrifice of Abram, whoſe ſon God redeemed with a great victim. By European writers it is called the Leſſer Bairam, as being leſs taken notice of by the generality of the people who are not ſtruck with it, becauſe the ceremonies, with which it is obſerved, are performed at Mecca, the only ſcene of the ſolemnity. On the feaſt of Bairam, after throwing little ſtones, one after another, into the valley of Mina, they uſually kill a ſheep, a goat, a bullock, or even a camel; and after giving a part thereof to the poor, eat the reſt with their friends. After this, they ſhave themſelves. The ſecond is a day of reſt. And on the third, they ſet out to return home.

BAIT, in ichthyology, ſignifies the fry of ſeveral ſorts of fiſh, for which it is a ſynonymous epithet. Near London, during the ſummer months, ſeveral varieties are caught in the river Thames, and highly eſteemed by the citizens of London. They are termed *white bait*.

Bait, among fiſhermen, implies a ſubſtance proper to be faſtened to a hook, in order to catch the different ſorts of fiſh.

BAITING, is the act of ſmaller or weaker beaſts attacking and haraſſing greater and ſtronger ones. In this ſenſe is ſignified the baiting of bulls or bears by maſtiffs, or bull-dogs, &c.

The ſhameful practice of bull-baiting was firſt introduced into England as an amuſement in the reign of king John, about 1209.

BALA, in botany, is ſynonymous with Banana, the Plantain, or Plantane Tree.

BALAAMITES, in eccleſiaſtical hiſtory, denotes the ſame as the Nicolatans, of whom Saint John in the Revelation ſpeaks of in a moſt awful judgment againſt the evil of their ways.

BALÆNA, or Whale, in ichthyology, is a genus of the 4th claſs, belonging to the cetaceous order. The characters of which are: the balæna, in place of teeth, has a horny plate on the upper jaw, and a double fiſtula or pipe for throwing out water. The ſpecies are four, viz.

1. The myſticetus, or common whale, which has many turnings and windings in its noſtrils, and has no fin on the back. This is the largeſt of all animals; it is even at preſent ſometimes found in the northern ſeas 90 feet in length; but formerly they were taken of a much greater ſize, when the captures were leſs frequent, and the fiſh had time to grow. Such is their bulk within the arctic circle; but in thoſe of the torrid zone, where they are unmoleſted, whales are ſtill ſeen 160 feet long. The head is very much diſproportioned to the ſize of the body, being one third of the ſize of the fiſh: the under lip is much broader than the upper. The tongue is compoſed of a ſoft ſpungy fat, capable of yielding five or ſix barrels of oil. The gullet is very ſmall for ſo vaſt a fiſh, not exceeding four inches in width. In the middle of the head are two orifices, through which it ſpouts water to a vaſt height, and with a great noiſe, eſpecially when diſturbed or wounded. The eyes are not larger than thoſe of an ox, and when the cryſtalline humour is dried, it does not appear larger than a pea. They are placed towards the back of the head, being the moſt convenient ſituation for enabling them to ſee both before and behind; as alſo to ſee over them, where their food is principally found. They are guarded by eye-lids and eye-laſhes, as in quadrupeds; and they ſeem to be very ſharp ſighted. Nor is their ſenſe of hearing in leſs perfection; for they are warned at great diſtance of any danger preparing againſt them.

What is called whalebone, adheres to the upper jaw; and is formed of thin parallel laminæ, ſome of the longeſt four yards in length: of theſe there are commonly 350 on each ſide, but in very old fiſh more; about 500 of them are of a length fit for uſe, the others being too ſhort. They are ſurrounded with long ſtrong hair, not only that they may not hurt the tongue, but as ſtrainers to prevent the return of their food when they diſcharge the water out of their mouths. The real bones of the whale are hard, porous, and full of marrow. Two great ſtrong bones ſuſtain the upper lip, lying againſt each other in the ſhape of an half moon.

The tail is broad and ſemilunar; and when the fiſh lies on one ſide, its blow is tremendous. The tail alone it makes uſe of to advance itſelf forward in the water; and it is ſurpriſing to ſee with what force and celerity its enormous bulk cuts through the ocean. The fins are only made uſe of for turning in the water, and giving a direction to the velocity impreſſed by the tail. The female alſo makes uſe of them, when purſued, to bear off her young, clapping them on her back, and ſupporting them by the fins on each ſide from falling off.

The whale varies in colour; the back of ſome being red, the belly generally white. Others are black, ſome mottled, others quite white; according to the obſervation of Martin, who ſays, that their colours in the water are extremely beautiful, and that their ſkin is very ſmooth and ſlippery. The outward or ſcarf ſkin of the whale is no thicker than parchment; but this removed, the real ſkin appears, of about an inch thick, and covering the fat or blubber that lies beneath: this is from eight to twelve inches in thickneſs; and is, when the fiſh is in health, of a beautiful yellow. The penis is eight feet in length, incloſed in a ſtrong ſheath. The teats in the female are placed in the lower part of the belly.

In copulation, the female joins with the male, as is aſſerted, more humano; and once in two years feels the acceſſes of deſire. The whale goes with young nine or ten months, and is then fatter than uſual, particularly when near the time of bringing forth. It is ſaid that the embryo, when firſt perceptible, is about 17 inches long, and white; but the cub, when excluded, is black, and about 10 feet long. She generally produces one young one, and never above two. When ſhe ſuckles her young, ſhe throws herſelf on one ſide on the ſurface of the ſea, and the young one attaches itſelf to the teat.

Nothing can exceed the tenderneſs of the female for her offſpring; ſhe carries it with her wherever ſhe goes, and, when hardeſt purſued, keeps it ſupported between her fins. Even when wounded, ſhe ſtills claſps her young one; and when ſhe plunges to avoid danger, takes it to the bottom; but riſes ſooner than uſual, to give it breath again. The young ones continue to ſuck at the teats for a year; during which time, they are called by the ſailors, ſhort heads. They are then extremely fat, and yield above 50 barrels of blubber. The mother at the ſame time is exceeding lean and emaciated. At the age of two years they are called ſtunts, as they do not thrive much immediately after they ceaſe to ſuck: they then yield ſcarcely more than 20 or 24 barrels of blubber: from that time forward they are called ſkull fiſh, and their age is wholly unknown.

Every ſpecies of whale propagates only with thoſe of its own kind, and does not at all mingle with the reſt: however, they are generally ſeen in ſhoals, of different kinds together, and make their migrations in large companies from one ocean to another. They are gregarious animals; which implies their want of mutual defence againſt the invaſions of ſmaller, but more powerful fiſhes.

It ſeems aſtoniſhing, therefore, how a ſhoal of theſe enormous animals find ſubſiſtence together, when it would ſeem that the ſupplying even one with food would require greater plenty than the ocean could furniſh. To increaſe our wonder, we not only ſee them herding together, but uſually find them fatter than any animals whatever.

Linnæus ſays, the meduſa or ſea blubber, is ſufficient for their ſupply; and content with this ſimple food, it purſues no other animal, leads an inoffenſive life in its element, and is harmleſs in proportion to its ſtrength to do miſchief.

As the whale is an inoffenſive animal, it is not to be wondered that it has many enemies, willing to take advantage of its diſpoſition, and inaptitude for combat. There is a ſmall animal, of the ſhell fiſh kind, called the whale louſe, that ſticks to its body, as we ſee ſhells ſticking to the foul bottom of a ſhip. This inſinuates itſelf chiefly under the fins; and whatever efforts the great animal makes, it ſtill keeps its hold, and lives upon the fat, which it is provided with inſtruments to arrive at.

The ſword, however, is the whale's moſt terrible enemy. "At the ſight of this little animal," ſays Anderſon, "the whale ſeems agitated in an extraordinary manner; leaping from the water as if with affright: wherever it appears, the whale perceives it at a diſtance and flies from it in the oppoſite direction. I have been myſelf," continues he, "a ſpectator of their terrible encounter. The whale has no inſtrument of defence except the tail: with that it endeavours to ſtrike the enemy; and a ſingle blow taking place, would effectually deſtroy its adverſary: but the ſword fiſh is as active as the other is ſtrong, and eaſily avoids the ſtroke; then bounding into the air, it falls upon its great ſubjacent enemy, and endeavours not to pierce it with its pointed beak, but to cut it with its toothed edges. The ſea all about it is ſeen dyed with blood, proceeding from the wounds of the whale; while the enor-animal, vainly endeavours to reach its invader, and ſtrikes with its tail againſt the ſurface of the water, making a report at each blow louder than the noiſe of a cannon."

In calm whether, the fiſhermen lie upon their oars as ſpectators of this combat, until they perceive the whale at the laſt gaſp: then they row towards him; and his enemies retiring at their approach they enjoy the fruits of the victory.

The grampus, and other large fiſhes of the cetaceous order, are attacked and deſtroyed by the ſame enemy in a ſimilar manner. The whale has alſo another deſperate enemy, a ſpecies of the ſhark, of different ſizes from one to three fathoms; ſo voracious, that it tears large pieces of fleſh from the whale, as if they had been cut out with a knife.

To view theſe animals in a commercial light we muſt obſerve, that the Engliſh were late before they engaged in the whale fiſhery: it appears by a ſet of queries, propoſed by an honeſt merchant in the year 1575, in order to get information in the buſineſs, that we were at that time totally ignorant of it, being obliged to ſend to "Biſkaie for men ſkilful in the catching of the whale, and ordering of the oil; and one cooper ſkilful to ſet up the ſtaved caſk." This ſeems very ſtrange; for by the account Octher gives of his travels to king Alfred, near 700 years before that period, it is evident that he made that monarch acquainted with the Norwegians practiſing the whale-fiſhery; but it ſeems all memory of that gainful employ, as well as of that able voyager Octher, and all his important diſcoveries in the north, were loſt for near ſeven centuries.

It was carried on by the Biſcayeners long before we attempted the trade; and that for the ſake not only of the oil, but alſo of the whalebone, which they ſeem to have long trafficked in. The earlieſt notice we find of that article in our trade is by Hackluyt, who ſays it was brought from the Bay of St. Laurence by an Engliſh ſhip that went there for the barbes and fynnes of whales and train oil, A. D. 1594, and who found there 700 or 800 whale fynnes, part of the cargo of two great Biſkaine ſhips, that had been wrecked there three years before. Previous to that ladies' ſtays muſt have been made of ſplit cane, or ſome tough wood, as Mr. Anderſon obſerves in his Dictionary of Commerce; it being certain that the whale fiſhery was carried on, for the ſake of the oil, long before the diſcovery of the uſe of whalebone.

2. The phyſalus, or fin-fiſh, is diſtinguiſhed from the common whale by a fin on the back, placed very low and near the tail. The length is equal to that of the common kind, but much more ſlender. It is furniſhed with whale bone in the upper jaw, mixed with hairs, but ſhort and knotty, and of little value. The blubber alſo on the body of this kind is very inconſiderable. Theſe circumſtances, added to its extreme fierceneſs and agility, which renders the capture very dangerous, cauſe the fiſhers to neglect it.

The phyſalus inhabits the European and American oceans.

3. The boops, or pike headed whale, has a double pipe in its ſnout, three fins like the former, and a hard horney ridge on its back. The belly is full of longitudinal folds or rugæ. It frequents the northern ocean. This ſpecies takes its name from the ſhape of its noſe, which is narrower and ſharper pointed than that of other whales.

4. The muſculus has a double pipe in its front, and three fins; the under jaw is much wider than the upper one. It frequents the Scotch coaſts.

Linnæus very properly makes the phyſeter and delphinus, which are ranked among the whales by ſome writers, two diſtinct genera.

BALAM PULLI, in botany, is the trivial name of the tree which produces the tamarind of the ſhops.

BALAM ZUELLI, in botany, is a ſynonyme of the tea tree, an article in commerce imported from the Eaſt Indies, now well known to every individual in Europe who has arrived to the years of maturity. In theſe countries it is a morning and afternoon's beverage.

BALAMINE, in tetrapodology, denotes the diſtinctions in the hooves of quadrupeds; which are only thoſe that divide the hoof, contradiſtinguiſhed from the velarmine, or thoſe that do not divide the hoof. Linnæus has, with an accuracy peculiar to himſelf, defined thoſe neceſſary diſtinctions of ſpecification in his method of claſſification.

BALANCE, or BALLANCE, is one of the ſix ſimple powers in mechanics, principally uſed in determining the equality or difference of weights in heavy bodies, and conſequently their maſſes or or quantities of matter.

The Deceitful BALANCE, or that which cheats by the inequality of its brachia, is founded on the ſame principle as the ſteel-yard.

Aſſay BALANCE, is a very nice balance uſed in docimaſtical operations, to determine exactly the weight of minute bodies.

The ſtructure of the aſſayer's ſcale is little different from that of common ſcales, otherwiſe than by its nicety and ſmallneſs. The longer the beam of it is, the more exact may the weight of a body be found; however, 10 or 12 inches are a ſufficient length.

Hydroſtatic BALANCE, is an inſtrument contrived to determine accurately the ſpecific gravity of both ſolid and fluid bodies.

BALANCE *of Trade*, ſignifies that which is commonly meant by comparing the importing of foreign commodities with the exporting of the native. And it is reckoned that that nation has the advantage in the balance of trade, which exports more of the native commodities, and imports leſs of the foreign.

The reaſon aſſigned is, that if the native commodities be of a greater value than are exported, the balance of that account muſt be made up in bullion or money; and the nation grows ſo much richer, as the balance of that account amounts to.

BALANCE *of a Clock* or *Watch*, is that part which regulates the beats.

BALANCE *Fiſh*, in ichthyology, ſignifies a ſpecies of ſqualus or ſhark.

BALANCING among ſeamen, implies the contracting a ſail into a narrower compaſs, in a ſtorm, by retrenching, or folding up a part of it at one corner: this method is uſed in contradiſtinction to reefing, which is common to all the principal ſails; but balancing is peculiar to few, ſuch as the mizen of a ſhip, and the main ſail of thoſe veſſels in which it is extended by a boom.

The balance of the mizen is thus performed: the mizen yard is lowered a little, then a ſmall portion of the ſail is rolled up at the peek or upper corner, and faſtened to the yard about one-fifth inward from the outer end or yard arm towards the maſt.

A boom main ſail is balanced, after all its reefs are taken in, by rolling up a ſimilar portion of the hindmoſt or aftmoſt lower corner called the clue, and faſtening it ſtrongly to the boom.

BALANUS, in zoology, is the trivial name of a ſpecies of lepas.

BALANUS, myrepſica, or oily acorn, in pharmacy, ſignifies a nut of a purging quality, and the dry preſſing or powder, after the oil is taken out, is of a cleanſing and drying nature.

BALAUSTINE, Baulauſtia, or Balauſtia, in medicine, denote the flowers of the wild pomgranate. They are rough to the taſte, but very aſtringent, and are therefore uſed in diærrheas, and other fluxes.

BALBUSARDUS, in ornithology, is a ſynonyme of a ſpecies of the bald buzzard and falco genus, in the firſt order of birds.

BALCONY, in architecture, a projecture in the front of a houſe, or other building, ſupported by pillars or conſoles, and encompaſſed with a baluſtrade.

BALDACHIN, or BALDAQUIN, in architecture, ſignifies a building in the form of a canopy, ſupported by pillars, and frequently uſed as a covering to inſulated altars. The term baldachin, alſo is uſed for the ſhell over the door.

BALDMONIE, in botany, is a ſynonymous term for the Gentian root uſed in the materia medica. It is uſed alſo to expreſs a ſpecies of ginger called radamata.

BALDNESS, ſignifies a defect of hair. Among the cauſes of it immoderate venery is reputed one of the chief; yet this opinion is in many caſes erroneous; old age uſually brings it on of courſe. Some anatomiſts ſay the proximate cauſe of baldneſs ariſes from the dryneſs of the brain, and its ſhrinking from the cranium; it having been obſerved, that in bald perſons there is always a vacuity or empty ſpace between the ſkull and the brain.

BALE, in commerce, denotes thoſe kinds of goods that are packed up in cloth, and corded round very tight, in order to keep them from breaking, or preſerve them from the weather.

A bale of cotton yarn is from 300 to 400 weight; of raw ſilk, is from 100 to 400; of lockram or, dowlas, either three, three and a half, or four pieces.

BALE *Goods*, ſignify, among the Engliſh merchants, ſuch goods as are imported or exported in bales; but the French give that name to hardware, and other ſorts of merchandize, which come to Paris, and are commonly made by bad workmen of indifferent materials.

BALISTES, or old wife fiſh, in ichthyology, is a genus of fiſhes belonging to the order of nantes, and fourth claſs of animal nature. The characters are theſe: the head is flat; there are eight teeth in each ſide, and the two anterior ones are longeſt, in the place of gills, the baliſtes has an aperture immediately above the pectoral fins; the body is flat, the ſcales are joined together by the ſkin, and the belly is keeled. There are eight ſpecies, viz.

1. The monoceros, or unicorn fiſh, whoſe head fin conſiſts of but one ray, and the tail rays are carinated. They moſtly frequent thoſe ſeas that ſurround the Bahama iſlands, where the corals are in greateſt plenty.

2. The hiſpidus, whoſe head fin is uniradiated, and there is a round black ſpot in the tail fin. The body is rough, and briſtly towards the tail. The ſpine or horn is ſituated between the eyes; the ſnout is ſubulated; and inſtead of a belly fin, it has a jagged ſharp ſpine. This ſpecies is a native of Carolina.

3. The tomentoſus, whoſe head fin is biradiated, and the body of it towards the hind part is hairy. It is a native of America.

4. The papilloſus, has a biradiated back fin, and a papillous body.

5. The verrucoſus, has a triradiated back fin; and the tail is full of little warts. In the place of a belly fin, this ſpecies has a large, thick, warty ray. It has 25 ſmall reverſed ſharp ſpines at the ſide of the tail, diſpoſed in four rows. It is a native of India.

6. The aculeatus has a triradicated back fin; and the ſpines of the tail lean upon each other. It is alſo a native of India.

7. The vetula, or old wife, has a triradiated back fin; the belly fin is longitudinal, and ſomewhat carinated; and the tail fin is forked. It is found at Aſcenſion iſland.

8. The ringens, has a triradicated back fin; there are three folds on each ſide of the head, and the tail fin is forked. This ſpecies is likewiſe found at Aſcenſion iſland.

BALIVO Amovendo, in law, was anciently a writ for removing a bailiff from his office, for want of having ſufficient land in his bailiwick to anſwer the king and his people, according to the ſtatute of Weſtminſter, 2 Reg. Orig. 78.

BALK, among builders, generally implies red deal, it alſo denotes the ſummer beam of a houſe; or the poles and rafters, which ſupport the roofs of barns, &c.

BALKS, in agriculture, ſignify the diviſions left in fields to aſcertain mounds of different proprietors.

It alſo ſpecifies the ridges or banks between two furrows or pieces of arable lands.

Balks, among ſhip builders, denote the framing of that part of the hulk, which includes the hold or holt.

Balks, in the menage, are thoſe huts which are raiſed on purpoſe to conceal a fowler near the haunt of game, who ply at lakes in hard froſt for their food. The menageriſt has a ſpy loft, and a conductor to level his piece upon. Formerly they were much uſed, but now are little practiſed, as the modes to ſurmount the difficulty of obtaining the game is the beſt part of the fowler's paſtime.

BALKERS, in the Britiſh fiſhery, denote perſons placed on rocks, and eminences at ſea, to ſpy the herring droves, and give notice to the fiſhermen, by waving boughs, what way they go, and where they may be found.

BALL, in a general ſenſe, indicates a ſpherical or round body, whether natural or artificial.

Ball, in the military art, comprehends all ſorts of bullets for firearms, from the ſize of the cannon to that of the piſtol. Cannon balls are of iron; muſket balls, piſtol balls, &c. are of lead. The experiment has been tried of iron balls for piſtols and fuſees; but they are juſtly rejected, not only on account of their lightneſs, which prevent them from flying in a ſtraight direction, but becauſe they are apt to furrow the barrel.

Ball *of a Pendulum*, is the weight at the bottom. In ſhorter pendulums, it is called the bob.

Ball, in pyrotechnics, or fire works, is a compoſition of various combuſtible ingredients, ſerving to burn, ſmoke, give light, &c. In this ſenſe are comprehended fire balls, light balls, ſmoke balls, ſtink balls, ſky balls, water balls, land balls, &c. &c.

Ball, among the Corniſh miners, ſignifies a tin mine.

Ball, among printers, is a kind of wooden tunnel ſtuffed with wool, contained in a leather cover, which is nailed to the wood, with which the ink is applied on the forms to be wrought off.

Horse *Balls*, among farriers, are given to horſes medicinally, and are of an oval ſhape, not exceeding the ſize of a pullet's egg; and ſhould be dipped in ſweet oil to make them ſlip down the eaſier. Some horſes have a ſtrait gullet, which makes them very averſe to a ball being thruſt down their throats; ſuch horſes had better have drenches given them, or their medicines may be mixed with bran, or in their maſhes.

Ball *Vein*, in mineralogy, is a name given by the miners of Suſſex to a ſort of iron ore, common there, and wrought to conſiderable advantage. It yields not any great quantity of metal, but what it has runs freely in the fire; it is uſually found in looſe maſſes, not in the form of a ſtratum, and is often covered with one or more cruſts. It generally contains ſome ſparkling particles; and is uſually of a circular form in the perfect maſſes, thickeſt in the middle, and gradually thinner as it approaches the ſides.

Ball *and Socket*, is an inſtrument made of braſs, with a perpetual ſcrew, ſo as to move horizontally, vertically, and obliquely; and is generally uſed for the managing of ſurveying and aſtronimical inſtruments.

Puff Ball, the Engliſh name of the lycoperdon.

Martial Balls, in pharmacy, are a mixture of filings of iron and cream of tartar, formed into a ſolid conſiſtence and form of a ball, which is uſed to impregnate water or other liquids with iron diſſolved by the tartareous acid.

Mercurial Balls, in pharmacy, are an amalgamation of mercury and tin, ſufficiently ſolid to be moulded, and to preſerve a given form. The method of making them is by adding mercury to melted tin, and pouring the fluid maſs into a round hollow mould. Theſe balls are employed to purify water, in which they are boiled.

Balls *of Silk Worms and Spiders*, are little caſes or cones of ſilk, in which thoſe inſects depoſit their eggs. Spiders are extremely careful of their balls, which they carry about with them, adhering to the papillæ about their anus. Grew mentions balls or bags of a ſpecies of ſilk worms in Virginia, as big as hens eggs, and containing each four aurelias.

Balls *in Electricity*, are two pieces of cork, or pith of elder, nicely turned in a lathe to the ſize of a ſmall pea, and ſuſpended by fine linen threads; intended as electrometers, and of excellent uſe to diſcover ſmall degrees of electricity, to obſerve the changes of it from poſitive to negative, and *vice verſa*; and to eſtimate the force of a ſhock before the diſcharge, ſo that the operator ſhould always be able to tell very nearly before the diſcharge, by knowing how high he has charged his jars, what the exploſion will be.

Fire Balls, are bags of canvas filled with gun-powder, ſulphur, ſalt-petre, pitch, &c. to be thrown by the ſoldiers, or out of mortars, in order to fire the houſes, incommoding trenches, advanced poſts, or the like.

Light Balls, in pyrotechny, are ſuch as diffuſe an intenſe light around; after having been caſt out of the hand or a mortar, and burn for ſome time, and illuminate the adjacent parts.

Smoke or Dark Balls, are thoſe which fill the air with ſmoke, and darken a place to prevent diſcoveries. To prepare a darkening ball, make an oval or ſpherical bag, melt roſin over the coals, and add an equal part of ſalt petre not purified, alſo of ſulphur, and a fifth part of charcoal. The whole being well incorporated, put in tow firſt ſhred, and fill the bags with this compoſition, and dip it after the ſame manner as a fire ball.

Stink Balls, are thoſe which yield a great ſtench where fired to annoy the enemy. Their preparation is thus: Melt ten pounds of pitch, ſix of roſin, twenty of ſalt petre, eight of gunpowder, and four of colophony; to theſe add two of charcoal, ſix of horſehoofs cut ſmall, three of aſſa-fœtida, one of ſtinking ſaracen, and any other offenſive ingredients. The reſt as in the former.

Sky Balls, are thoſe caſt on high out of mortars, and which, when arrived at their height, burſting like rockets, afford a ſpectacle of decoration. Sky balls are made of a wooden ſhell, filled with various compoſitions, particularly that of the ſtars of rockets. Theſe are ſometimes intermixed with crackers and other combuſtibles, making rains of fire, &c.

Water Balls, are thoſe which ſwim and burn a conſiderable time in the water, and at length burſt in it. Theſe are made in a wooden ſhell, the cavity of which is filled with refined ſalt petre, ſulphur, ſaw-duſt boiled in water of ſalt petre, and dried; to which ſometimes other ingredients are added, as iron filings, Greek pitch, amber duſt, powdered glaſs, and camphor. The ingredients are to be ground, mixed up, and moiſtened with linſeed oil, nut oil, olive oil, hemp-ſeed oil, or petrol. At the bottom is placed an iron coffin, filled with whole gunpowder, that the ball may at laſt burſt with a greater noiſe: and, laſtly, the ball is, by the addition of lead or otherwiſe, made of the ſame ſpecific gravity with water.

Land Balls are thoſe which, being thrown out of a mortar, fall to the ground, burn, and burſt there. The ingredients are much the ſame as in the water balls, only the ſpecific gravity is not attended to.

BALLAD, ſignifies a vulgar ſong, adapted to the capacity of the lower claſs of people.

BALLAST, is a naval term, denoting any heavy matter, as ſtone, gravel, iron, &c. thrown into the hold of a ſhip, in order to make her ſink a proper depth into the water, that ſhe may be capable of carrying a ſufficient quantity of ſail without overſetting

The knowledge of ballaſting a ſhip with propriety, is certainly an article that deſerves the attention of the ſkilful mariner: for although it is known, that ſhips in general will not carry a ſufficient quantity of ſail till they are laden ſo deep that the ſurface of the water will nearly glance on the extreme breadth amidſhips, yet there is more than this general knowledge required; ſince, if ſhe has a great weight of heavy ballaſt, as lead, iron, &c. in the bottom, it will place the centre of gravity too low in the hold; and although this will enable her to carry a great ſail, ſhe will nevertheleſs ſail very heavily, and run the riſk of being diſmaſted by her violent rolling.

To ballaſt a ſhip, properly, is the art of diſpoſing thoſe materials ſo that ſhe may be duly poiſed, and maintain a proper equilibrium on the water, as neither to be too ſtiff nor too crank, qualities equally pernicious: as in the firſt, although the ſhip may be fitted to carry a great ſail, yet her velocity will not be proportionably increaſed; whilſt her maſts are more endangered by her ſudden jerks and exceſſive labouring: and in the laſt, ſhe will be incapable of carrying ſail, without the riſk of overſetting.

The whole art of ballaſting, therefore, conſiſts in placing the centre of gravity to correſpond with the trim and ſhape of the veſſel, ſo as neither to be too high nor yet too low; neither too far forward nor yet too far aft; and to lade the ſhip ſo deep, that the ſurface of the water may nearly riſe to the extreme breadth amidſhips; and thus ſhe will be enabled to carry a good ſail, incline but little, and ply well to the windward.

Ships are ſaid to be in ballaſt when they have no other loading. Maſters of veſſels are obliged to declare the quantity of ballaſt they bear, and to unload it at certain places.

Ship maſters are prohibited to unlade their ballaſt in havens, roads, &c. the neglect of which has ruined many excellent ports. Ships and veſſels taking in ballaſt in the river Thames, are to pay ſo much a tun to the Trinity houſe, Deptford; who employ ballaſtmen, and regulate them; and their lighters to be marked, &c. on pain of 10l.

BALLATOONS, are large heavy luggage-boats uſed for carrying wood by the river from Aſtracan and the Caſpian ſea from Moſcow. Theſe will carry from 100 to 200 ton, and have from 100 to 120 men employed to row and tow them along.

BALLET, **Balet**, or **Baletto**, a kind of dramatic poem, repreſenting ſome notable action or ſubject divided into ſeveral entries; in which ſeveral perſons appear, and recite things under the name of ſome illuſtrious character or fabulous deity.

Ballet is more particularly uſed for a kind of comic dance, conſiſting of a ſeries of ſeveral airs of different kinds of movements, which together repreſent ſome ſubject or action. They are performed chiefly by maſks, repreſenting ſylvans, tritons, nymphs, ſhepherds, and the like; and conſiſt of three parts, the entry, figure, and the retreat.

BALLERUS, in botany, is a trivial name for a ſpecies of the gourd of paleſtine, frequently mentioned in the holy writ.

Ballerus, in ichthyology, is a ſynonyme for the leather mouth, or carcaſſii tertium genus.

The pallerus, blica and pleyſta, are called by this name.

BALLIAGE, or **Bailiage**, in commerce, is a ſmall duty paid to the city of London by aliens, and even denizens, for certain commodities exported by them.

BALISTA was a machine uſed by the ancients for ſhooting darts; it reſembled in ſome meaſure our croſs bow.

BALLOON, or **Ballon**, in a general ſenſe, ſignifies any ſperical hollow body. In chemiſtry a balloon denotes a round ſhort necked veſſel, uſed to receive what is diſtilled by means of fire.

In architecture, a balloon is a round globe on the top of a pillar; and among engineers, a balloon is a kind of bomb made of paſte board, and played off in fire works, either in the air or on the water, in imitation of a real bomb.

Air **Balloon**, is deſcribed in the Syſtem of Aeroſtation.

Balloon alſo denotes a kind of game ſomewhat reſembling tennis. The balloon is played in the open field, with a great round ball of double leather blown up with wind, and thus driven to and fro with the ſtrength of a man's arm, fortified with a brace of wood.

Balloon, or **Balloen**, is more particularly uſed among voyagers for the ſtate barges of Siam. Theſe balloons are a kind of brigantine, managed with oars, of very odd figures, as ſerpents, ſea horſes, &c. but, by their ſharpneſs and number of oars, of incredible ſwiftneſs.

Balloon, in the French Paper trade, is a term which ſignifies a quantity of paper, containing 24 reams.

Balloon, **Ballon**, or **Ballot**, in the French glaſs trade, ſignifies a certain quantity of glaſs plates, ſmaller or greater according to their quality. The ballon of white glaſs contains 25 bundles, of ſix plates per bundle; but the ballon of coloured glaſs is only of 12½ bundles, and of three plates to a bundle.

BALLOTA, white horehound, in botany, is a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants: and in the natural method ranking under the 42d order, Verticillatæ. The calyx has 5 teeth, with 10 ſtriæ; and the upper lip of the corolla is crenated. It is a common weed growing on the ſides of banks in moſt parts of England.

BALLOTADE, in the menage, ſignifies the leap of a horſe between two pillars, or upon a ſtraight line, made with juſtneſs of time, with the aid of the hand and the calves of the legs; and in ſuch a manner, that when his fore-feet are in the air, he ſhows nothing but the ſhoes of his hinder feet without yerking out.

BALLOTING, a methcd of voting at elections, &c. by means of little balls uſually of different colours, by the French called ballots; which are put into a box privately.

BALLUSTARII, or **Ballistes**, in the ancient hiſtory of the military, denotes the ſoldiery who fought with the Balliſta.

But in the modern acceptation of the word, it denotes archus, or croſs-bow-men.

BALLUSTER, in architecture, is a ſmall kind of pillar uſed for balluſtrades.

BALLUSTRADE, is a ſeries or row of balluſters, joined by a rail; ſerving as well for a reſt to the elbows as for a fence or incloſure to balconies, altars, and ſtair caſes.

BALM, in botany, is the ſame as Meliſſa.

Balm, or **Balsam**, is the ſame as Balſam.

Balm *of Gilead*, is the ſame as Amyris.

BALNEARII *Servi*, in antiquity, were ſervants or attendants belonging to the baths. Some were appointed to heat them, called fornicatores; others were denominated capſarii, who kept the cloaths of thoſe that went into them; others aliptæ, whoſe care it was to pull off the hair; others unctuarii, who anointed and perfumed the body.

BALNEARIUS *Fur*, in law, and in antiquity, denoted a kind of thief who practiſed ſtealing the cloaths of perſons in the baths; ſometimes alſo called fur balnearum. The crime of thoſe thieves was a kind of ſacrilege; for the hot baths were ſacred: hence they were more ſeverely puniſhed than common thieves who ſtole out of private houſes. The latter were acquitted with paying double the value of the thing ſtolen; whereas the former were puniſhed with death.

BALNEUM, is a term uſed by chemiſts to ſignify a veſſel filled with ſome matter, as ſand, water, or the like, in which another is placed that requires a more gentle heat than the naked fire.

BALLONICH, is the Eaſtern name for rough, or crude camphor. By this name it was known to the ancients.

BALSAM, or *Native* **Balsam**, is an oily, reſinous, liquid ſubſtance, flowing either ſpontaneouſly, or by means of inciſion, from certain plants.

There are a great variety of balſams, generally denominated from the ſubſtances from which they are obtained.

BALSAMATION, in the records of the literati, implies the art of embalming the dead.

BALSAMELÆON, in pharmacy, denotes the Balſamum judaicum.

BALSAMICS, *Balſamica*, ſignify mitigating; the term balſamic is a very lax one; it includes medicines of very different qualities, as emollients, detergents, reſtorativesr &c. But in medicines of all theſe kinds there ſeems to be this requiſite in them, viz. that they be ſoft, yielding, and adheſive, alſo that by their ſmallneſs they have a ready diſpoſition to motion. Medicines of this tribe are generally required for complaints whoſe ſeat is in the viſcera; and as they cannot be conveyed there but by the common road of the circulation, it follows, that no great effects can be expected from them but by their long continuation. Hoffman calls by the name of balſamics thoſe medicines which are hot and acrid, alſo the natural balſams, gums, &c. by which the vital heat is increaſed.

BALTAGI, among the Turks, ſignify porters, and hewers of wood, in the court of the grand ſignior; who alſo mount on horſeback when the emperor rides out. Part of them muſt be caſtrated in order to keep watch at the gates of the firſt and ſecond courts of the ſeraglio. Theſe laſt are called capigi, and their commander capigi paſcha.

BALTHEUS Orionus, or *Belt of Orion*, in aſtronomy, is a part of the conſtellation Orion, conſiſting of 3 ſtars of the 2d magnitude, placed as it were in Orion's girdle or belt.

BALTIMORA, in botany, is a genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants. The receptaculum is chaffy; there is no pappus; the calyx is cylindrical and polyphyllous; and the ray of the corolla is quinqueſtorous. There is but one ſpecies, the recta, a native of Maryland.

BALTIMORE *Bird*, in ornithology, is the ſame as the Oriolus.

BAMBO, in commerce, is a meaſure containing five pints Wincheſter meaſure.

BAMBOE or **Bamboo**, in botany, the trivial name of a ſpecies of arundo.

BAMIER, is the name of a plant common in Egypt. It produces a pyramidal huſk, with ſeveral compartments, of the colour of a lemon, and filled with muſky ſeeds. This huſk dreſſed with meat is a wholeſome food, and has a very agreeable flavour. The Egyptians make great uſe of it in their ragouts.

BAN, in commerce, is a ſort of ſmooth fine muſlin, which the Engliſh import from the Eaſt Indies. The piece is almoſt a yard broad, and runs about 20 yards and a half in length.

BANANA Tree, is a ſpecies of the muſa or plantain.

BANCI Jus, or the privilege of having a bench, was antiently only allowed to the king's judges, *qui ſummam adminiſtrant juſtitiam*. Inferior courts, as courts baron, hundred courts, &c. were not allowed that prerogative; and even at this day the hundred court at Freibridge in Norfolk is held under an oak at Gey-wood; and that of Woolfry, in Herefordſhire, under an oak near Aſhton in that county, called Hundred-oak.

BANCO, is an Italian word, which ſignifies bank. It is commonly uſed to ſignify the bank of Venice.

BAND, in a general ſenſe, denotes ſome ſmall narrow ligament, with which any thing is bound, tied, or faſtened round about.

BAND, in architecture, is a general name for any flat low member, or moulding, that is broad but not very deep.

BAND *of Soldiers*, in military affairs, are thoſe who fight under the ſame flag or enſign.

BAND *of Penſioners*, are a company of 120 gentlemen, who receive a yearly allowance of 100l. for attending on his majeſty on particular occaſions.

BAND is alſo the denomination of a military order in Spain, inſtituted by Alphonſus XI. king of Caſtile, for the younger ſons of the nobility; who, before their admiſſion, muſt ſerve 10 years at leaſt, either in the army or at court; and are bound to take up arms for the Catholic faith againſt Infidels.

BANDAGE, in ſurgery, ſignifies a fillet, roller, or ſwathe, uſed in dreſſing and binding up wounds, reſtraining dangerous hemorrhages, and in joining fractured and diſlocated bones.

BANDALEER, or **BANDELEER**, in military affairs, denotes a large leathern belt, thrown over the right ſhoulder, and hanging under the left arm; worn by the antient muſqueteers both for ſuſtaining their fire arms, and the carriage of their muſket charges, which being put up in little wooden caſes, coated with leather, were hung, to the number of twelve, to each bandaleer.

BANDELET, or **BANDLET**, in architecture, denotes any little band, or flat molding; ſuch as that which crowns the Doric architrave.

BANDERET, a general, or one of the commanders in chief of the forces. This appellation is given to the principal commanders of the troops of the canton of Bern in Switzerland, where there are four banderets, who command all the forces of that canton.

BANDITTI, from the Italian bandito, denominate perſons proſcribed, or outlawed. It is alſo a denomination given to highwaymen or robbers who infeſt the roads in troops, eſpecially in Italy, France, and Sicily.

BANDOLEER CASE, ſignifies the little wooden barrel uſed by the Gallic ſoldiery, to keep their ammunition dry when out on a march in caſe of wet weather. It likewiſe implies a ſmall wooden caſe, containing a ſufficient quantity of powder for the charge of a muſquet.

BANDORE, is the name of a muſical inſtrument with ſtrings, reſembling a lute, and ſaid to be invented in the fourth year of queen Elizabeth, by John Roſe, a citizen of London.

BANDY LEGS, from the French *bander*, to bend, ſignifies a diſtortion of the legs, when they turn either inward or outward on either ſide; ariſing from ſome defect in the birth, or imprudence in the nurſe, endeavouring to make a child ſtand or walk before the legs are ſtrong enough to ſuſtain the weight of the body.

BANE, in a general ſenſe, ſignifies deſtruction or overthrow. Thus, "I will be the bane of ſuch a man," is a common ſaying. So, when a perſon receives a mortal injury by any thing, we ſay, "it was his bane."

BANGLE EARS, in the menage, is an imperfection in a horſe, remedied in the following manner. Place his ears in ſuch a manner as you would have them ſtand; bind them with two little boards ſo faſt that they cannot ſtir, and then clip away all the empty wrinkled ſkin cloſe by the head.

BANGUE, is a ſpecies of opiate, in great uſe throughout the eaſt, is a kind of wild hemp, growing in the countries of the Levant: it differs little, either as to leaf or ſeed, from our hemp, except in ſize.

BANIANS, are a religious ſect in the empire of the Mogul, who believe a metempſychoſis, or tranſmigration of ſouls; and will therefore eat no living creature, nor kill even noxious animals, but endeavour to releaſe them when in the hands of others.

Banians in a proper ſenſe, is reſtrained to a peculiar caſt, or tribe, of Indians, whoſe office or profeſſion is trade and merchandize: in which ſenſe, Banians ſtand contradiſtinguiſhed from Bramins, Cuttery, and Wyſe, the three other caſts into which the Indians are divided.

The four tribes or caſts are abſolutely ſeparate as to occupation, relation, marriage, &c. though all of the ſame religion; which is more properly denominated the religion of the Bramins, who make the eccleſiaſtical tribe, than of the Banians, who make the mercantile. The proper Banians are called, in the ſhaſter, or book of their law, by the name of Shuddery; under which are comprehended all who live after the manner of merchants, or tranſact buſineſs for others, as brothers; excluſive of the mechanics, or artificers, who make another caſt, called Wyſe.

The Banians have no peculiar ſect or religion, unleſs it be, that two of the eight general precepts given by their legiſlator Bremaw to the Indian nation, are, on account of the profeſſion of the Banians, ſuppoſed more immediately to relate to them, viz. thoſe which enjoin veracity in their words and dealings, and avoiding all practices of circumvention in buying and ſelling.

The Banians are the great factors, by whom moſt of the trade of India is managed; in this reſpect, comparable to the Jews and Armenians, and not behind either, in point of ſkill and experience, in whatever relates to commerce. Nothing is bought but this their mediation. They are diſperſed, for this purpoſe, through all parts of Aſia, and abound in Perſia, particularly at Iſpahan and Gombroom, where many of them are extremely rich, yet not above acting as brokers. The chief agents of the Engliſh, Dutch, and French Eaſt India companies, are of this nation: being faithful, they are generally entruſted with the caſh of thoſe companies in their keeping. They act alſo as bankers, and can give bills of exchange for moſt cities in the Eaſt Indies.

Their form of contract in buying and ſelling is remarkable; being done without words, in the profoundeſt ſilence, only by touching each other's fingers: the buyer looſening his pamerin, or girdle, ſpreads it on his knee, and both he and the ſeller having their hands underneath, by the intercourſe of the fingers, mark the price of pounds, ſhillings, &c. demanded, offered, and at length agreed on. When the ſeller takes the buyer's whole hand, it denotes a thouſand; and, as many times as he ſqueezes it, as many thouſand pagods, or roupees, according to the ſpecies in queſtion, are demanded: when he only takes the five fingers, it denotes five hundred; and when only one, one hundred: taking only half a finger, to the ſecond joint, denotes fifty; the ſmall end of the finger, to the firſt joint, ſtands for ten.

BANISHMENT, ſignifies exile, and is of two kinds: viz. the one voluntary, and upon oath; the other by compulſion, for ſome offence or crime. The former properly called abjuration, is now ceaſed; the latter is chiefly enjoined by judgment of Parliament. Yet the outlawing and tranſportation may alſo be conſidered as a ſpecies of exile.

BANISTERIA, in botany, is a genus of the trigynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 23d order, Trihilatæ. The calyx is quinquepartite, with nectarious pores on the outſide of the baſe; the petals are roundiſh and ungulated; the ſeeds are three, with membranaceous wings. There are ſeven ſpecies, all natives of warm countries, but poſſeſſing no remarkable properties.

BANK, in commerce, ſignifies a common repoſitory, where many perſons agree to keep their money, to be always ready at their call or direction; under certain ſocieties or communities, who take the charge of it, either to improve it, or to keep it ſecure.

The firſt inſtitution of banks was in Italy, where the Lombard Jews kept benches in the market-places for the exchange of money and bills; and *banco* being the Italian name for *bench*, banks took their title from this word.

Banks are of two principal kinds. 1. One ſort is either public, conſiſting of a company of monied men, who being duly eſtabliſhed, and incorporated by the laws of their country, agree to depoſit a conſiderable fund, or joint ſtock, to be employed for the uſe of the ſociety, as lending money upon good ſecurity, buying and ſelling bullion, diſcounting bills of exchange, &c. or private, i. e. ſet up by private perſons, or partnerſhips, who deal in the ſame way as the former upon their own ſingle ſtock and credit.

The greateſt bank of circulation in Europe is the Bank of England. The company of which was incorporated by parliament, in the fifth and ſixth years of king William and queen Mary, by the name of The Governors and Company of the Bank of England; in conſideration of the loan of 1,200,000l. granted to the government; for which the ſubſcribers received nearly 8 per cent.

By this charter, the company are not to borrow under their common ſeal, unleſs by act of parliament; they are not to trade, or ſuffer any perſon in truſt for them to trade, in any goods or merchandize; but they may deal in bills of exchange, in buying or ſelling bullion, and foreign gold and ſilver coin, &c.

By an act of parliament paſſed in the 8th and 9th years of William III. they were impowered to enlarge their capital ſtock to 2,201,171l. 10s. It was then alſo enacted, that bank ſtock ſhould be a perſonal, and not a real eſtate; that no contract either in word or writing, for buying or ſelling bank ſtock, ſhould be good in law, unleſs regiſtered in the books of the bank within 7 days, and the ſtock transferred in 14 days; and that it ſhall be felony, without benefit of clergy, to counterfeit the common ſeal of the bank, or any ſealed bank bill, or any bank note, or to alter or eraſe ſuch bills or notes. By another act paſſed in the 7th of queen Anne, the company were impowered to augment their capital to 4,402,343l. and they then advanced 400,000l. more to the government; and in 1714, they advanced another loan of 1,500,000l.

In the third year of the reign of king George I. the intereſt in their capital ſtock was reduced to 5 per cent. when the bank agreed to deliver up as many exchequer bills as amounted to 2,000,000l. and to accept an annuity of 100,000l. and it was declared lawful for the bank to call from their members, in proportion to their intereſts in the capital ſtock, ſuch ſums of money as in a general court ſhould be found neceſſary. If any member ſhould neglect to pay his ſhare of the moneys ſo called for, at the time appointed by notice in the London Gazette, and fixed upon the Royal Exchange, it ſhould be lawful for the bank, not only to ſtop the dividend of ſuch member, and to apply it towards payment of the money in queſtion, but alſo to ſtop the transfers of the ſhare of ſuch defaulter, and to charge him with an intereſt of 5 per cent. per annum, for the money ſo omitted to be paid: and if the principal and intereſt ſhould be three months unpaid, the bank ſhould then have power to ſell ſo much of the ſtock belonging to the defaulter as would ſatisfy the ſame. After this, the bank reduced the intereſt of 2,000,000l. lent to the government, from 5 to 4 per cent. and purchaſed ſeveral other annuities, which were afterwards redeemed by the government, and the national debt due to the bank reduced to 1,600,000l. But in 1742, the company engaged to ſupply the government with 1,600,000l. at 3 per cent. which is now called the 3 per cent. annuities; ſo that the government was now indebted to the company 3,200,000l. the one half carrying 4, and the other 3 per cent.

In the year 1746, the company agreed that the ſum of 986,800l. due to them in the exchequer bills unſatisfied, on the duties for licences to ſell ſpirituous liquors by retail, ſhould be cancelled, and in lieu of it to accept of an annuity of 39,442l. the intereſt of that ſum at 4 per cent. The company alſo agreed to advance the further ſum of 1,000,000l. into the exchequer, upon the credit of the duties ariſing by the malt and land tax at 4 per cent. for exchequer bills to be iſſued for that purpoſe; in conſideration of which, the company were enabled to augment their capital with 986,800l. the intereſt of which, as well as that of the other annuities, were reduced to 3½ per cent. till the 25th of December 1757, and from that time to carry only 3 per cent.

And in order to enable them to circulate thoſe exchequer bills, they eſtabliſhed what is now called bank circulation. The nature of which may be underſtood from what follows:

The company of the bank are obliged to keep caſh ſufficient not only to anſwer the common, but alſo any extraordinary demand that may be made upon them; and whatever money they have by them, over and above the ſum ſuppoſed neceſſary for the purpoſes, they employ in what may be called the trade of the company; that is to ſay, in diſcounting bills of exchange, in buying of gold and ſilver, and in government ſecurities, &c. But when the bank entered into the abovementioned contract, as they did not keep unemployed a larger ſum of money than what they deemed neceſſary to anſwer their ordinary and extraordinary demands, they could not conveniently take out of their current caſh ſo large a ſum as a million, with which they were obliged to furniſh the government, without either leſſening that ſum they employed in diſcounting, buying gold and ſilver, &c. or inventing ſome method that ſhould anſwer all the purpoſes of keeping the million in caſh. The method which they choſe, and which fully anſwers their end, was as follows:

They opened a ſubſcription, which they renew annually, for a million of money; in which the ſubſcribers advance 10 per cent. and enter into a contract to pay the remainder, or any part of it, whenever the bank ſhall call upon them, under penalty of forfeiting the 10 per cent. ſo advanced; in conſideration of which, the bank pays the ſubſcribers 4 per cent. intereſt for the money paid in, and ¼ per cent. for the whole ſum they agree to furniſh; and in caſe a call ſhall be made upon them for the whole, or any part of it, the bank further agrees to pay them at the rate of 5 per cent. per annum for ſuch ſum till they repay it, which they are under an obligation to do at the end of the year. By this means the bank obtains all the purpoſes of keeping a million of money by them; and though the ſubſcribers, if no call is made upon them (which is in general the caſe) receive 6½ per cent. for the money they advance, yet the company gains the ſum of 23,500l. per annum by the contract; as will appear by the following calculation:

The bank receives from the government for the advance of a million - - - - - -	£. 30,000
The bank pays the ſubſcribers who advance 100,000l. and engage to pay (when called for) 900,000l. more	6,500
The clear gain to the bank therefore is -	23,500

This is the ſtate of the caſe, provided the company ſhould make no call on the ſubſcribers; which they will be very unwilling to do, becauſe it would not only leſſen their profit, but affect the public credit in general.

Bank-ſtock may not improperly be called a trading ſtock, ſince with this they deal very largely in foreign gold and ſilver, in diſcounting bills of exchange, &c. Beſides which, they are allowed by the government very conſiderable ſums annually for the management of the annuities paid at their office. All which advantages render a ſhare in their ſtock very valuable; though it is not equal in value to the Eaſt India ſtock. The company make dividends of the profits half yearly, of which notice is publicly given; when thoſe who have occaſion for their money may readily receive it; but private perſons, if they judge convenient, are permitted to continue their funds, and to have their intereſt added to the principal.

This company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the ſame manner as in the Eaſt India company. Thirteen, or more, compoſe a court of directors for managing the affairs of the company. The officers of this company are very numerous.

The ſtability of the bank of England is equal to that of the Britiſh government. All that it has advanced to the public muſt be loſt before its creditors can ſuſtain any loſs. No other banking company in England can be eſtabliſhed by act of parliament, or can conſiſt of more than ſix members. It acts, not only as an ordinary bank, but (as we have already ſeen) as a great engine of ſtate; receiving and paying the greater part of the annuities which are due to the creditors of the public; circulating exchequer bills; and advancing to government the annual amount of the land and malt taxes, which are frequently not paid up till ſome years thereafter. It likewiſe has, upon ſeveral different occaſions, ſupported the credit of the principal houſes, not only in England, but of Hamburgh and Holland. Upon one occaſion it is ſaid to have advanced for this purpoſe, in one week, about 1,600,000l. a great part of it in bullion.

In Scotland there are two public banks, both at Edinburgh. The one is called The Bank of Scotland, which was eſtabliſhed by act of parliament in 1695; the other, called The Royal Bank, by royal charter in 1727.

Within theſe 30 years there have alſo been erected private banking companies in almoſt every conſiderable town, and even in ſome villages in Scotland. Hence the buſineſs of the country is almoſt entirely carried on by paper-currency, i. e. by the notes of thoſe different banking companies; with which purchaſes and payments of all kinds are commonly made. Silver very ſeldom appears, except in the change of a twenty ſhillings bank note, and gold ſtill ſeldomer. It is well known, that the trade of the city of Glaſgow has been doubled in about 15 years after the firſt erection of the banks there; and that the trade of Scotland has been more than quadrupled ſince the firſt erection of the two public banks at Edinburgh.

The value of the ſilver money, which circulated in Scotland before the union in 1707, and which immediately after it was brought into the bank of Scotland, in order to be recoined, amounted to £.411,117 : 10 : 9 ſterling. No account has been got of the gold coin; but it appears from the ancient accounts of the mint of Scotland, that the value of the gold annually coined ſomewhat exceeded that of the ſilver. There were a good many people too upon this occaſion, who, from a diffidence of repayment, did not bring their ſilver into the bank of Scotland; and there was, beſides, ſome Engliſh coin, which was not called in. The whole value of the gold and ſilver, therefore, which circulated in Scotland before the Union, cannot be eſtimated at leſs than a million Sterling. It ſeems to have conſtituted almoſt the whole circulation of that country; for though the circulation of the bank of Scotland which had then no rival, was conſiderable, it ſeems to have made but a very ſmall part of the whole. In the preſent times the whole circulation of Scotland cannot be eſtimated at leſs than two millions, of which that part which conſiſts in gold and ſilver moſt probably does not amount to half a million. But though the circulating gold and ſilver of Scotland have ſuffered ſo great a diminution during this period, its real riches and proſperity do not appear to have ſuffered any. Its agriculture, manufactures, and trade, on the contrary, the annual produce of its land and labour, have evidently been augmented.

It is chiefly diſcounting bills of exchange, that is, by advancing money upon them before they are due, that the greater part of banks and bankers iſſue their promiſſory notes. They deduct always, upon whatever ſum they advance, the legal intereſt till the bill ſhall become due. The payment of the bill, when it becomes due, replaces to the bank the value of what had been advanced, together with a clear profit of the intereſt. The banker, who advances to the merchant whoſe bill he diſcounts, not gold and ſilver, but his own promiſſory notes, has the advantage of being able to diſcount to a greater amount, by the whole value of his promiſſory notes, which he finds by experience are commonly in circulation. He is thereby enabled to make his clear gain of intereſt on ſo much a larger ſum.

The late multiplication of banking companies in both parts of the united kingdom, an event by which many people have been much alarmed, inſtead of diminiſhing, increaſes the ſecurity of the public. It obliges all of them to be more circumſpect in their conduct, and, by not extending their currency beyond its due proportion to their caſh, to guard themſelves againſt thoſe malicious runs which the rivalſhip of ſo many competitors is always ready to bring upon them. It reſtrains the circulation of each particular company within a narrower circle, and reduces their circulating notes into a ſmaller number. By dividing the whole circulation into a greater number of parts, the failure of any one company, an accident, which, in the courſe of things, muſt ſometimes happen, becomes of leſs conſequence to the public.

Since the free trade has been granted to Ireland, a National Bank has been opened in the city of Dublin, under the firm of the Governor and Company of the Bank of Ireland. It is ſaid their capital amounts to upwards of 4 millions. The intereſt of money in that kingdom is 6 per cent. per ann. but their ſterling currency at par is 8⅓ per cent. under the real current coin of Great Britain.

2. The other kind of banks conſiſts of ſuch as are inſtituted

wholly on the public account, and are called Banks of Depoſit; the nature of which not being generally underſtood, the following particular explanation may not be unacceptable.

The currency of great ſtates ſuch as Great Britain and Ireland generally conſiſt of their own coin. Should this currency, therefore, be at any time worn, clipt, or otherwiſe degraded below its ſtandard value, the ſtate by a reformation of its coin can effectually re-eſtabliſh its currency. But the currency of a ſmall ſtate, ſuch as Genoa or Hamburgh, can ſeldom conſiſt altogether in its own coin, but muſt be made up, in a great meaſure, of the coins of all the neighbouring ſtates with which its inhabitants have a continual intercourſe. Such a ſtate, therefore, by reforming its coin, will not always be able to reform its currency. If foreign bills of exchange are paid in this currency, the uncertain value of any ſum, of what is in its own nature ſo uncertain, muſt render the exchange always very much againſt ſuch a ſtate, its currency being in all foreign ſtates, neceſſarily valued even below what is worth. In order to remedy the inconvenience to which this diſadvantageous exchange muſt have ſubjected their merchants, ſuch ſmall ſtates, when they began to attend to the intereſt of trade, have frequently enacted, that foreign bills of exchange of a certain value ſhould be paid, not in common currency, but by an order upon, or by a transfer in the books of, a certain bank, eſtabliſhed upon the credit and under the protection of the ſtate; this bank being always obliged to pay, in good and true money, exactly according to the ſtandard of the ſtate.

The banks of Venice, Genoa, Amſterdam, Hamburgh, and Nuremberg, ſeem to have been all originally eſtabliſhed with this view, though ſome of them may have afterwards been made ſubſervient to other purpoſes. The money of ſuch banks, being better than the common currency of the country, neceſſarily bore an agio, which was greater or ſmaller, according as the currency was ſuppoſed to be more or leſs degraded below the ſtandard of the ſtate. The agio of the bank of Hamburgh, for example, which is ſaid to be commonly about 14 per cent. is the ſuppoſed difference between the good ſtandard money of the ſtate, and the clipt, worn, and diminiſhed currency poured into it from all the neighbouring ſtates.

In order to remedy theſe inconveniences, a bank was eſtabliſhed in 1609, under the guarantee of the city of Amſterdam. The bank received both foreign coin, and the light and worn coin of the country, at its real and intrinſic value in the good ſtandard money of the country, deducting only ſo much as was neceſſary for defraying the expence of coinage, and the other expences of management. For the value which remained after this ſmall deduction was made, it gave a credit in its books. This credit was called bank money; which, as it repreſented money exactly according to the ſtandard of the mint, was always of the ſame real value, and intrinſically worth more than current money. It was at the ſame time enacted, that all bills drawn upon or negociated at Amſterdam of the value of 600 gilders and upwards, ſhould be paid in bank money, which at once took away all uncertainty in the value of thoſe bills. Every merchant, in conſequence of this regulation, was obliged to keep an account with the bank in order to pay his foreign bills of exchange, which neceſſarily occaſioned a certain demand for bank money.

Thoſe depoſits of coin, which the bank was bound to reſtore in coin, conſtituted the original capital of the bank, or the whole value of what was repreſented by what is called bank money. At preſent they are ſuppoſed to conſtitute but a very ſmall part of it. In order to facilitate the trade in bullion, the bank has been for theſe many years in the practice of giving credit in its books upon depoſits of gold and ſilver bullion. This credit is generally about 5 per cent. below the mint price of ſuch bullion. The bank grants at the ſame time what is called a recipice or receipt, intitling the perſon who makes the depoſit, or the bearer, to take out the bullion again at any time within ſix months, upon retransferring to the bank a quantity of bank money equal to that for which credit had been given in its books when the depoſit was made, and upon paying ¼ per cent. for the keeping, if the depoſit was in ſilver, and ½ per cent. if it was in gold; but at the ſame time declaring, that in default of ſuch payment, and upon the expiration of this term, the depoſit ſhould belong to the bank at the price at which it had been received, or for which credit had been given in the transfer books. What is thus paid for the keeping of the depoſit may be conſidered as a ſort of warehouſe rent; and why this warehouſe rent ſhould be ſo much dearer for gold than for ſilver, ſeveral different reaſons have been aſſigned. The fineneſs of gold, it has been ſaid, is more difficult to be aſcertained than that of ſilver. Frauds are more eaſily practiſed, and occaſion a greater loſs in the more precious metal. Silver, beſides, being the ſtandard metal, the ſtate wiſhes to encourage the making of depoſits of ſilver than of thoſe of gold.

The bank of Amſterdam profeſſes to lend out no part of what is depoſited with it, but, for every gilder for which it gives credit in its books, to keep in its repoſitories the value of a gilder, either in money or bullion.

What may be the amount of the treaſure in the bank is a queſtion which has long employed the ſpeculations of the curious. Nothing but conjecture can be offered concerning it. It is generally reckoned, that there are about 2000 people who keep accounts with the bank; and allowing them to have, one with another, the value of 1500l. lying upon their reſpective accounts, the whole quantity of bank money, and conſequently of treaſure in the bank, will amount to 3,000,000l. or, at 11 gilders the pound ſterling, 33,000,000 of gilders; a great ſum, and ſufficient to carry on a very extenſive circulation, but vaſtly below the extravagant ideas which ſome people have formed of this treaſure.

Bank, in the marine, denotes an elevation of the ground or bottom of the ſea, ſo as ſometimes to ſurmount the ſurface of the water, or at leaſt to leave the water ſo ſhallow as uſually not to allow a veſſel to remain a-float over it. In this ſenſe, bank amounts to much the ſame as flat, ſhoal, &c.

BANKER, ſignifies a perſon who traffics and negociates in money, and receives and remits money from place to place by commiſſion from correſpondents, or by means of bills of exchange, letters of credit, &c.

BANKING, in a general ſenſe, implies the making of banks to oppoſe the force of the ſea, rivers, or the like, and ſecure the land from being overflowed. With reſpect to the water which is to be kept out, this is called banking; but with reſpect to the land, which is to be hereby defended, embanking.

Banking is alſo applied to the keeping of a bank, or the employment of a banker. Banking in this ſenſe, ſignifies the trading in money, or remitting it from place to place, by means of bills of exchange. This anſwers to what the French call *faire la banque.*

In France, every body is allowed to bank, whether merchant or not; even foreigners are indulged in this kind of traffic.

In Italy, banking does not derogate from nobility, eſpecially in the republic ſtates; whence it is, that moſt of the younger ſons of great families engage in it. In reality, it was the nobility of Venice and Genoa, that, for a long time, were the chief bankers of Europe.

BANKRUPT, *bancus ruptus*, in law and trade, ſignifies a breaking or failing in the world.

A bankrupt from the ſeveral deſcriptions given of him in our ſtatute law, may be defined "a trader, who ſecretes himſelf, or does certain other acts tending to defraud his creditors." For the better underſtanding of this article, it will be proper to conſider, 1. Who may become a bankrupt: 2. What acts conſtitute a bankrupt:

1. A bankrupt was formerly conſidered merely in the light of a criminal or offender. But at preſent the laws of bankruptcy are calculated for the benefit of trade, and founded on the principles of humanity as well as juſtice; and to that end they confer ſome privileges, not only on the creditors, but alſo on the bankrupt himſelf. On the creditors; by compelling the bankrupt to give up all his effects to their uſe, without any fraudulent concealment: on the debtor; by exempting him from the rigor of the general law, though in reality he has nothing to ſatisfy the debt; ſo that the law of bankrupts, taking into conſideration the ſudden and unavoidable accidents to which men in trade are liable, has given them the liberty of their perſons, and ſome pecuniary emoluments, upon condition they ſurrender up their whole eſtate to be divided among their creditors.

The laws of England have done wiſely in providing at once againſt the inhumanity of the creditor, who is not ſuffered to confine an honeſt bankrupt after his effects are delivered up; and at the ſame time taking care that all his juſt debts ſhall be paid, ſo far as the effects will extend. But ſtill they are cautious of encouraging prodigality and extravagance by this indulgence to debtors: and therefore they allow the benefit of the laws of bankruptcy to none but actual traders; ſince that ſet of men are, generally ſpeaking, the only perſons liable to accidental loſſes, and to an inability of paying their debts, without any fault of their own.

If perſons in other ſituations of life run in debt without the power of payment, they muſt abide the conſequences of their indiſcretion, even though they meet with ſudden accidents that may reduce their fortunes: for the law holds it to be an unjuſtifiable practice, for any perſon but a trader to encumber himſelf with debts of any conſiderable value. If a gentleman of a liberal profeſſion, at the time of contracting his debts, has a ſufficient fund to pay them, the delay of payment is a ſpecies of diſhoneſty, and a temporary injuſtice to his creditor: and if, at ſuch time, he has not a ſufficient fund, the diſhoneſty and injuſtice is the greater. He cannot therefore murmur, if he ſuffers the puniſhment which he has voluntary drawn upon himſelf. But in mercantile tranſactions the caſe is quite otherwiſe. Trade cannot be carried on without mutual credit on both ſides: the contracting of debts is therefore here not only juſtifiable but neceſſary. And if by accidental calamities, as by the loſs of a ſhip in a tempeſt, the failure of brother traders, or by the non-payment of perſons out of trade, a merchant or trader becomes incapable of diſcharging his own debts, it is his misfortune and not his fault. To the misfortunes therefore of debtors, the law has given a compaſſionate remedy, but denied it to their faults: ſince, at the ſame time that it provides for the ſecurity of commerce, by enacting that every conſiderable trader may be declared a bankrupt, for the benefit of his creditors as well as himſelf, it has alſo, to diſcourage extravagance, declared, that no one ſhall be capable of being made a bankrupt, but

but only a trader; nor capable of receiving the full benefit of the ſtatutes, but only an induſtrious trader.

In the interpretation of the ſeveral ſtatutes made concerning bankrupts, it hath been held, that buying *only*, or ſelling *only*, will not qualify a man to be a bankrupt; but it muſt be both buying and ſelling, and alſo getting a livelihood by it: as, by exerciſing the calling of a merchant, a grocer, a mercer, or, in one general word, a *chapman*, who is one that buys and ſells any thing. But no handicraft occupation will make a man a regular bankrupt.

2. The acts of bankruptcy are thoſe which render a man a bankrupt; to define them, according to legal authority, it will be neceſſary to conſult the ſtatutes in that caſe made and provided.

1. Departing from the realm, by which a man withdraws himſelf from the juriſdiction and coercion of the law, with an intent to defraud his crediters.

2. Departing from his own houſe, with intent to ſecrete himſelf and avoid his creditors.

3. Keeping in his own houſe, privately (except for juſt and neceſſary cauſe), ſo as not to be ſeen or ſpoken with by his creditors; which is likewiſe conſtrued to be an intention to defraud his creditors, by avoiding the proceſs of the law.

4. Procuring or ſuffering himſelf willingly to be arreſted, or outlawed, or impriſoned, without juſt and lawful cauſe; which is likewiſe deemed an attempt to defraud his creditors.

5. Procuring his money, goods, chattels, and effects, to be attached or ſequeſtrated by any legal proceſs; which is another plain and direct endeavour to diſappoint his creditors of their ſecurity.

6. Making any fraudulent conveyance to a friend, or ſecret truſtee, of his lands, tenements, goods, or chattels; which is an act of the ſame ſuſpicious nature with the laſt.

7. Procuring any protection, not being himſelf privileged by parliament, in order to ſcreen his perſon from arreſts; which alſo is an endeavour to elude the juſtice of the law.

8. Endeavouring, or deſiring, by any petition to the king, or bill exhibited in any of the king's courts againſt any creditors, to compel them to take leſs than their juſt debts; or to procraſtinate the time of payment, originally contracted for; which are an acknowledgment of either his poverty or his knavery.

9. Lying in priſon for two months, or more, upon arreſt or other detention for debt, without finding bail, in order to obtain his liberty.

10. Eſcaping from priſon after an arreſt for a juſt debt of 100l. or upwards.

11. Neglecting to make ſatisfaction for any juſt debt to the amount of 100l. within two months after ſervice of legal proceſs, for ſuch debt, upon any trader having privilege of parliament.

Theſe are the ſeveral acts of bankruptcy expreſsly defined by the ſtatutes relating to this article; which being ſo numerous, and the whole law of bankrupts being an innovation on the common law, our courts of juſtice have been tender of extending or multiplying acts of bankruptcy by any conſtruction or implication. And therefore Sir John Holt held, that a man's removing his goods privately to prevent their being ſeized in execution, was no act of bankruptcy. For the ſtatutes mention only fraudulent gifts to third perſons, and procuring them to be ſeized by ſham proceſs, in order to defraud creditors: but this, though a palpable fraud, yet, falling within neither of thoſe caſes, cannot be adjudged an act of bankruptcy.

It has alſo been determined expreſsly, that a banker's ſtopping or refuſing payment is no act of bankruptcy: for it is not within the deſcription of any of the ſtatutes; and there may be good reaſons for his ſo doing, as ſuſpicion of forgery, and the like: and if, in conſequence of ſuch refuſal, he is arreſted, and puts in bail, ſtill it is no act of bankruptcy; but if he goes to priſon, and lies there two months, then, and not before, is he become a bankrupt.

BANKRUPTCY, in the language of the law, ſignifies a failure in trade which was carried on ſolely by the profeſſion of buying and ſelling, ſo as to live upon the profits of ſuch traffic.

BANKSIA, in botany, is a genus of the monogynia order, belonging to the tetrandia claſs of plants. The amentum is ſcaly, the corolla conſiſts of four petals; the antheræ are in the cavity of the folds, and ſoſſile; the capſule is bivalvular; and the ſeed is ſolitary, and bipartic. There are four ſpecies, the ſerata, integrifolia, eridæ folia, and dentata, all natives of New Holland.

BANN, Ban, or Banns, ſignifies generally a proclamation of any public ſummons or edict, which a thing is commanded or forbidden.

The word banns is particularly uſed in England in publiſhing matrimonial contracts; which is done in the church before marriage, to the end that if any perſons can ſpeak againſt the intention of the parties, either in reſpect of kindred, precontract, or any other juſt cauſe, they may take their exception in time, before the marriage is conſummated: if there is a licence for the marriage, then this ceremony is omitted; but miniſters muſt not celebrate matrimony between any perſons without a licence, except the banns have been firſt publiſhed three ſeveral times, upon pain of ſuſpenſion, &c.

Bann, is alſo uſed to denote proſcription or baniſhment for a crime proved; becauſe anciently publiſhed by ſound of trumpet; and thoſe who did not appear at the ſummons, were puniſhed by proſcription. Hence, to put a prince under the bann of the empire, is to declare him diveſted of all his dignities.

Bann alſo denotes a pecuniary mulct, or penalty, laid on a delinquent for offending againſt a public ordonance.

Epiſcopal Bann, ſignifies a mulct paid to the biſhop by thoſe guilty of ſacrilege and other crimes.

Bann, is alſo uſed for a ſolemn anathema, or excommunication, attended with curſes, &c. In this ſenſe we read of papal banns, &c.

Bann, in military or naval affairs, denotes a proclamation made in the fleet or army by beat of drum, ſound of trumpet, &c. requiring the ſtrict obſervance of diſcipline, either for the declaring a new officer, or puniſhing an offender.

BANNER denotes either a ſquare flag, or the principal ſtandard belonging to a prince.

The Banner *of France*, was the largeſt and richeſt of all the flags borne by the ancient kings in their great military expeditions. St. Martin's cap was in uſe 600 years as the banner of France; it was made of taffety, painted with the image of that ſaint, and laid one or two days on his tomb to prepare it for uſe.

About the year 1100 came in a more pompous apparatus. The banner royal was faſtened to the top of a maſt, or ſome tall tree, planted on a ſcaffold, borne on a carriage drawn by oxen, covered with velvet houſings, decorated with devices or cyphers of the reigning prince. At the foot of the tree was a prieſt, who ſaid maſs early every morning. Ten knights mounted guard on the ſcaffold night and day, and as many trumpets at the foot of the tree never ceaſed flouriſhing, to animate the troops. This cumberſome machine, the mode of which was brought from Italy, continued in uſe 130 years. Its poſt was in the centre of the army. And here it was that the cheaf feats were performed, to carry off and defend the royal banner; for there was no victory without it, nor was any army reputed vanquiſhed till they had loſt the banner.

BANNERETS, were an ancient order of knights, or feudal lords; who, poſſeſſing ſeveral large fees, led their vaſſals to battle under their own flag or banner, when ſummoned thereto by the king.

Formerly there were two kinds of knights, the firſt were called bannerets and the ſecond bachelors; the firſt compoſed the upper, the ſecond the middle, nobility.

The banneret was a dignitary allowed to march under his own flag, but the bachelarius eques followed that of another. To be qualified as a banneret, one muſt be a gentleman of family, and be able to raiſe a certain number of armed men, with eſtate enough to ſubſiſt at leaſt 28 or 30 men. This expence muſt have been very conſiderable in thoſe days; as each man, beſides his ſervant, had two horſemen to wait on him armed, the one with a croſs-bow, the other with a bow and hatchet. As he was not allowed to be a baron who had not above 13 knights fees, ſo he was not admitted to be a banneret if he had leſs than 10.

Bannerets were ſecond to none but knights of the garter. They were reputed the next degree below the nobility; and were allowed to bear arms with ſupporters, which none elſe may under the degree of a baron. In France, it is ſaid, the dignity was hereditary; but in England it died with the perſon that gained it. The order dwindled on the inſtitution of barronets by king James I. and at length became extinct. The laſt perſon created banneret was Sir John Smith, made ſo after Edghill-fight, for reſcuing the ſtandard of king Charles I.

The form of the banneret's creation was this. On a day of battle, the candidate preſented this flag to the king or general; who, cutting off the train or ſkirt of it, and making it a ſquare, returned it again, the proper banner of bannerets; who are hence ſometimes called knights of the ſquare flag.

Banneret was alſo the name of an officer or magiſtrate of Rome towards the cloſe of the 14th century. The people of that city, and throughout the territory of the church, during the diſputes of the antipopes, had formed a kind of republican government; where the whole power was lodged in the hands of a magiſtrate called ſenator, and twelve heads of quarters called bannerets.

BANNOCK, is a Scotch word, which ſignifies a kind of oaten-cake; baked in the embers, or on a ſtone placed before the fire, generally called a ſconn. It is common in the Northern parts of this kingdom.

BANNUM, in law, ſignifies the utmoſt bounds of a manor or town land, uſually called mears and mounds.

BANOY, in ornythology, ſignifies a ſpecies of the ſparrow hawk, of the genus of falco, and claſs or order the firſt. It is a native of the Philippine iſlands.

BANQUET, is a feaſt or entertainment where people regale themſelves with agreeable food and pleaſant fruits.

Banquet, in the menage, is that ſmall part of the branch of a bridle that is under the eye; which being rounded like a ſmall rod, gathers and joins the extremities of the bit to the branch in ſuch a manner that the banquet is not ſeen, but covered by the cope, or that part of the bit that is next the branch.

BANQUET *Line*, is an imaginary line drawn, in making a bit, along the banquet, and prolonged up or down, to adjuſt the deſigned force or weakneſs of the branch, in order to make it ſtiff or eaſy in curbing.

BANQUET, or *Banquette*, in fortification, is a little foot-bank, or elevation of earth, forming a path which runs along the inſide of a parapet, upon which the muſketeers get up, in order to diſcover the counterſcarp, or to fire on the enemy, in the moat or in the covert-way; but more uſually to obſerve the motions of the enemy.

BANQUETING *Room*, or *Houſe*, was a ſmall ſaloon where the ancient Romans ſupped; but, in after-times, magnificent ſaloons, or banqueting rooms, were built, for the more commodious and ſplendid entertainment of their gueſts.

BANSTICLE, in ichthyology, is a ſpecies of the gaſteroſteus, commonly called the prickle back, of which this name is a ſynonymous term.

BANTAM *Work*, is a kind of painted or carved work, reſembling that of japan, only more gaudy and lighter.

There are two ſorts of Bantam, as well as of Japan work. As, in the latter, ſome are flat, lying even with the black, and others high and emboſſed; ſo, in bantam work, ſome are flat, and others in-cut, or carved into the wood, as we find in many large ſcreens; with this difference, that the japan artiſts work chiefly in gold and other metals; and thoſe of bantam generally in colours, with a ſmall ſprinkling of gold here and there: for the flat bantam work is done in colours, mixed with gum water, proper for the thing deſigned to be imitated.

The carved, or in cut kind, is thus deſcribed by an ingenious artiſt; viz. 1. The wood is primed with whiting and ſize, ſo often, till the primer lie near a quarter of an inch thick; then it is water planed, i. e. rubbed with a fine wet cloth, and, ſome time after, rubbed very ſmooth, the blacks laid on, varniſhed up with a good body, and poliſhed well, but with a gentle hand. This done, the deſign is to be traced out with vermilion and gum water, exactly in the manner in which it is intended to be cut; the figures, trees, buildings, &c. in their due proportion: then the graver is applied, with other tools of proper ſhapes, differing according to the workman's fancy: with theſe he cuts deep or ſhallow, as is found convenient, but never deeper than the whiting lies, the wood being never to feel the edge of the inſtrument. Lines, or parts of the black, are ſtill to be left for the draperies, and other out lines, and for the diſtinction of one thing from another; the rule being to cut where the white is, and leave the black untouched.

The carving being finiſhed, then take to the pencil, with which the colours are laid into the cut work; after this, the gold is to be lain in thoſe places which the deſign requires; for which purpoſe, a ſtrong thick gum arabic water is taken and laid with a pencil on the work; and, while this remains wet, leaf gold is cut with a ſharp ſmooth edged knife, in little pieces, ſhaped to the bigneſs and figure of the places where they are to be laid. Theſe being taken up with a little cotton, they daub them with the ſame cloſe to the gum-water, which affords a rich luſtre. The work thus finiſhed, they clear up the black with oil, taking care not to touch the colours.

BAOBAB, is the name given by Proſper Alpinus to the African calabaſh tree, ſince called ADANSONIA.

BAPHE, in antiquity, ſignifies the fine red colour with which the ſcribes illumined their head lines, before the uſe of printing commenced.

BAPTES, in the materia medica of the old pharmacopias, was ſpecies of the foſſil called bitumen, and in dangerous caſes for inward bruiſes. In the modern practice it is leſs eſteemed, as the lower claſs of people adminiſter in its ſtead what is uſually called black ſlate or ſlate coal.

BAPTISM, in matters of religion, ſignifies the ceremony of waſhing; or a ſacrament, by which a perſon is initiated into the Chriſtian church.

The neceſſity of baptiſm to ſalvation, is grounded on thoſe two ſayings of our Saviour: *He that believeth, and is baptized, ſhall be ſaved; and, except a man be born of water and of the ſpirit, he cannot enter into the kingdom of God.*

The receiving baptiſm is not limited to any time, or age of life. In the canon law we find divers injunctions againſt deferring the baptiſm of infants beyond the 37th day, 30th day, and the 9th day; ſome of them under pecuniary forfeitures.

Salmaſius, and Suicerus from him, deliver it as authentic hiſtory, that for the two firſt ages, no one received baptiſm, who was not firſt inſtructed in the faith and doctrine of Chriſt, ſo as to be able to anſwer for himſelf, that he believed; becauſe of thoſe words, *He that believeth, and is baptiſed*; which, in effect, is to ſay, that no infant, for the firſt two ages, was ever admitted to Chriſtian baptiſm. But, afterwards, they own, that pædo baptiſm came in, upon the opinion that baptiſm was neceſſary to ſalvation. But Voſſius, Dr. Forbes, Dr. Hammond, Mr. Walker, and eſpecially Mr. Wall, who has exactly conſidered the teſtimony and authority of almoſt every ancient writer that has ſaid any thing upon this ſubject, endeavour to evince, that infants were baptiſed even in the apoſtolical age.

It is certain, Tertullian pleads ſtrongly againſt giving baptiſm to infants; which ſhows, at leaſt, that there was ſome ſuch practice in his age, though he diſapproved of it.

It is certain, the ordinary ſubjects of this ſacrament in the firſt ages were converts from Judaiſm and Gentiliſm, who, before they could be admitted to baptiſm, were obliged to ſpend ſome time in the ſtate of catechumens, to qualify them to make their profeſſions of faith, and a Chriſtian life, in their own perſons; for, without ſuch perſonal profeſſions, there were ordinarily no admiſſion of them to the privilege of baptiſm. Thoſe baptiſed in their ſick beds were called clinici; and were held in ſome reproach, as not being reputed true Chriſtians. Hence ſeveral cenſures, in councils and eccleſiaſtical writers, of clinic baptiſm. This clinic baptiſm was not ſufficient to qualify the perſon, in caſe of recovery, for ordination. Some had their baptiſm put off by way of puniſhment when they fell into groſs and ſcandalous crimes, which were to be expiated by a longer courſe of diſcipline and repentance. This was ſometimes 5, 10, 20 years, or more; even all their lives, to the hour of death, when their crimes were very flagrant.

In the earlieſt ages of the church, there was no ſtated time or place for the reception of baptiſm. Afterwards, Eaſter, Whitſuntide, and Epiphany, became ſolemn ſeaſons, out of which baptiſm was not adminiſtered, except in caſes of neceſſity.

In the ancient church, the perſon to be baptized, if an adult was firſt examined by the biſhop or officiating prieſt, who put ſome queſtions to him; as, firſt, Whether he abjured the devil and al his works; ſecondly, Whether he gave a firm aſſent to all the articles of the Chriſtian faith: to both which he anſwered in the affirmative. If the perſon to be baptized was an infant, theſe interrogatories were anſwered by his *ſponſores*, or godfathers. Whether the uſe of the ſponſors was as old as the apoſtles days, is uncertain: perhaps it was not, ſince Juſtin Martyr, ſpeaking of the method and form of baptiſm, ſays not a word of them. In performing the ceremony of baptiſm, the uſual cuſtom was to immerſe the whole body. Thus St. Barnabas, deſcribing a baptized perſon, ſays, "We go down into the water full of ſin and filth, but we aſcend bearing fruit in our hearts."

From this cuſtom the feaſt of Pentecoſt, which was one of the annual ſeaſons of baptiſm, came to be called Whitſunday, i. e. White-ſunday. This garment was afterwards laid up in the church, that it might be an evidence againſt ſuch perſons as violated or denied that faith which they had owned in baptiſm. When the baptiſm was performed, the perſon baptized, according to Juſtin Martyr, "was received into the number of the faithful, who "then ſent up their public prayers to God, for all men, for them"ſelves, and for thoſe who had been baptized."

The ordinary miniſters, who had the right of adminiſtering this ſacrament, that is, of applying the water to the body, and pronouncing the formula, were preſbyters or biſhops; though on extraordinary occaſions, laymen were admitted to perform the ſame.

As to the preſent mode of adminiſtering baptiſm, the church of Rome uſes the following form. When a child is to be baptized, the perſons who bring it wait for the prieſt at the door of the church, who comes thither in his ſurplice and purple ſtole, attended by his clerk. He begins with queſtioning the godfathers, whether they promiſe, in the child's name, to live and die in the true catholic and apoſtolic faith, and what name they would give the child. Then follows an exhortation to the ſponſors; after which the prieſt, calling the child by its name, aſks it as follows: *What doſt thou demand of the church?* The godfather anſwers, *Eternal life.* The prieſt goes on: *If you are deſirous of obtaining eternal life, keep God's commandments, thou ſhalt love the Lord thy God*, &c. This ſaid, he makes the ſign of the croſs on the child's forehead and breaſt, ſaying, *Receive the ſign of the croſs on thy forehead, and in thy heart.* Then taking off his cap, he repeats a ſhort prayer; and laying his hand gently on the child's head, repeats a ſecond prayer: which ended, he bleſſes ſome ſalt; and putting a little of it into the child's mouth, pronounces theſe words, *Receive the ſalt of wiſdom.* All this is performed at the church door. The prieſt, with the godfathers and godmothers, coming into the church, and advancing towards the font, repeat the apoſtles creed and the Lord's prayer. Being come to the font, the prieſt taking a little of his own ſpittle, with the thumb of his right hand, rubs it on the child's ears and noſtrils, repeating, as he touches the right ear, *Ephata, be thou opened.* Laſtly, they pull off its ſwaddling cloaths, or ſtrip it below the ſhoulders, during which the prieſt prepares the oils, &c. The ſponſors then hold the child directly over the font, obſerving to turn it due eaſt and weſt: upon which the prieſt aſks the child, *Whether he renounces the devil and all his works*; and the godfather having anſwered in the affirmative, the prieſt anoints the child between the ſhoulders in the form of a croſs. Then taking ſome of the conſecrated water, he pours part of it thrice on the child's head, at each perfuſion calling on one of the perſons of the Holy Trinity. The prieſt concludes the ceremony of baptiſm with an exhortation. But baptiſm is never refuſed by the canons of this church, to be performed at the dwelling of the child's parents.

The Greek church differs from the Romiſh, as to the rite of baptiſm, chiefly, in performing it by immerſion, or plunging the infant all over in the water.

The forms of adminiſtering baptiſm among us is too well known to require a particular deſcription. They are ſet forth at large in the book of Common Prayer.

By the ancient laws, baptiſm was not to be conferred on image-makers, ſtage players, gladiators, aurigæ, or public drivers, magicians, or even ſtrolling beggars, till they quitted ſuch profeſſions. Slaves were not allowed the privilege of baptiſm without the teſtimony and conſent of their maſters; excepting the ſlaves of Jews, Heathens, and heretics, who were not only admitted to baptiſm, but, in conſequence thereof, had their freedom. Voſſius has a learned and elaborate work *De Baptiſmo*, wherein he accurately diſcuſſes all the queſtions concerning baptiſm according to the doctrine of the ancients.

Hypothetical Baptism was formerly adminiſtered in doubtful caſes, with this formula: *If thou art baptized, I do not rebaptize; if thou art not, I baptize thee in the name of the Father, &c.* This ſort of baptiſm, enjoined by ſome ancient conſtitutions of the Engliſh church, is now fallen into diſuſe.

Solemn Baptism was conferred at ſtated ſeaſons; ſuch in the ancient church, were the Paſchal baptiſm, and that at Whitſuntide. This is ſometimes alſo called general baptiſm.

Lay Baptism has been permitted by both the Common-prayer books of king Edward and that of queen Elizabeth, when an infant is in immediate danger of death, and a lawful miniſter cannot be had. This was founded upon the miſtaken notion of the impoſſibility of ſalvation without the ſacrament of baptiſm: but afterwards, when they came to have clearer notions of the ſacraments, it was unanimouſly reſolved in a convocation, held in the year 1575, that even private baptiſm, in a caſe of neceſſity, was only to be adminiſtered by a lawful miniſter.

Baptism is alſo applied, abuſively, to certain ceremonies uſed in giving names to things inanimate. The firſt notice we have of this cuſtom is in the capitulars of Charles the Great, where it is only mentioned to be cenſured: but, afterwards, it crept into the Roman offices by degrees. Baronius carries its antiquity no higher than the year 968, when the greateſt bell of the church of Lateran was chriſtened by Pope John III. At laſt it grew to that ſuperſtitious height, as to be thought proper to be complained of in the Centum Gravamina of the German nation, drawn up in the public diet of the empire held at Nurimberg anno 1581; where (after having deſcribed the ceremony of baptizing a bell, with godfathers, who make reſponſes as in baptiſm, and gave it a name, and clothe it with a new garment as Chriſtians were uſed to be clothed, and all this to make it capable of driving away tempeſts and devils) they conclude againſt it, as not only a ſuperſtitious practice, but contrary to the Chriſtian religion, and a mere ſeduction of ſimple people.

Baptism, in the ſea language, was formerly and ſtill continues as a ceremony in long voyages on board merchant ſhips, to be practiſed both on perſons and veſſels who paſs the tropic or line for the firſt time.

The baptizing the veſſel is ſimple, and conſiſts only in waſhing them throughout with ſea-water; that of the paſſengers is more myſterious. The oldeſt of the crew, that has paſt the tropic or line, comes with his face blacked, a groteſque cap on his head, and ſome ſea-book in his hand, followed by the reſt of the ſeamen, dreſſed like himſelf, each having ſome kitchen utenſil in his hand, with drums beating; he places himſelf on a ſeat on the deck, at the foot of the main maſt. At the tribunal of this mock magiſtrate, each paſſenger not yet initiated, ſwears he will take care the ſame ceremony be obſerved, whenever he is in the like circumſtances: then, by giving a little money by way of gratification, he is diſcharged, with a little ſprinkling of water; otherwiſe he is heartily drenched with ſtreams of water poured upon him; and the ſhip-boys are incloſed in a cage, and ducked at diſcretion. The ſeamen, on the baptizing a ſhip, pretend to a right of cutting off the beak-head, unleſs redeemed by the captain.

BAPTISMAL, implies ſomething belongingto baptiſm; thus we ſay baptiſmal vow, preſents, &c.

Baptismal *Vow*, or *Covenant*, is a profeſſion of obedience to the laws of Chriſt, which perſons in the ancient church made before baptiſm. It was an indiſpenſable part of the obligation on catechumens, before they were admitted to the ceremony of regeneration.

Baptismal *Preſents*, are ſtill in uſe in Germany, and made by the ſponſors to the infant, conſiſting of money, plate, and ſometimes fieſs of lands; which by the laws of the country are to be kept for the child till of age, the parents having only the truſt, not the right, of diſpoſing of them.

BAPTISTS, in eccleſiaſtical hiſtory, from βαπτιζω, *I baptize*; are a denomination of Chriſtians, diſtinguiſhed from the eſtabliſhed church of England, by their particular opinions reſpecting the mode and the ſubjects of baptiſm.

Inſtead of adminiſtering the ordinance by ſprinkling of water, they maintain that it ought to be adminiſtered only by immerſion. Such, they inſiſt, is the meaning of the word βαπτιζω; ſo that a command to baptize, is a command to immerſe. Thus it was underſtood by thoſe who firſt adminiſtered it. John the Baptiſt, and the apoſtles of Chriſt, adminiſtered it in Jordan and other rivers, and places where there was much water. Both the adminiſtrators and the ſubjects are deſcribed as going down into, and coming up again out of, the water; and the baptized are ſaid to be buried in baptiſm, and to be raiſed again: which language could not, they hold, be properly abopted on ſuppoſition of the ordinance being adminiſtered in any other manner than by immerſion. And thus they affirm it was in general adminiſtered in the primitive church; and is now adminiſtered in the Ruſſian or Greek church: and thus it is, at this day, directed to be adminiſtered in the church of England, to all who are thought capable of ſubmitting to it in this manner.

With regard to the ſubjects of baptiſm, the baptiſts hold that this ordinance ought not at all to be adminiſtered to children or infants, nor to grown up perſons in general; but to adults only of a certain character and deſcription. Our Saviour's commiſſion to his apoſtles, by which Chriſtian baptiſm was inſtituted, is to go and teach all nations, baptizing them: that is, ſay they, not to baptize all they meet with; but firſt to inſtruct them; to teach all nations, or to preach the goſpel to every creature; and whoever receives it, him to baptize in the name of the Father, and of the Son, and of the Holy Ghoſt. To ſuch perſons, and to ſuch only, baptiſm appears to have been adminiſtered by the apoſtles, and the immediate diſciples of Chriſt. They are deſcribed as repenting of their ſins, as believing in Chriſt, and as having gladly received the word. Without theſe qualifications, Peter acquaints thoſe who were converted by his ſermon, that he could not have admitted them to baptiſm. Philip holds the ſame language in his diſcourſe with the eunuch; and Paul treats Lydia, the jailor, and others, in the ſame manner.

Indeed, without theſe qualifications, Chriſtians in general think it wrong to admit perſons to the Lord's ſupper; and, for the ſame reaſons, without theſe qualifications, at leaſt a profeſſion of them, the baptiſts think it wrong to admit any to baptiſm.

The baptiſts in England form one of the denominations of Proteſtant diſſenters. They ſeparate from the eſtabliſhment for the ſame reaſons as their brethren of the other denominations do; and from additional motives derived from their particular tenets reſpecting baptiſm. The conſtitution of their churches, and their modes of worſhip, are congregational or independent: in the exerciſe of which they are protected, in common with other diſſenters, by the act of toleration.

They bore a conſiderable ſhare in the perſecutions of the laſt and of the preceding centuries; and, as it ſhould ſeem, in thoſe of ſome centuries before; for there were ſeveral among the Lollards and the followers of Wickliff, who diſapproved of infant-baptiſm. There were many of this perſuaſion among the Proteſtants and Reformers abroad. In Holland, Germany, and the North, they went by the names of Anabaptiſts and Mennonites; and, in Piedmont and the South, they were found among the Albigenſes and Waldenſes.

The baptiſts ſubſiſt under two denominations, viz. the Particular or Calviniſtical, and the General or Arminian.

BAPTISTERY, in the eccleſiaſtical ceremonial, ſignifies a place in which the Sacrament of baptiſm is performed.

In the ancient church it was one of the exedræ or buildings diſtinct from the church itſelf: and conſiſted of a porch or antiroom where the perſons to be baptized made their confeſſion of faith, and an inner room where the ceremony of baptiſm was performed.

The ancient baptiſteries were commonly called Φωτιστηρια, *photiſteria*, q. d. places of illumination; an appellation ſometimes given to baptiſm.

The name baptiſtery is ſometimes alſo given to a kind of chapel in a large church, which ſerved for the ſame office. It is an obſervation of ſome learned men, that anciently there was but one baptiſtery in a city, and that at the biſhop's church; and that afterwards they were ſet up in pariſh churches, with the ſpecial allowance of the biſhop. They were aboliſhed in the 6th century, and the ceremony was performed in the porch of the church, and in the 8th century removed into the body of the church itſelf.

BAR, in a general ſenſe, denotes a ſlender piece of wood or iron, for keeping things cloſe, or ſecure from falling down.

Bar, in courts of juſtice, is an incloſure made with a ſtrong partition of timber, where the council are placed to plead cauſes. It is alſo applied to the benches where the lawyers or advocates are ſeated, becauſe anciently there was a bar to ſeparate the pleaders from the attorneys and others. Hence our lawyers who are called to the bar, or licenſed to plead, are termed barriſters, an appellation equivalent to licentiate in other countries.

Bar, or Barr, in common law, is a plea or peremptory exception of a defendant, ſufficient to deſtroy the plaintiff's action: and is divided into 1. Bar to common intendment; 2. Bar ſpecial; 3. Bar temporary, and 4. Bar perpetual.

Bar to a common intendment is an ordinary or general bar, which uſually diſables the declaration of the plaintiff; Bar ſpecial is that which is more than ordinary, and falls upon ſome ſpecial circumſtance of the caſe. Bar temporary is ſuch a bar as is good for the preſent, but may afterwards fail; and Bar perpetual is that which overthrows the action of the plaintiff for ever from a trial at law on the merits of the premiſes.

Bar, in heraldry, is an ordinary in the form of the feſs, but much leſs.

Bar, in the menage, is the higheſt part of that place of a horſe's mouth ſituated between the grinders and tuſhes, ſo that the part of the mouth which lies under and at the ſide of the bars retains the name of the gum. A horſe with ſenſible bars has a fine light mouth, with an even and firm appui.

To Bar *a Vein*, in farriery, is an operation performed upon the veins of the legs of a horſe and other parts, with intent to ſtop the malignant humours. It is performed by opening the ſkin above it, diſengaging it, and tying it both above and below, and ſtriking between the two ligatures.

Bar, in muſic, is a ſingle ſtroke drawn perpendicularly acroſs the five lines of a piece of muſic, including between each two a certain quantity or meaſure of time, which is various as the time of the muſic is either triple or common. In common time, between each two bars is included the meaſure of four crotchets; in triple, three. The principal uſe of bars is to regulate the beating of time in a concert. The double bar, is ſet to divide the different airs or tunes one from another, and when two dots are added to each ſide, it ſignifies the foregoing part muſt be played twice over.

Bar, in hydrography, denotes a bank of ſand, or other matter, by which the mouth of a river is in a manner choaked up.

The term *bar* is alſo uſed for a reef of rocks which run acroſs the mouth of an harbour, ſo as to give but a narrow paſſage through a gap, that always requires the flow of a tide to bring in a ſhip. The word alſo implies a ſtrong beam, wherewith the entrance of a harbour is ſecured: this is more commonly called *boom*.

Bar of a tavern or coffee-houſe, is the place where the waiters attend to anſwer the calls of the cuſtomers.

Bar, among printers, denotes a piece of iron with a wooden handle, by which the ſcrew of the preſs is turned in printing.

Bars *of Iron*, are made of the metal of the ſows and pigs when they come from the furnace. Theſe paſs through two forges called the *finery* and the *chauſery*; where, undergoing five ſeveral heats, they are formed into bars.

BARA, is the name of a feſtival celebrated with much magnificence at Meſſina, and repreſenting the aſſumption of the Virgin.

BARABINZIANS, are a tribe of Tartars, living on both ſides of the river Iris. They ſeem to derive their name from the Barabaian deſart, whoſe lakes ſupply them abundantly with fiſh, on which and the produce of their cattle they chiefly ſubſiſt. They have plenty of game and wild-fowl of every kind, particularly ducks and puffins. Moſt of them are heathens, but Mahometaniſm daily gains ground among them. Some of them pay tribute to the Empreſs of Ruſſia, and others to the Khan Taiſha.

BARACK, is the ſame as Barrack, under which article it is deſcribed.

BARALIPTON, among logicians, is a term denoting the firſt indirect mode of the firſt figure of ſyllogiſm. A ſyllogiſm in baralipton, is when the two firſt propoſitions are general, and the third particular, the middle term being the ſubject in the firſt propoſition, and the predicate in the ſecond. The following is of this kind:

Ba. Every evil ought to be feared;
ra. Every violent paſſion is an evil;
lip. Therefore ſomething that ought to be feared is a violent paſſion.

BARALLOTS, in church hiſtory, were a ſect of heretics at Bologna in Italy, who had all things in common, even their wives and children. Their facility in complying with all manner of debauchery made them get the name *obedientes*, compliers.

BARANGI, were officers among the Greeks of the lower empire. Cujas calls them in Latin *protectores*, and others give them the name of *ſecurigeri*. It was their buſineſs to keep the keys of the city gates, where the emperor reſided.

BARATHRUM, in antiquity, was a deep dark pit at Athens, into which condemned perſons were caſt headlong. It had ſharp ſpikes at the top, that no man might eſcape out; and others at the bottom, to pierce and torment ſuch as were caſt in. Its depth and capacioufneſs made it to be applied proverbially to a covetous perſon: a glutton, or a proſtitute.

BARATRY, is the ſame as Baretry, under which article it is explained.

BARATZ, denote letters patent granted by the Turkiſh emperors to the Greek patriarch, biſhops, &c. for the exerciſe of their eccleſiaſtical functions. This Baratz gives the biſhops full power and authority to eſtabliſh and depoſe the inferior clergy, and all other religious perſons; to grant licences for marriages, and iſſue out divorces; to collect the revenues belonging to the churches; to receive the pious legacies bequeathed to them; in ſhort, to enjoy all the privileges and advantages belonging to their high ſtation: and all this (as it is expreſſed in the baratz itſelf) "according to the vain and idle ceremonies of the Chriſtians."

BARB, or Barbe, in the menage, ſignifies a horſe brought from Barbary.

BARBA, in botany, is a ſpecies of pubes, or down, with which the ſurface of ſome plants is covered. The term was invented by Linnæus; and by its application in the ſpecies plantarum, ſignifies a tuſt or bunch of ſtrong hairs terminating the leaves. Meſembryanthemum barbatum, furniſhes an example.

The word is alſo uſed in compoſition to form the trivial names of ſeveral plants, as barba jovis, barba capræ, &c.

BARBACAN, or Barbican, in fortification, denotes an outer defence to a city or caſtle, uſed eſpecially as a fence to the city or walls; alſo, an aperture made in the wall of a fortreſs, to fire through upon the enemy.

Barbacan, alſo denotes a fort at the entrance of a bridge, or the outlet of a city, having a double wall with towers of defence and obſervation.

BARBADOES Tar, in natural hiſtory, is a mineral fluid of the nature of the thicker fluid bitumens, of a nauſeous bitteriſh taſte, very ſtrong and diſagreeable ſmell, found in many parts of America trickling down the ſides of the mountains, and ſometimes floating on the ſurface of the waters. It has been greatly recommended in coughs, and other diſorders of the breaſt and lungs.

BARBARA, among logicians, is the firſt mode of the firſt figure of ſyllogiſms. A ſyllogiſm in barbara is one of which all the propoſitions are univerſal and affirmative; the middle term being the ſubject of the firſt propoſition, and attribute in the ſecond.

Examp. Bar. Every wicked man is miſerable;
Ba. All tyrants are wicked men;
Ra. Therefore all tyrants are miſerable.

BARBARIAN, was a name given by the ancient Greeks and Romans to all who were not of their own country, or were not initiated in their language, manners and cuſtoms. In this ſenſe, the word ſignified with them no more than a foreigner; not ſignifying, as among us, a wild, rude, or uncivilized perſon.

BARBARISM, in a general ſenſe, indicates a rudeneſs of language or behaviour.

Barbarism, in grammar, is an offence againſt the purity of language; an ungrammatical way of ſpeaking or writing, contrary to the true idiom of any particular language, and is ſynonimous with ſoleciſm, which in the modern acceptation of the refined ſtile is the better mode of expreſſion, as the former carries a vulgarity with it, but the latter betokens a knowledge of letters.

BARBATULA, in ichthyology, is a ſpecies of cobitis.

BARBUTUS, in ichthyology, is a ſpecies of the ſilucus.

BARBILLONS, in entomology, ſignify certain bodies uſually two in number, placed under the head of an inſect, and moveable at pleaſure.

BARCALON, is an appellation given to the prime miniſter of the king of Siam. This officer has under his controul every thing relative to commerce both foreign and domeſtic. He is likewiſe ſuperintendant of the king's magazines.

BARCONE, in naval language, ſignifies the craft uſed as coaſters in the Mediterranean.

BARD, in the culinary art, ſignifies a ſlice of ſalted fleſh laid over hollow fuel deſigned for roaſting.

BARDANA, in botany, is the ſame as burdock, which is generally called arctium.

BARDED, in heraldry, ſignifies a horſe fully capariſoned.

BARDELLE, in the menage, ſignifies a ſaddle of wood, frequently denominated ſtraddles.

BARDESANISTS, in philoſophizing, imply the adherents of Barſanes, the chief of the Oriental philoſophy. The whole of their opinions amounted to no more, than that all good works, as well as thoughts, proceeded from a direct influx of the Deity on the ſoul of man; and all evil in a direct contraſt from the devil.

BARDS, in Engliſh, Iriſh, Scotch, and Gallic hiſtory, denote thoſe poets who, in former times, deſcribed and ſung in verſe, the heroic actions of generals and ſtateſmen, with a deſign to recommend and inculcate virtue.

Thoſe bards or bardi were alſo compoſers of love elegies, ſongs of peace, odes of harmony, and nuptual rejoicings.

BARGAIN, in law, ſignifies a contract made between the buyer and ſeller of either goods or chattels, the former is called the bargainee, and the latter the bargainer: it is underſtood, that both are amenable to the terms of ſuch contract, if legally entered into, or in default thereof to abide the conſequence at law, as a breach of commercial faith.

Bargain and Sale, in conveyancing, is a kind of real contract, by which the bargainer for ſome pecuniary conſideration bargains and ſells, i. e. contracts to convey his lands or other things to the bargainee; and becomes by ſuch bargain a truſtee for, or ſeized to the uſe of, the bargainee; and then the ſtatute of uſes completes the purchaſe: or, as it has been well expreſſed by Blackſtone, the bargain firſt veſts the uſe, and then the ſtatute veſts the poſſeſſion.

But as it was foreſeen that conveyances thus made would want all thoſe benefits of notoriety, which the old common law aſſurances were not calculated to give: to prevent therefore clandeſtine conveyances of freeholds, it was enacted in the ſame ſeſſion of parliament, by Stat. 27. Hen. 8. c. 16, that ſuch bargains and ſales ſhould not enure to paſs a freehold, unleſs the ſame be made by indenture, and enrolled within ſix months after, in the county court, or in one of the courts of record at Weſtminſter. In the ſyſtem of Engliſh law, under the Article Conveyancing by Leaſe and Releaſe, this will be further explained.

BARGE, in maritime language, ſignifies a large pleaſure boat of ſtate, equipped with a band of rowers, and decorated with flags and ſtreamers. They are generally uſed for proceſſions on the water, by noblemen, officers of ſtate, or magiſtrates of cities.

Barge is alſo the name of a flat bottomed lighter, uſually employed to load or unload ſhips in harbour.

Barge *Couples*, in architecture, ſignify two beams mortiſed into each other, to ſtrengthen the building.

Barge *Courſe*, in building, ſignifies the projection of tiles over the ends of the rafters.

BARGHMASTER, Barmer, or Barmaster, in the royal mines, ſignifies the ſteward or judge of the barmote. He keeps two great courts yearly, and a ſmall one every week.

BARGEMOTE, or Barmote, is a court which takes cognizance of cauſes and diſputes between miners.

BARILLA, in commerce, is a ſort of aſhes produced from ſea weeds, in the Levant, and much uſed by bleachers and glaſsmakers.

BARING *of Trees*, in agriculture, ſignifies the taking away of ſome of the earth from the roots, ſo as to permit the rain and ſnow to enter at the roots.

BARK, in medicine, ſignifies the rind of the cinchona, or quinquina.

Bark, in botanical language, ſignifies the outer rind or ſkin of trees, which have a cruſted coat.

BARLERIA, or ſnapdragon, in botany, is a genus of the angioſpermia order, belonging to the didynamia claſs of plants.

The flower is uſually of the lip kind, of one leaf, funnel ſhaped, and divided into five parts at the top; four ſlender ſtamina; an oval germen placed in the center; with two roundiſh cells, containing two compreſſed ſeeds. There are four ſpecies, all exotics.

BARLEY, in botany, is a gramineous frumentaceous herb, whoſe qualities are well known in agriculture and huſbandry.

BAUM, among bakers, is the ſame as yeaſt, of which it is a ſynonyme.

BARNACLE, in ornithology, is a ſpecies of the anas.

BAROMETER, in pneumatics, is an inſtrument for meaſuring the weight of the atmoſphere, and is uſually denominated a weather-glaſs; under which article it will be explained.

BARON, is a degree below a viſcount, and is the loweſt title of nobility.

Baron *by Tenure*, is one who holds certain territories of the king, who ſtill retained the tenure in chief to himſelf.

Baron and Feme, in the Engliſh law, is a term uſed for huſband and wife, in relation to each other, and are deemed but one perſon, ſo that a wife cannot be witneſs for or againſt her huſband, *et vice verſa*, except in caſes of high treaſon.

BARONET, is a modern degree of honour inſtituted by James I. on the 22d of May 1611, and made hereditary in the male line.

BARONS *of the Exchequer*, are four judges to whom the adminiſtration of juſtice is committed, in cauſes between the king and his ſubjects, relating to matters concerning the revenue. They were formerly barons of the realm, but of late are choſen from the barriſters at law.

BARONY, ſignifies the honour and territory which gives title to a baron, whether he be a layman or a biſhop.

BARRACKS, in military matters, ſignify the houſes built as public lodgings for the ſoldiery.

BARRATOR, in law, ſignifies a perſon guilty of barretry.

BARRENNESS, is the ſame as ſterility.

BARRETRY, in law, ſignifies the ſtirring up of feuds or quarrels between his Majeſty's liege ſubjects.

BARRICADE, or Barricado, in military affairs, ſignifies the fence raiſed up of earth or rubbiſh, to ſtand proof againſt ſhot.

Barricade, in naval architecture, is a ſtrong rail, which ſupports the quarter deck.

BARRIER, in fortification, is a kind of fence made at a paſſage to ſtop the entry thereof.

BARRISTER, at law, ſignifies a counſellor learned in the law, and admitted to plead at the bar, and there take upon him the defence and protection of his clients.

BARROWS, in Britiſh topography, ſignify thoſe artificial hills, or hillocks, raiſed by the Romans for ſepulchres, as is generally ſuppoſed by our antiquaries.

BARRY, in heraldry, is when the eſcutcheon is divided barways into an even number of partitions, and conſiſts of two or more tinctures interchangeably diſpoſed.

Barry Bendy, in heraldry, is when the eſcutcheon is divided even by both bar and bendways, by lines drawn tranſverſe and diagonally, interchangeably varying the tinctures of which it conſiſts.

Barry Piby, ſignifies when the coat is divided by ſeveral lines drawn obliquely, ſo as to form acute angles.

BASE, in architecture, denotes the lower part of a column.

Base, in fortification, denotes the external ſide of the polygon; or that imaginary line which is drawn from the flanked angle of a baſtion to that which is oppoſite thereto.

Base *of a Figure*, in geometry, denotes the loweſt part of its perimeter.

Base *of a Triangle*, is the loweſt ſide, or that which lies parallel to the horizon.

Base *of a ſolid Figure*, is its loweſt ſide, or that whereon it ſtands.

Base *of a Conic Section*, is a right line in the hyperbola and parabola, formed by the common interſection of the ſecant plane, and the baſe of the cone.

Base *of the Heart*, in anatomy, denotes the broader or upper part of that viſcus, to the ſides of which the two auricles are affixed.

Base, or Basis, in chemiſtry, any body which is diſſolved by another body which it receives and fixes, and with which it forms a compound, may be called the baſis of the compound. Thus, for example, the baſes of neutral ſalts are the alkaline, earthy, and metallic matters, which are ſaturated by the ſeveral acids, and form with them theſe neutral ſalts. It is proper for the conveniency of chemical language to retain this manner of expreſſion; but theſe baſes muſt not be conſidered as inactive, and only yielding to the action of the acids which they fix, and to which they give a body and conſiſtence. In every combination and ſolution, the ſeveral bodies which unite are equally active, their action being reciprocal. They diſſolve each other; ſo that it is as proper to ſay, as Mr. Gellert obſerves, that a metal or an earth diſſolves an acid, as that an acid diſſolves a metal or an earth; though this latter mode of expreſſion is moſt common. Probably the diſſolving power which the more weighty and fixed bodies have, is really much ſtronger than that of bodies leſs weighty and fixed. It certainly is ſo, if the tendency to unite be only the effect of the general attraction, or the gravitation of all particles of matter to each other.

Basis, in pharmacy, is that ingredient on which moſt ſtreſs is laid, for effecting the purpoſe of any compound medicine.

Base, in muſic, is the ſame as Bass.

Base *Fee*, denotes a tenure in fee at the will of the lord. By which it ſtand diſtinguiſhed from ſocage, or free tenure.

Base *Court*, is any court not of record. Such, e. gr. is the court-baron.

Base *Knights, bas chevaliers*, denote the inferior order of knights, as diſtinguiſhed from barons and bannerets, who were the chief or ſuperior knights.

Base *Point*, in heraldry, ſee Point and Eſcutcheon.

Base *Ring of a Cannon*, is the great ring next behind the touch hole.

BASELLA, in botany, climbing night ſhade, from Malabar, a genus of the pentandria order and trigynia claſs. The characters are theſe: the flower hath no empalement; it is ſhaped like a pitcher, cloſed toward the brim; it hath five ſtamina faſtened to the petal, the globular germen, which is ſituated in the centre, ſupports three ſlender ſtyles, crowned by oblong ſtigmas; the petal of the flower remains, and encloſes a roundiſh fleſhy belly, including one round ſeed. There are two ſpecies, all natives of the Indies.

From the berries of the firſt ſort, a beautiful colour is drawn; but when uſed for painting, it does not laſt, but changes to a pale colour; it is probable, however, that ſome method might be found to fix it, as it is ſaid that the juice of theſe berries is uſed for ſtaining callicoes in India.

BASEMENT, in architecture, is a continued baſe, extended a conſiderable length, as around a houſe, a room, or other piece of building.

BASHARIANS, a ſect of Mahometans, being a branch or ſubdiviſion of the Motazalites.

The Baſharians are thoſe who maintain the tenets of Baſhar Ebn Motamer, a principal man among the Motazalites, who varied, in ſome points, from the general tenets of the ſect, as extending man's free agency to a great length, even to the making him independent.

BASHAW, Pascha, or Pacha, is the title of a Turkiſh governor of a province, city, or other diſtrict.

We ſay, the Baſhaw of Babylon, the Baſhaw of Anatolia, the Baſhaw of Bender, &c.

All Egypt is, on the part of the grand ſeignior, governed by a Baſhaw, who has in reality but little power; but ſeems principally to be meant for the means of communicating to his divan of beys, and to the divans of the ſeveral military ogiacs, that is, their bodies, the orders of the grand ſeignior, and to ſee that they be executed by the proper officers.

Baſhaws include beglerbegs, and ſometimes ſangiachegs; though a diſtinction is ſometimes made, and the name Baſhaw is appropriated to the middle ſort or ſuch as have two enſigns or horſe tails carried before them. Thoſe who have the honour of three tails are called beglerbegs, and thoſe who have only one, ſangiachegs.

Baſhaw, uſed abſolutely, denotes the prime vizier; the reſt of the denomination being diſtinguiſhed by the addition of the province, city, or the like, which they have the command of; as the Baſhaw of Egypt, of Paleſtine, &c. The Baſhaws are the emperor's ſpunges. We find loud complaints among Chriſtians of their avarice and extortions. As they buy their governments, every thing is venal with them.

When glutted with wealth, the emperor frequently makes them a preſent of a bow ſtring, and becomes heir to all their ſpoil.

There are alſo ſub baſhaws, or deputy governors under the firſt. Phil. Tranſ. N° 218.

BASHAW, *Captain*, is the title of the Turkiſh high admiral.

BASIATRAHAGI, in botany, is a name uſed by ſome for the common polygonum, or knot graſs.

BASIL, among joiners, denotes the angle to which the edge of an iron tool is ground.

To work on ſoft wood they uſually make their baſil 12 degrees, for hard wood 18; it being obſerved, that the more acute or thin the baſil is, the better and ſmoother it cuts; and the more obtuſe, the ſtronger and better it is for ſervice.

Basil, *Order of St.* is the moſt ancient of all the religious orders; it takes its name from St. Baſil, biſhop of Cæſarea, in Cappadocia, about the middle of the fourth century; who is ſuppoſed to have been the author of the rules obſerved by this order, though ſome diſpute it.

The order of St. Baſil was anciently very famous in the Eaſt, and ſtill continues in Greece. The habit of the monks is black, and plain, conſiſting of a long caſſock, and a great gown with large ſleeves: on their head they wear a hood, which reaches to the ſhoulders: they wear no linen; ſleep without ſheets, in ſtraw; eat no fleſh; faſt often, and till the ground with their own hands.

This order was introduced in the Weſt in 1057, and was reformed in 1579, by pope Gregory XIII. who united the religious of this order in Italy, Spain, and Sicily, into one congregation; of which the monaſtery, of St. Saviour, at Meſſina, is the chief, and enjoys pre-eminence over the reſt. Each community has its particular rule, beſides the rule of St. Baſil, which is very general, and preſcribes little more than the common duties of a Chriſtian life.

Basil, in botany, ocymum, is a genus of the didynamia order and gymnoſpermia claſs of plants, the characters of which are theſe: the empalement of the flower is ſhort, permanent, of one leaf, divided into two lips; the flower is of the lip kind, of one petal inverted; the riſing lip is broad and cut into four obtuſe equal parts; the reflexed lip is long, narrow, and ſawed; it hath four ſtamina on the lower lip, which are reflexed; two of which are a little longer than the other, terminated by half moon-ſhaped ſummits; the germen is divided into four parts, which afterward become four naked ſeeds encloſed in the empalement. There are ſeven ſpecies, all exotics.

Basil, Syrian field Ziziphora, in botany, is a genus of the diandria order and monogynia claſs. The characters are theſe, the flower hath a long, rough cylindrical empalement, which is ſlightly cut into five parts at the brim; and the flower is of the labiated kind, having a long cylindrical tube; the upper lip is oval, reflexed, and entire; and the under lip, or beard, is divided into three equal ſegments, it has two ſpreading ſtamina, terminated by oblong ſummits, and a quadrifid germen, ſupporting a briſtly ſtyle, crowned by a ſharp pointed inflexed ſtigma; the germen turns to four oblong ſeeds, which ripen in the empalement. There are three ſpecies, all natives of the Eaſt.

BASILEUS, is a title aſſumed by the emperors of Conſtantinople, excluſive of all other princes, to whom they give the title rex, king.

The ſame quality was afterwards given by them to the kings of Bulgaria, and to Charlemagne, from the ſucceſſors of which laſt they endeavoured to wreſt it back again.

The title baſileus has been ſince aſſumed by other kings, particularly the kings of England, *Ego Edgar totius Angliæ* baſileus *confirmavi*.

Hence alſo the queen of England was intitled Baſilea and Baſiliſſa.

BASILICA, or **Basilicus**, in anatomy, is the name of a vein, ariſing from the axillary branch, and running the whole length of the arm.

BASILICON, or **Basilicum**, in pharmacy, is the denomination of an officinal unguent or plaſter; called alſo tetrapharmicum, as being compoſed of four ſimples, viz. reſin, wax, pitch, and oil-olive.

BASILICUS, or **Basilica**, in aſtronomy, is the name of a fixed ſtar of the firſt magnitude, in the conſtellation Leo; called alſo Regulus, and Cor Leonis.

BASILIDIANS, in church hiſtory, denotes the followers of Baſilides, an Egyptian, who lived near the beginning of the ſecond century. In general, the Baſilidians, held much the ſame opinion with the Valentinians, another branch of the Gnoſtics.

BASILISC, in amphibiology, is a ſpecies of the Lacerta.

Basilisc is alſo myſtically uſed by the alchemiſts, to denote the ſublimate mercury of the philoſophers.

Basilisc alſo denotes a great piece of ordnance; thus denominated from its reſemblance to the ſuppoſed ſerpent of that name.

The baſiliſc throws an iron ball of two hundred pounds weight. It was much talked of in the time of Solyman emperor of the Turks, in the wars in Hungary; but ſeems now out of uſe.

BASILISCUS, in ornithology, a name given by ſome authors to the regulus criſtatus, or golden crowned wren, which is tranſlated baſiliſc, ſignifies an aſp, as the beſt interpreters agree.

BASIOGLOSSUM, or rather **Basiglossum**, in anatomy, are a pair of muſcles, which ariſe fleſhy from the baſis of the os hyoides, and are inſerted into the root of the tongue: ſerving to draw the tongue towards the bottom of the mouth.

BASIS, in oratory, denotes the fourth member of a complete exordium, being that which ſucceeds the apodoſis, and prepares the way for the propoſition.

BASIUM, among chemiſts, is an extemporaneous tincture of iron and copper, invented by Cloſſæus.

BASKET, a kind of veſſel made of oſier, wicker, ruſhes, or the like, of different figures and ſizes, according to the uſe it is intended for.

Baſkets have their uſes not only in the œconomical, but military affairs; at ſieges, they make uſe of a ſmall baſket filled with earth and ranged on the top of the parapet.

They are about a foot and a half high, as much in diameter at top, and eight or ten inches at bottom; ſo that being ſet together, they leave a ſort of embraſures at the bottom, through which the ſoldiers fire, without expoſing themſelves.

Basket, *Corbeille*, in architecture, a kind of vaſe, or figure-piece of ſculpture, in form of a baſket, filled with flowers or fruits, ſerving to terminate ſome decoration.

Basket *Fiſh*, in ichthiology, is a name given by the Engliſh in North America to a very remarkable fiſh, ſometimes caught in the ſeas thereabout.

Mr. Hooke, to whom it was referred by the Royal Society to name it, has called it *Piſcis echinoſtellaris viſciformis*, the body of it reſembliug an egg-fiſh, or *echinus marinus*, and the arms a ſtar-fiſh, and finally, the dividing of the branches being more like that of the branches of miſletoe than any other natural production we are acquainted with.

This fiſh ſpreads itſelf from a pentagonal mouth piece, or root, in the centre of which the mouth is placed, into five main limbs or branches; and each of theſe, at its firſt iſſuing out of the body, is divided into two, which makes twenty, and ſo on, each dividing to the fourteenth time; at which place they make more than fourſcore thouſand limbs. Theſe are too ſmall to be traced farther by the eye, or preſerved in carriage: but it is very probable that even theſe were again divided, perhaps, ſeveral times.

The branches between the joints are not all equally of a length, though, for the moſt part, they are pretty nearly ſo. The arms or branches are never very ſtrong; but, when they are dry, they are greatly more brittle than before, the leaſt force imaginable deſtroying them.

The ſhoals of Nantucket, an iſland on the coaſt of New England, at times furniſh the fiſhermen with this creature; but it is remarkable, that they are never ſeen there, unleſs when taken by hooks in fiſhing for other fiſh. They claſp the hook bait faſt, and encircle it with all their arms, coming up, when drawn by it, in form of a wicker baſket; whence the name: but, when they have been ſome time out of the water, they become flat.

The uſe of the numerous arms of this fiſh is plainly to catch its prey. It probably extends them to their full length while under the water, and then claſps hold of any thing fit for food that chances to ſwim over them. The fiſhermen have ſometimes found the arms containing ſmall mackrel, or pieces of larger. Phil. Tranſ. N° 57 and 74. It is evident from the deſcription, that this fiſh is of the ſtella abboreſcens, or branched ſtar fiſh kind; but whether the ſame with the commonly known kind, called the caput meduſæ, is not evident from this deſcription. The body of this fiſh, by what is related of its protuberance, and reſemblance to the echini marini, may probably be the aſteropodium, in its foſſil ſtate.

Basket *Salt*, this is a brine ſalt, made from the water of our ſalt ſprings in Cheſhire, and elſewhere, differing from the common brime ſalt in the fineneſs of the grain, and in its whiteneſs and purity.

In the preparing of this kind of ſalt, ſome uſe reſin, and other additions, to break the grain, and make it ſmall: others effect this by keeping up a very briſk fire under it, and ſtirring it all the while; but the moſt approved method is only to take out of this kind the third draught of every pan that is working for the common brine ſalt, and to do this before the granules or cryſtals are perfectly formed. By this means the ſalt is very fine; and when it has been hard preſſed down into ſmall wicker baſkets, it is dried at the ſtove in them, and ſo kept for ſale.

BASON, *Pelvis*, in anatomy, is a round cavity in form of a tunnel, ſituate between the anterior ventricles of the brain, deſcending from its baſe, and ending in the point at the glandula pituitaria.

It is formed of the pia mater, and receives the pituita which comes from the brain, and paſſes through the pituitary gland, and from thence into the veins.

Bason, or **Dish**, among glaſs grinders, who uſe various kinds of baſons, of copper, iron, &c. and of various forms, ſome deeper, others ſhallower, according to the focus of the glaſſes that are to be ground. In theſe baſons it is, that convex glaſſes are formed, as concave ones are formed on ſpheres or bowls. There are two methods of preparing them, viz.

In the firſt, the baſon is fitted to the arbor, or tree of a lath, and the glaſs (fixed with cement to a handle of wood) preſented and held faſt in the right hand within the baſon, while the proper motion is given by the foot of the baſon. In the other the baſon is fixed to a ſtand or block, and the glaſs with its wooden handle moved.

The moveable baſons are very ſmall, ſeldom exceeding five or ſix inches in diameter; the others are larger, ſometimes above ten feet in diameter.

After the glaſs has been ground in the baſon, it is brought ſmoother with greaſe and emery: and poliſhed firſt with tripoli, and finiſhed with paper cemented to the bottom of the baſon.

Bason, among hatters, is a large, round ſhell, or caſe, ordinarily of iron, placed over a furnace; in which the matter of the hat is moulded into form.

The hatters have alſo baſons for the brims of hats, uſually of lead, having an aperture in the middle, of a diameter ſufficient for the largeſt block to go through.

Bason is alſo uſed on various occaſions for a ſmall reſervatory of water.

BASS, in muſic, is that part of the concert which is the moſt heard, which conſiſts of the graveſt, deepeſt, loudeſt, and longeſt ſounds; or which is played on the largeſt pipes or ſtrings of inſtrument.

It is called *baſs*, from the Italian *baſſo*, of the Latin *baſis*, as being the foundation of the harmony.

Muſicians hold the baſs the principal part of a concert, and the foundation of the compoſition; though ſome will have the treble the chief part; which others only make a circumſtance, or ornament.

The ingenious Dr. Franklin, in his very curious letter to lord Kaimes on this ſubject, declares it to be his opinion that the baſs is unneceſſary to ſome tunes, and gives ſome reaſons in ſupport of it, which the curious may ſee there.

Bass, *Counter*, is a ſecond baſs, where there are ſeveral in the ſame concert.

Bass, *Thorough*, is that which proceeds, without interruption, from the beginning of a muſical compoſition to the end. By which it ſtands contradiſtinguiſhed from the ſinging baſs, and the baſſes of violins, which make pauſes from time to time. The thorough-baſs is the harmony made by baſs viols, theorbos, or the like, continuing to play, both while the voices ſing, and the other inſtruments perform their part; and alſo filling the intervals when any of thoſe ſtop.

It is commonly diſtinguiſhed from the other baſſes by figures over the notes, directing what chords are to be played to them; which figures are proper only for the organ, harpſichord, ſpinet, and theorbo lute. But it is to be obſerved a thorough baſs is not always figured, though it ought to be ſo.

Bass, among gardeners, a ſoft kind of ſedge or ruſh, uſed in binding plants, &c.

BASSANUS, in ornithology, is a ſpecies of the Pelican.

BASSE, in ichthyology, is the Engliſh name of the ſea wolf. It is properly a ſpecies of pearch, and is diſtinguiſhed by Artedi by the name of the pearch with thirteen rays in the ſecond fin of the back, and fourteen in the *pinna auri*.

Basse *Cour*, in building, a court ſeparated from the principal one, and deſtined for the ſtables, coach-houſes, and livery ſervants.

Basse *Cour*, of a country ſeat, is the yard or place where the cattle, fowls, &c. are kept.

BASSET, or Basette, a game with cards, ſaid to have been invented by a noble Venetian, for which he was baniſhed. It was firſt introduced into France by ſignior Juſtiniani, ambaſſador of Venice, in 1674. Severe laws were made againſt it by Louis XIV. to elude which they diſguiſed baſſet under the name of *pour & contre*, that is, *for and againſt*, which occaſioned new arrets and prohibitions of parliament. The parties concerned in it are, a dealer or banker, his aſſiſtant, who ſuperviſes the loſing cards, and the punter, or any one who plays againſt the banker.

BASSETING, in the coal mines, denotes the riſe of the vein of coals towards the ſurface of the earth, till it comes within two or three feet of the ſurface.

BASSIA, in botany, is a genus of the dodecandria order, and monogynia claſs of plants.

BASSON, or Bassoon, is a muſical wind inſtrument, blown with a reed, and furniſhed with eleven holes; ſerving for the baſs in concerts of hautboys, &c.

To render it more portable, it divides into two parts, whence it is called a *fagot*. Its diameter at bottom is nine inches, and its holes are ſtopped like thoſe of a large flute.

BASSO Relievo, or Bass Relief, ſignifies a piece of ſculpture, where the figures or images do not protuberate, jet, or ſtand out, far above the plane on which they are formed

Whatever figures or repreſentations are thus cut or ſtampt, ſo that not the entire body, but only a part of it is raiſed above the plane are ſaid to be done in relief: but when it is nearly flat it is called low relief: and when the repreſentation of a perſon is ſtruck on a medal it is uſually ſtiled ſtrong relief.

Basso *Relievos* make part of the furniture of antiquaries. Thoſe of the Trajan and Autonine columns have been copied by Bartoli, and explained by Bellori, &c. Thoſe of the arch of Severus by Suareſius.

Some have alſo made maps of proſpects of countries in baſſo relievo.

BASS Viol, is a muſical inſtrument of the ſame form with that of the violin, except being much larger. It is ſtruck with a bow; and has four ſtrings, and eight ſtops, divided by half ſtops, or ſemi-tones.

The ſound it yields is much more grave, ſweet and agreeable, than that of the violin, and of much nobler effect in a concert.

BASTARD, in law, ſignifies a natural child, or one born out of lawful wedlock.

A baſtard differs from one born in adultery, or inceſt, as the parents of the former are free, or allowed to marry, which thoſe of the latter are not.

The baſtards, or natural ſons of a king in France, are princes when owned; thoſe of a prince, or nobleman, are gentlemen; but thoſe of a gentleman are only plebeians, and pay taxes accordingly.

A baſtard's arms, according to the laws of heraldry, ſhould be croſſed with a bar, fillet or traverſe from the left to the right. They were not formerly allowed to carry the arms of their father, and therefore they invented arms for themſelves, which is ſtill done by the natural ſons of a king.

A baſtard by the laws of England cannot inherit land as heir to his father, being *nullius filius*; nor can any perſon inherit land as heir to him, but one that is heir of his body. If a child be begotten by him who doth marry the woman after the child's birth, yet it is in law a baſtard, though the church holds it legitimate. If a perſon marry a woman, and die before night, and never conſummate marriage, and his wife bring forth a child after, it is yet accounted his child, and legitimate.

If a man or woman marry again, and have iſſue by the ſecond wife or huſband, while the firſt is living, ſuch iſſue is a baſtard in law.

If a woman elope with a ſtranger and have a child by him, her huſband being within the four ſeas, this is ligitimate, and ſhall inherit the huſband's lands. But this is not now adhered to; for though the huſband and wife are both in England, if there be ſufficient proof that he had no acceſs to her, the child will be a baſtard.

By ſtat. 18 Eliz. cap. 3. two juſtices may take order for the puniſhment of the mother and reputed father of a baſtard: and by ſtat. 7 Jac. I. cap. 4. the penalty of commitment to the houſe of correction is inflicted on the woman only. But it ſeems that in both caſes the penalty can only be inflicted, when the child becomes chargeable to the pariſh. By 6 Geo. II. cap. 31. the reputed father may be apprehended by warrant of a juſtice, on the oath of the pregnant woman, and committed, unleſs he gives ſecurity to indemnify the pariſh to which the child belongs. But by ſtat. 18 Eliz. the woman is not compellable to anſwer any queſtions relative to her pregnancy, till one month after her delivery; nor can the man be held to bail, according to ſtatute law, until that period.

Judge Blackſtone, in his commentaries on the laws of England, under the article of public wrongs, has defined baſtardy as a breach of the peace, ſo that doors may be broken in purſuit of the reputed father of a baſtard, who conceals himſelf from the repreſentatives of the pariſh burdened with ſuch ſpurious offspring: yet the ſame excellent law commentator declares, that the perſon ſo concealing himſelf, may uſe fire arms in his defence, and kill thoſe who may break into his apartments. For although the act is a breach of the peace, yet in its nature it is but a debt due from the offender to pariſh, who has his offspring to maintain.

Bastard, in the ſea language, ſignifies a large ſail of galley, which will make way with a ſlack wind.

Bastard is alſo uſed adjectively, or in compoſition with divers other words, to denote things of inferior or diminutive value.

In this ſenſe we meet with baſtard coral, baſtard alabaſter, baſtard amianthus, &c.

BASTARDY, is a defect of birth objected to one born out of wedlock.

BASTERIA, or Allspice, in botany, is a genus of plants not deſcribed by Linnæus. Of this there is but one ſpecies known, which has oval leaves placed oppoſite, flowers coming from the ſides of the ſtalks, and a branched ſhrubby ſtalk. It is a native of Carolina in America. The flowers appear in May, are of a dull purple colour, and have a diſagreeable ſcent. The bark is brown, and has a very ſtrong aromatic flavour, from whence the plants takes the name of Allſpice.

BASTILE, denotes a ſmall antique caſtle, fortified with turrets. Such is the baſtile of Paris, which ſeems the only caſtle that has retained the name: it was begun to be built in 1369, by order of Charles V. and finiſhed in 1383, under the reign of his ſucceſſor.

Its chief occupants are ſtate priſoners.

BASTION, in fortification, ſignifies a huge maſs of earth uſually faced with ſods, ſometimes with brick, rarely with ſtone, ſtanding out from a rampart, of which it is a principal part, and is what in the ancient fortification was called a bulwark.

A baſtion conſiſts of two faces, and two flanks, and an opening towards the centre of the place, called the gorge.

Solid Bastions, are thoſe that are filled up entirely, and have the earth equal to the height of the rampart, without any void ſpace towards the centre.

Void and Hollow Bastions, are thoſe ſurrounded with a rampart and parapet, only ranging round their flanks and faces, ſo as to leave a void ſpace towards the centre; where the ground is ſo low, that if the rampart be taken, no retrenchment can be made in the centre, but what will lie under the fire of the beſieged.

Flat Bastion, is a baſtion built on a right line in the middle of the curtin, when it is too long to be defended by the baſtion at its extremes.

Cut Bastion, is that whoſe point is cut off, and in lieu thereof has a re-entering angle, or an angle inwards with two points outward; this is ſometimes alſo called, baſton with a tenaille; and is uſed either when, without ſuch a contrivance, the angle would be too acute, or when water, or ſome other impediment, hinders the carrying on the baſtion to its full extent.

Compoſed Bastion, is when the two ſides of the interior polygon are very unequal, which makes the gorges alſo unequal.

Regular Bastion, is that which has its due proportion of faces, flanks, and gorges.

Irregular Bastion, is where this proportion and equality is not obſerved.

Deformed Bastion, is where the irregularity of the lines and angles makes the baſtion out of ſhape, as when it wants one of its demi-gorges; one ſide of the interior polygon being too ſhort.

Demi Bastion, is that which hath but one face, and one flank: called alſo an epaulement.

To fortify the angle of a place that is too acute, they cut off the point, and make two demi-baſtions, which form a tenaille, or a re-entering angle. Their chief uſe is before a hornwork, or crownwork.

Double Bastion, is that which on the plane of the great baſtion, has another baſtion, built higher, ſomewhat after the manner of a cavalier; leaving twelve or eighteen feet between the parapet of the lower, and the foot of the higher.

BASTON, in law, ſignifies one of the ſervants to the warden of the Fleet priſon, who attends the king's court with a red ſtaff, for taking ſuch to ward as are committed by the court, and likewiſe attends on ſuch priſoners as are ſuffered to go at large by licence.

Baston, or Batoon, in architecture, denotes a mould in the baſe of a column, otherwiſe called a tore.

Baston, or Batoon, in heraldry, a kind of bend, which does not go from ſide to ſide of the eſcutcheon, as the ſcarf does, but is broken off ſhort, in form of a truncheon.

It is only borne in Engliſh coats of arms as a mark of baſtardy: but French heralds introduce it in arms as a difference, a mark of conſanguinity.

Baston alſo ſignifies the earl marſhal's ſtaff.

BASTONADO, Bastonade, is the puniſhment of beating or drubbing a criminal with a ſtick.

The baſtonade is a puniſhment uſed both among the ancient Greeks, Romans, and Turks.

It is much in uſe in the Eaſt to this day. The method there practiſed is thus: the criminal being laid on his belly, his feet are raiſed, and tied to a ſtake, held faſt by officers for the purpoſe; in which poſture he is beaten by a cudgel on the ſoles of his feet, back, chin, &c. to the number of one or more hundred blows.

BAT, in zoology, a genus of quadrupeds, of the order of Verſpertillio. See Syſtem of Tetrapodology.

Bat, in commerce, is a ſmall baſe ſilver coin, current in divers parts of Germany and Switzerland at different prices.

BATARDIERE, a place in a garden, prepared for the planting of fruit trees in, which being tranſplanted thither from the nurſery, are to be placed in eſpaliers, or elſewhere, to ſupply the place of dead trees.

BATCHELOR's Buttons, in botany, is the ſame as Campion.

BATENKETOS, a ſtar about the third magnitude, in the conſtellation Cetus.

BATFOWLING, a method of catching birds in the night, by lighting ſome ſtraw, or torches, near the place where they are at rooſt: for, upon beating them up they fly to the flames, where, being amazed, they are eaſily caught in nets, or beat down with buſhes fixed to the end of poles, &c.

BATH, Balneum, in medical language, is a convenient receptacle of water for perſons to waſh, or plunge in, either for health or pleaſure.

Baths are either natural or artificial, and are hot or cold.

Hot BATHS, owe their origin partly to the admixture of ſulphureous particles, while the water is paſſing through its ſubterraneous canals, or rather while it creeps through beds and mines of ſulphur, &c. and partly to the fumes and vapours exhaling through the pores of the earth where ſulphur is, either pure or impure, as in coals, amber, &c. Though in moſt hot baths there are likewiſe mixed particles of iron, alum, nitre, and other mineral bodies, which gave them an acid aſtringent taſte.

The chief hot baths in our country are thoſe at Bath and Briſtol, in Somerſetſhire; and thoſe at Buxton and Matlock in Derbyſhire; the latter are rather warm or tepid than hot.

It has been thought by many, that the practice of drinking our Bath waters in Somerſetſhire is not very ancient, and that their ancient uſe was in bathing; but Dr. Friend endeavours to ſhew the internal uſe of thoſe waters to have been very early. Dr. Guidot, in whoſe time this uſage revived, and who has given us the beſt hiſtorical narrative of theſe waters, goes no higher for their internal uſe than the latter end of the ſixteenth century. But they appear to have been in uſe in the thirteenth century: Gilbert, ſurnamed Anglicus, who, according to Bayle, lived in 1210, in the reign of king John, or more probably in that of Edward I. mentions a perſon cured of a leucophlegmacy, attended with a ſwelling, &c. by the ſulphureous Baths; which Dr. Friend underſtands of the Bath waters; and that the cure was wrought by drinking, not bathing, which had been improper in ſuch a caſe.

Dr. Muſgrave makes it probable, that they were reſorted to in the time of Geta; there being ſtill the remains of a ſtatue erected to that general, in gratitude for ſome benefactions which he had conferred on the place. Some pretend that theſe waters were in uſe 800 years before Chriſt. Phil. Tranſ. N° 49. 346.

See the uſes of Bath waters, and their difference from thoſe of Briſtol, under the head Briſtol water.

The Bath waters abound with a mineral ſulphur: they are hot, of a blueiſh colour, and ſtrong ſcent; and ſend forth thin vapours. They do not paſs through the body like moſt other mineral waters; though, if ſalt be added, they purge preſently. On ſettlement they afford a black mud, which is uſed by way of cataplaſms in aches; of more ſervice to ſome than the waters themſelves: the like they depoſit on diſtillation, and no other.

Dr. Aſtendoff found the colour of the ſalt drawn from the king's hot bath to be yellow; and that from the croſs bath, white; whence he concludes, that the croſs bath has more alum and nitre than the hotter, which abounds more with ſulphur; and yet the croſs bath is found to looſen ſhrunk ſinews, by which it ſhould ſeem to abound leſs with alum: it is harſher to the taſte than the others, and ſoaks the hands more. The croſs bath preys on ſilver, and all of them on iron, but none on braſs.

The two ſtated ſeaſons for drinking the Bath waters are ſpring and fall; though they may be uſed whenever they are found neceſſary. The heat of theſe waters, and their milky detergent quality, are aſcribed to a mixture and fermentation of two different kinds of water, diſtilling from Clarton Down, and Lanſdown: of which the former has ſprings that are ſulphureous, or bituminous, mixed with nitre; and the latter ſuch as are tinctured with iron ore. Beſides, the adjacent country abounds with mines of coal, which all naturaliſts agree to be ſulphureous and bituminous.

It is from the combination of ſulphur, iron, and ſea ſalt, that Bath water is ſo uſeful, whenever the vital heat requires an increaſe. Nothing but iron can make ſuch a quick improvement, as this water does in decayed conſtitutions; and it is the ſoapineſs of it, from the union of its ſulphur and iron, that relaxes, ſo as to give vent to gouty, and other peccant matters, by perſpiration. More than two pints per day can never be required, and they may be drank at three or four times. In all internal diſorders, where iron and ſulphur are preſcribed, the internal uſe of this water is effectual; and by merely bathing in it, much relief is obtained in a great variety of diſorders.

The virtues of many of our mineral waters have been very juſtly aſcribed to the fixed air with which they abound; and ſome have aſcribed thoſe of the Bath waters to the ſame principle. But Dr. Prieſtley found upon trial, that the quantity of fixed air contained in them is ſo ſmall as to render it very improbable that their virtues ſhould be at all owing to it. And Dr. Falconer obſerves, that theſe waters do not ſo properly contain fixed air, as a calcareous earth; which though it contain fixed air, may not part with it in the ſtomach, unleſs it meet with ſome acid to decompoſe it. By ſome accurate obſervations that were made on the heat of Bath and Briſtol water, by Mr. Canton, it appears, that a Fahrenheit's thermometer held in the ſtream from the common pump of the king's bath after pumping about $\frac{1}{4}$ of an hour, was raiſed to 112°. The ſtream from the common pump of the hot bath raiſed it to 114°$\frac{1}{2}$. At the pump of the croſs bath it ſtood at 110°; the heat of the ſhaded air at noon being 66°, and of common water expoſed to it 61°. And the Briſtol water raiſed the thermometer to 76°, whilſt in common water, expoſed to the ſhaded air, it ſtood at 62°. Phil. Tranſ. vol. lvii. N° 22.

Buxton water has been obſerved to raiſe the thermometer to 80°, and that of Matlock to 66° or 68°.

The uſe of hot baths, it is obſerved, increaſe the weight of the body for the preſent, but cauſe a plentiful perſpiration afterwards; though not ſo great as ſet down by Dr. Keill, who makes it amount to 1$\frac{1}{2}$ pound in an hour's time. By Mr. Martin's experiment at Buxton, it was only 5 ounces in one hour, and from 8 to 12 ounces in an hour and an half. Phil. Tranſ. N° 407. p. 27.

The uſe of theſe baths is found beneficial in diſeaſes of the head, as palſies, &c. in cuticular diſeaſes, as leproſies, &c. obſtructions and conſtipations of the bowels, the ſcurvy and ſtone, and in moſt diſeaſes of women and children. The baths have performed many cures, and are commonly uſed as a laſt remedy in obſtinate chronic diſeaſes, where they ſucceed well, if they agree with the conſtitution of the patient: but whether they will agree or not, cannot be known without trial.

Cold **Baths** were long diſuſed, though the ancients had them in the greateſt eſteem; but the improvements which have at various periods been made in phyſic, have brought them into uſe again; and the preſent age can boaſt abundance of noble cures performed by them, and ſuch as were long attempted in vain by the moſt powerful medicines.

The cold bath is found one of the moſt univerſal and innocent remedies yet diſcovered. It is ſerviceable in moſt chronic diſtempers; and is reckoned ſo ſafe, that phyſicians ſometimes preſcribe it in a beginning phthiſis, or conſumption, when the lungs are but ſlightly affected.

The riſe and progreſs of cold bathing, and the cures effected thereby, are deſcribed at large in Sir J. Floyer's, and Dr. Baynard's Hiſtory of Cold Bathing.

In tender conſtitutions, and ſome diſeaſes, a moderate warm bath ſhould be uſed before the cold bath, the approach to which ought to be gradual. People of rigid fibres, and unſound viſcera, are injured by the cold bath.

The cold bath is hurtful, and ought to be diſcontinued, when the patient continues to be cold and numb after coming out of it, notwithſtanding all precautions to prevent it. Even where immerſion in the cold bath is ſtrengthening, a continuance in it is weakening, and in proportion to its duration.

Vapour **Baths** are, when the patient is not plunged into what is prepared for the bath, but only receives its ſteam upon thoſe parts of his body which require it: as in ſome diſtempers of the fundament and womb, where the patient ſits and receives the fumes of ſome proper fomentation, &c. To theſe may be added the bagnio, where people are made to ſweat by the heat of a room, and pouring on of hot water; after which they generally go into a hot bath, or bagnio.

Dry **Baths**, are thoſe made of aſhes, ſalt, ſand, ſhreds of leather, and the like.

In New England they make a kind of ſtoves of turf, wherein the ſick are ſhut up to bathe or ſweat. Phil. Tranſ. Nº 384. p. 130. The ſame name is ſometimes alſo given to another kind of baths, made of kindled coals, or burning ſpirit of wine; the patient being placed in a convenient cloſe chair for the reception of the fume, which riſes and provokes ſweat in a plentiful manner: care is here taken to keep the head out, and to ſecure reſpiration.

Metalline **Baths**, are thoſe prepared with the ſcoriæ of iron.

Bath, in chemiſtry, implies the ſeveral matters employed to tranſmit heat are called baths, but the ſubſtances moſt frequently uſed by chemiſts for this purpoſe, are water and ſand.

Bath is alſo uſed by chemiſts, to ſignify the fuſion of metallic matter in certain certain operations,

In refining or cupelling, for example, the metals are ſaid to be in bath when they are melted.

Knights of the **Bath**, are a military order in England inſtituted by Richard II. who ordained that there ſhould be no more than four; however, his ſucceſſor, Henry IV. increaſed them to forty-ſix. Their motto was *Tres in uno*, ſignifying the three theological virtues.

It was the cuſtom to bathe before they received the golden ſpurs: but this was only obſerved at firſt, being afterwards gradually dropped: however, it was this occaſioned the denomination of Knights of the Bath.

The order of Knight of the Bath is ſcarce ever conferred but at the coronation of kings, or the inaugration of a prince of Wales, or duke of York. They wear a red ribband belt-wiſe; to which is affixed the badge of the order, viz. a ſceptre, roſe, thiſtle, and three imperial crowns joined within a circle; upon which circle is the motto in pure gold. Each knight wears a ſilver ſtar of eight points upon the left breaſt of his upper garment. See Syſtem of Peerage.

Camden and others ſay, Henry IV. was the inſtitutor, in 1399, and upon this occaſion: that prince, being in the bath, was told by ſome knight, that two widows came to demand juſtice of him; when his majeſty leaping out of the bath, cried, He ought to prefer doing juſtice to his ſubjects to the pleaſure of the bath; and thereupon created Knights of the Bath.

Some authors, however, will have the order of the Bath to have been on foot long before Henry IV. even as early as the Saxon times: at leaſt, it is certain, that bath has been uſed long before, in the creation of knights, in France; though there was no order of knights under this name.

The order of the Bath, after remaining many years extinct, was revived under king George I. by a ſolemn creation of a great number of knights.

Bath *Metal*, is a preparation of copper with zinc, which gives a more beautiful colour than the calamine uſed in the preparation of the common braſs.

BATHING, the act of uſing or applying a bath; that is, of immerging the body, or part of it in water, or other fluid.

Bathing is not to be practiſed without great great care and precaution, in melancholic, œdematous, or paralytic caſes. As to the phthiſis, authors are divided: ſome abſolutely reject the uſe of baths for this diſorder; others allow it, provided the water be only of a moderate degree of warmth, and the body be previouſly prepared by laxatives and venæſection. Different baths have different effects, according to the ingredients of their waters: thoſe of the vitriolic kind are ſaid to fix the morbific matter in arthritic diſorders and render them ſtill more obſtinate. They are alſo leſs proper where the body is foul, and the viſcera weak or obſtructed, being apt to render ſuch patients hydropic.

Sulphurous and aluminous baths are commended againſt an incontinency of urine; but prove hurtful to cachectic habits.

The Caroline baths have this quality beyond other hot waters, that they do not ſoften the body, but rather by reaſon of the copious earthy and aſtringent matter they contain, bind up the parts, ſtrengthen thoſe which are weak, block up the pores, and thus produce a contrary effect to other hot ſprings.

Hence they are prejudicial to people of a tender and delicate habit, when the body is foul, or affected with ſpaſmodic, hypochondriac, or colic diſorders, and in many other caſes. They are of uſe where the limbs are to be ſtrengthened, the ligaments and tendons to be gently excited to motion, and the body to be dried.

Bathing ſhould be uſed with caution, the conſtitution of the patient ſhould be conſidered, and the particular qualities and ingredients of the water, hot or warm bathing tends to relax the ſkin, promote perſpiration, cleanſe the body, dilute the blood, and carry off cuticular foulneſſes by the pores. To conceive the manner of its operation, it is to be obſerved, that when the body is plunged in a pure, light, and ſimple warm water, it muſt neceſſarily undergo the following changes.

1. The heat neceſſarily rarefies and expands the blood and all the juices, and thus dilates the whole ſyſtem of the veſſels; the conſequence of which is, that the pulſe, or contractive ſtrokes of the arteries, increaſes; whence the blood circulates with greater force, and the external parts of the body become red, and begin to ſweat.

2. By the gravity of the water, the body, plunged therein, is greatly altered; and its ſurface, in that caſe, ſuſtains a violent preſſure, which ſqueezes the blood forcibly in upon the viſcera. But the additional preſſure in common cold bathing is very inconſiderable, and therefore the contraction of the fibres is principally owing to the ſtimulus of cold. Thus, whilſt the veſſels are compreſſed from without, and dilated from within, the inteſtine motion of the conſtituent parts of the blood is increaſed, and conſequently the viſcid juices are thus diſſolved, obſtructions overcome, and the humour s are better fittedto paſs through all the ſecretory and excretory ducts.

Thence, as by the water's gravity the parts are compreſſed from without, and the blood driven plentifully upon the heart, the lungs, the brain, and the larger veſſels, we ſee why, if the bath be too hot, it cauſes palpitations of the heart, oppreſſions in the viſcera, or ſometimes fainting; and again, why, when the body is foul, or full of bad juices, it produces continued fevers, or inveterate intermittents, if the firſt paſſages abound with crudities.

Theſe ill effects are more frequently obſerved from the hot ſprings which have alſo an aſtringent quality, as the violent hot Caroline ſpring evidently has.

3. Another change enſues upon the body from the moiſture of the bath, which, aſſiſted with a temperate heat, procures a great ſuppleneſs of the ſkin and fibres; inſomuch that, upon coming out of the water, the whole habit of the body ſwells conſiderably, is looſened in its texture, and opened in its pores and veſſels; whilſt the blood and juices have a more free paſſage to the ſurface. Hence it is, that if a perſon go directly out of the warm bath to bed, he preſently begins to ſweat plentifully, which is the beſt effect that can proceed from bathing, and of great ſervice in the cure of diſeaſes.

Bathing is found more eſpecially beneficial to thoſe of a moiſt habit, and who have ſtore of humours in their veſſels and pores, as it colliquates the humours and promotes their diſcharge.

In the ſummer it ſerves to cleanſe the ſkin from ſweat, and keep the pores open; in winter to promote perſpiration. It is uſed with good effect in many chronic diſorders, in atrophies, the ſtone, &c. It is a good palliative in the coryza; but uſeleſs in the jaundice, and hurtful in the aſcites and ſciatica, and generally to all in a time of plague. By its promoting perſpiration, it becomes noxious to perſons of a dry conſtitution, as it exſiccates too faſt; more eſpecially to perſons hectically inclined, as by means thereof the humours already too prone to colliquation, are ſtill more reſolved.

Cold bathing was in high eſteem among the ancient phyſicians for the cure of diſeaſes, as appears from Strabo, Pliny, Hippocrates, and Oribaſius.

Bathing, among the Cophts and Æthiopians, denotes the day of Chriſt's baptiſm, reputed the 6th of January; when, from an opinion of an extraordinary ſanctity in the waters on that day, they not only, by ancient cuſtom, baptiſed their catechumens, but were re-baptiſed themſelves.

BATHMUS, in anatomy, is an appellation given to ſuch cavities of bones as receive the prominences of other bones into them.

BATILLUS, ſignifies a muſical inſtrument made of metal, in the form of a ſtaff, furniſhed with metalline rings, which being ſtruck, yield harmonic ſounds; uſed by the Armenians in their church ſervice.

BATIS, in botany, is a genus of the dioecia order and tetrandia claſs of plants.

BATISTE, in commerce, is a fine white kind of linen cloth, manufactured in Flanders and Picardy. There are three kinds of batiſte: the firſt very thin; the ſecond leſs thin; and the third much thicker, called Holland batiſte, as coming very near the goodneſs of Hollands.

BATOS, in ichthyology, is a ſpecies of the raia, diſtinguiſhed by Artedi by the name of the variegated ray, with the middle of the back ſmooth, and with one row of ſpines on the tail.

BATRACHUS, in ichthyology, is a ſpecies of the ſilurus.

BATTABLE *Ground*, denotes land lying between England and Scotland.

BATTALIA, ſignifies an army ranged in order of battle, or ready for engagement.

BATTALION, in the military art, ſignifies a body of infantry ranged in form of battle, and ready to engage.

A battalion uſually contains from five to eight hundred men, of which one third were formerly pikes in the middle, and the other two thirds muſquets poſted on the wings: they are now armed with firelocks and bayonets. The battalion is divided into thirteen companies, one of which is grenadiers.

BATTENS *of the Hatches* in ſea language, are nailed along the tarpaulings, and ſerve to keep their edges cloſe down to the hatches, in order to prevent the water which waſhes over the deck from penetrating into the lower apartments of the ſhip.

BATTERING RAM, in antiquity, was a military engine uſed to beat down the walls of places beſieged.

BATTERING *Rams*, in heraldry, a bearing or coat of arms, reſembling the military engine of the ſame name.

BATTERING is the attacking a place, work, or the like, with heavy artillery.

To BATTER *in Breach*, is to play furiouſly on a work, as the angle of a half moon, in order to demoliſh and make a gap or breach in it.

In this, they obſerve never to fire a ſingle piece againſt the top of the wall; but all towards the bottom: three, four, five, or ſix feet from the ground: they alſo fire par camarade, all together, till they perceive the earth fall from behind the lining of the rampart.

BATTERY, in the military art, denotes an eminence caſt up, whereon to plant artillery, that it may play to better advantage. It conſiſts of an empaulement or breaſt work, of about eight feet high, and eighteen or twenty thick.

An open BATTERY is nothing more than a number of cannon, generally field-pieces, ranged in a row a-breaſt of one another, on ſome ſmall natural elevation of the ground, or an artificial bank of about a yard or two high.

A covered BATTERY, is when the cannon and gunners are covered by a bank made of bruſh wood, faggots, and earth; of about eighteen or twenty feet thick, and ſeven or eight feet high.

A ſunk BATTERY, is that whoſe platform is ſunk or let down into the ground, with trenches cut into the earth again the muzzles of the guns, to ſerve for embraſures.

Croſs BATTERIES, are two batteries at a conſiderable diſtance from each other, which play athwart one another at the ſame time, and upon the ſame point, forming right angles; where, what one bullet ſhakes, the other beats down.

BATTERY, in law, denotes an act that tends to the breach of the peace of the realm, by unlawfully ſtriking, beating, or offering violence to another perſon.

Battery is frequently confounded with aſſault, though in law they are different offences; becauſe, in the treſpaſs for aſſault and battery, one may be found guilty of the aſſault, yet not convicted of the battery: there may therefore be aſſault without battery; but battery always implies an aſſault. A perſon guilty of battery againſt a clergyman, is liable to three kinds of proſecution for the ſame offence: an indictment for breach of peace, a civil action for damages, and a ſuit in the eccleſiaſtical court.

BATTERY, in electricity, ſignifies a combination of coated ſurfaces of glaſs, ſo connected together, that they may be charged at once, and diſcharged by a common conductor. Mr. Gralath, a German electrician, was the firſt who contrived to increaſe the ſhock, by charging ſeveral phials at the ſame time. Dr. Franklin, after he had analyzed the Leyden phial, and found that it loſt at one ſurface the electric fire which it received at the other, conſtructed a battery, conſiſting of eleven panes of large ſaſh glaſs, coated on each ſide, and connected in ſuch a manner that the whole might be charged together, and with the ſame labour as one ſingle pane; and by bringing all the giving ſides into contact with one wire, and all the receiving ſides with another, he contrived to unite the force of all the plates, and to diſcharge them at once. But the moſt complete battery that has yet been conſtructed, is deſcribed by Dr. Prieſtley. See Syſtem of ELECTRICITY.

BATTEURS D'ESTRADE, ſcouts, or horſemen, ſent out before, and on the wings of an army, two or three miles, to make diſcoveries; of which they are to give an account to the general.

BATTLE, in military language, ſignifies a general engagement between two armies.

The Athenians, by the ancient laws of their country, were not to draw out their forces for battle till after the ſeventh day of the month. And Lucian relates of the Lacedæmonians, that by the laws of Lycurgus, they were not to fight before full moon. Among the Germans, it was reputed an impiety to fight in the wane of the moon; and Cæſar tells us, that Arioviſtus was beaten by him, becauſe contrary to the laws of his country, he had fought when the moon was in her wane. The German ſoldiers were intimidated with the apprehenſion, and afforded Cæſar an eaſy victory; *acie commiſſa impeditos religione hoſte vicit.*

It is well known that Jeruſalem was taken by Pompey in an attack on the ſabbath day, when, by the Jewiſh ſuperſtitious notions, they were not allowed to fight, or even to defend themſelves.

BATTLE *Array*, denotes the order in which an army is drawn up at a review, or for engagement. With reſpect to the diſpoſition of troops for battle, and the methods to be purſued in order to fruſtrate the deſigns of an enemy, and obtain a victory. See MILITARY AFFAIRS.

BATTLE, in a naval ſenſe, denotes an engagement between two fleets, ſquadrons, or even ſingle ſhips; which is more frequently diſtinguiſhed by the name of ſea fight. Of late, fleets are ranged in line of battle, like land armies, and fight much after the ſame order. For deſcription, manœuvering, &c. ſee NAVAL AFFAIRS.

BATTLE *Royal*, in cock fighting, denotes a fight between three, five, or ſeven cocks all together; and the cock which ſtands longeſt gets the day.

BATTLE *Ax*, was originally called *ſecuris danica*, and introduced into England by the Danes.

BATTLEMENTS, in the military art, are notches in the top of a wall, parapet, or other building, in form of embraſures, for the ſake of looking through them.

BATTOLOGY, in grammar, ſignifies a multipyling of words without occaſion.

BATTORY, a name given by the Hans Towns to their magazines or factories. The chief of theſe are thoſe at Archangel, Novogrod, Berghem, Liſbon, Venice, and Antwerp.

BATTUTA, in muſic, ſignifies the motion of the hand or foot in beating time.

BATZ, or BATZEN, a copper coin mixed with ſome ſilver, and current at different rates, according to the quantity of alloy, in many parts of Germany and Switzerland.

BAUGE, in commerce, is a drugget manufactured in Burgundy, with thread, ſpun thick, and coarſe wool.

BAUHINA, or MOUNTAIN EBONY, in botany, is a genus of plants of the decandria claſs, and monogynia order. The characters are theſe: the flower is compoſed of five petals; and hath ten ſtamina; the oblong germen ſits upon the foot ſtalk, which afterwards becomes a long taper pod, encloſing a row of roundiſh compreſſed ſeeds. There are ten ſpecies, viz.

1. The aculeata with a prickly ſtalk is very common in Jamaica, riſing to the height of 16 or 18 feet, terminated by elegant yellow flowers, which are ſucceeded by bordered pods of two inches long, with three ſwelling ſeeds incloſed.

2. The tomentoſa, a native of Campeachy, and appears much like the latter.

3. The acuminta, a native of India.

4. The varigata, alſo a native of India.

5. The divaricata, a native of the Weſt Indies.

Beſides theſe there are 5 other ſpecies enumerated, but thoſe already mentioned are the moſt remarkable. They may all be propagated by ſeeds in a hot bed, and tranſplanted into a back ſtove.

BAVINS, in war, are bruſh faggots, made with the bruſh at length.

BAVOSA, in ichthyology, is a name given to a ſpecies of the ray fiſh, diſtinguiſhed by Artedi by the name of the variegated ray, with ten prickly tubercles on the middle of the back.

BAURAC, in pharmacy, is an ancient name for nitre, but in ſome places uſed in a reſtrained ſenſe, as not ſignifying every thing that was called by that name, but only one of two different ſalts that were confuſedly called nitre.

BAWD, ſignifies a perſon who keeps a place of proſtitution, or makes a trade of debauching women, and procuring or conducting criminal intrigues. Some think the word is derived from the old French *boude*, bold or impudent; though Verſtegan has a conjecture which would carry it higher, viz. from *bathe*, anciently written *bade*. In which ſenſe, *bawd* originally imported no more than bath holder, as if bagnios had anciently been the chief ſcenes of ſuch proſtitution. The Romans had their male as well as female *bawds*; the former denominated *lenones* and *proagogi*, among us *panders*; the latter, *lenæ*. By a law of Conſtantine, bawds were to be puniſhed by pouring melted lead down their throats. By the common law of England, a perſon may be indicted for keeping a bawdy houſe, and puniſhed by fine and impriſonment: and haunters of bawdy houſes bound to their good behaviour, But it does not appear that the offence of being a bawd is indictable; though that of keeping a bawdy houſe is.

BAWLING, among hunters, ſignifies when the dogs are too buſy before they find the ſcent good.

BAY TREE, in botany, is the ſame as Laurus.

BAY, in geography, denotes a little gulf, or an arm of the ſea, ſtretching up into the land; being larger in the middle within, than at its entrance, which is called the mouth of the bay.

BAY, among huntſmen. Deer, &c. are ſaid to bay, or be at bay, when, after being hard run, they turn head againſt the hounds.

BAY *Colour*, denotes a kind of red inclining to cheſnut, chiefly uſed in ſpeaking of horſes.

BAYONET, in the military art, is a ſhort broad dagger, made lancet faſhion, and having, inſtead of an hilt, an iron handle and ring, to fix it to the end of a muſquet, ſo as not to hinder its firing or charging. Theſe are of great ſervice to the dragoons and fuſileers, after they have ſpent all their powder and ball.

BAYS, in commerce, is a kind of coarſe, open, woollen ſtuff, having a long knap; ſometimes frized on one ſide, and ſometimes not frized, according to the uſes for which it is intended.

This ſtuff is without wale, being wrought on a loom with two treddles, like flannel. The manufacture of bays is very conſiderable in England, particularly about Colcheſter; and in Flanders, about Liſle and Tournay, &c.

Formerly the French, as well as Italians, were furniſhed with bays from England; but of late the French workmen have undertaken to counterfeit them, and ſet up manufactures of their own; and that with ſucceſs; eſpecially at Niſmes, Montpellier, &c.

The export of bays is very conſiderable in Spain, Portugal, and Italy. Their chief uſe is for the religious, and for linings in the army: the looking glaſs makers alſo uſe them behind their glaſſes, to preſerve the tin or quickſilver; and the caſe makers to line their caſes.

The breadth of bays is commonly a yard and half, yard and three quarters, or two yards, by forty two, or forty eight in length: thoſe of a yard and three quarters are moſt proper for the Spaniſh trade.

BAYTAU, among naturaliſts, denotes any ſubſtance in foſſilogy, which cannot be arranged claſſically; but in ſome meaſure partakes of a variety of ſeveral ſpecies.

BAZA, or **BAZAT**, in commerce, is fine ſpun cotton, which comes from Jeruſalem, whence it is alſo called Jeruſalem cotton.

BAZAR, **BASAR**, or **BEZESTINY**, is a denomination among the Turks and Perſians, given to exchanges or market places where their fineſt ſtuffs and other wares are ſold.

The bazar or maidan of Iſpahan is one of the fineſt places in all Perſia, and even ſurpaſſes any of the exchanges in Europe; yet, notwithſtanding its magnificence, it is excelled by the bazar of Tauris, which is the largeſt known.

At Conſtantinople there is the old and the new bazar, which are large, ſquare buildings, covered with domes, and ſuſtained by arches and pilaſters; the former chiefly for arms, harneſſes, and the like; the later for goldſmiths, jewellers, furriers, and all ſorts of manufactures.

BAZATA, in the trade of Perſia, ſignifies the finer ſort of ſhawls, which are uſed by perſons of quality as the attire for dinner. Moſt of the fine ſhawls imported by the India company are a ſpecies of that manufacture.

BAZGENDGES, in natural hiſtory, is the name of a ſubſtance uſed by the Turks, and other Eaſtern nations, in their ſcarlet dying: they mix it for this purpoſe with cochineal and tartar, the proportions being two ounces of the bazgendges to one ounce of cochineal.

They ſeem to be no other than the horns of the turpentine tree in the Eaſtern parts of the world; and it is not only in Syria that they are found, but China alſo affords them. Many things of this kind were ſent over to M. Geoffroy at Paris from China, as the ſubſtances uſed in the ſcarlet dying of that country, and they all proved wholly the ſame with the Syrian and Turkiſh bazgendges, and with the common turpentine horns. The lentiſk or maſtic tree is alſo frequently found producing many horns of a like kind with theſe, and of the ſame origin, all being owing to the pucerons, which make their way into the leaves, and breed their young there.

BDELLIUM, is an aromatic gum, brought from the Levant, of ſome uſe, both as a medicine and a perfume.

This gum is ſomewhat bitter, tranſparent when broken, and of a fattiſh ſubſtance.

It is thought to facilitate digeſtion, to promote perſpiration, and to be good in coughs, and many diſorders of the breaſt; but its chief uſe now in compoſition is in diſcutient plaſters, cerates, and unguents; in which it is much commended for reducing of ruptures, and ſoftening any indurations of the nervous parts.

BEACON, is a ſignal for better ſecuring a kingdom from foreign invaſion.

On certain eminent places of the country are placed long poles erect, on which are faſtened pitch barrels to be fired by night, and ſmoke made by day, to give notice, in a few hours to the whole kingdom, of an approaching invaſion. Theſe are commonly called beacons; whence alſo comes beaconage. The erection of ſuch ſignals formerly belonged to the king, but now the corporation of the Trinity houſe, are impowered to do this by act of parliament, 8 El. c. 13. If any perſon ſhall deſtroy or remove any ſea-mark, he ſhall forfeit 100l. and in caſe of inability to pay it, be ipſo facto outlawed.

BEACONAGE is money paid towards the maintenance of a beacon.

BEAD, in architecture, denotes a round moulding, carved in ſhort emboſſiments, like beeds in necklaces.

BEAD, in aſſaying, is the ſmall lump or maſs of pure metal ſeparated from the ſcoriæ, and ſeen diſtinct and pure in the middle of the coppel while in the fire.

BEADS are more particularly underſtood to be a ſort of glaſs necklace, made in imitation of the colour and figure of pearl.

BEADS are alſo uſed in ſpeaking of thoſe glaſs globules vended to the ſavages on the coaſt of Africa, thus denominated, becauſe they are ſtrung together for the convenience of traffic.

BEADS, in a religious ſenſe, are uſed for directing the number of prayers to be ſaid at maſs by the votaries of the church of Rome.

BEAD *Roll*, among the Romiſh prieſts, is a liſt or catalogue of ſuch perſons, for the reſt of whoſe ſouls they are obliged to ſay maſs when deceaſed.

BEAD *Makers*, called by the French *paternoſtriers*, are thoſe employed in making, ſtringing, and ſelling beads. At Paris there are three companies of *paternoſtriers*, or *bead makers*; one who makes them of glaſs or cryſtal; another in wood and horn; and a third in amber, coral, jet, &c.

BEAD *Proof*, or *double Proof*, are terms uſed by diſtillers, to expreſs that ſort of Proof of the ſtandard ſtrength of ſpirituous liquors, which conſiſt in their having, when ſhaken in a phial, or poured from on high into a glaſs, a crown of bubbles, which ſtand on the ſurface ſome time after. This is eſteemed a proof that the ſpirit conſiſts of equal parts of rectified ſpirits.

BEAD *Tree*, azederach, or melia, in botany, is a genus of the decandria order and monogynia claſs. Its characters are theſe: the flower has five ſpear ſhaped petals which ſpread open, and a cylindrical nectarium of one leaf, indented in ten parts. Ten ſmall ſtamina inſerted in the top of the noctarium; with a conical germen, which turns to a ſoft globular fruit, including a roundiſh nut, having five rough furrows and five cells, each containing one oblong ſeed. There are two ſpecies, both exotics.

BEADLE, or **BEDEL**, **BEDELLUS**, ſignifies a crier or meſſenger of a court, who cites men to appear and anſwer on particular occaſions. It alſo denotes an officer in univerſities, whoſe place it is to walk before the maſters at all public proceſſions, &c. with a mace. There are alſo church beadles whoſe office is well known.

BEAGLES, in menagery, are a ſmall ſort of hounds or hunting dogs, and of divers kinds; as the Southern beagle, ſomething leſs and ſhorter, but thicker than the deep mouthed hound; the fleet northern, or cat beagle, ſmall, and of a finer ſhape than the ſouthern, and a harder runner. From the two, by croſſing the ſtrains, is bred a third ſort held preferable to either. To theſe may be added a ſtill ſmaller ſort of beagles, ſcarce bigger than lap dogs, which make pretty diverſion in hunting the cony, or even ſmall hare in dry weather: but otherwiſe unſerviceable, by reaſon of their ſize.

BEAK, in architecture, is a little fillet left on the edge of a larmier, which forms a canal, and makes a kind of pendant chin, anſwering to what Vitruvius calls the mentum.

BEAK, or **BEAK** *Head of a Ship*, is that part without the ſhip before the forecaſtle, which is faſtened to the ſtem, and ſupported by the main knee: this is uſually carved and painted.

BEAK, among farriers, denotes a little horſe ſhoe, turned up, and faſtened in upon the fore part of the hoof, in order to ſecure the real ſhoe from coming off by the ſtamping of the horſe.

BEAKED, *Becquē*, in heraldry, is a term uſed to expreſs the beak or bill of a fowl.

BEAKING, in cock fighting, expreſſes the holding with the bill, and ſtriking with the gaffs.

BEAM, in architecture, is the largeſt piece of wood in a building; being laid acroſs the walls, and ſerves to ſupport the principal rafters of the roof. No building has leſs than two of theſe beams, viz. one at each head: into theſe the girders of the upper floor are alſo framed. The proportion of beams in London are fixed by ſtatute, as follows: a beam fifteen feet long muſt be ſeven inches on one ſide its ſquare, and five on the other; if it be ſixteen feet long, one ſide muſt be eight inches, the other ſix: if ſeventeen feet long, one ſide muſt be ten inches, the other ſix: in the country they uſually make them ſtronger.

BEAM *of a Plough*, in huſbandry, is a name given by our farmers to the great timber of the plough, into which all the other parts of the plough-tail are infixed.

BEAMS *of a Ship*, are the great main croſs timbers, ſtretching from ſide to ſide, which hold the ſides of a ſhip from falling together, and which alſo ſupport the decks and orlops; the main beam is next the main maſt; and from it they are reckoned by firſt, ſecond, third beam, &c. The greateſt of all is called the midſhip beam.

On the **BEAM** in ſea language, denotes any diſtance from the ſhip on a line with the beams, or at right angles with the keel. Any object that lies eaſt or weſt, when the ſhip ſteers northward, is ſaid to be on the ſtarboard or larboard beam.

Before the **BEAM**, ſignifies an arch of the horizon comprehended between the line of the beam, and that point of the compaſs which the ſtems.

On the Weather **BEAM**, ſignifies on the weather ſide of the ſhip.

BEAM, or **ROLLER**, among weavers, is a long and thick wooden cylinder placed lengthways on the back part of the loom of thoſe who work with the ſhuttle. That cylinder, on which the ſtuff is rolled as it is weaved, is alſo called the beam or roller, and is placed on the fore part of the loom.

BEAM, in heraldry, is uſed to expreſs the main horn of a hart or buck.

BEAM, in menagery, denotes the main ſtem of a deer's head, or that part which bears the antlers, royals, and tops; the little ſtreaks wherein are called circles.

BEAM is alſo uſed for a fiery meteor in the ſhape of a pillar; and for a ray of the ſun.

BEAM *Compaſs*, is the large wooden compaſs uſed by coopers for deſcribing circles to make the veſſels by, from wide ſtaves, uſually called captops.

BEAN FABA, in botany, is a genus of vicia. The characters are theſe: the flower is of the butterfly kind; the ſtandard is large, oval, and indented at the end; it hath two oblong erect wings, which encloſe the keel, being much longer; the keel is ſhort, ſwelling, and cloſely covers the parts of generation: the nine ſtamina are in three parts, and one ſtands ſeparate; at the bottom is ſituated an oblong compreſſed germen, which afterward becomes a long, compreſſed, leathery pod, having one cell, filled with compreſſed kidney ſhaped ſeeds.

We have four ſorts of beens commonly ſowed in our gardens. 1. The ſmall Liſbon or Maragan. 2. The Spaniſh. 3. The Sandwich. And, 4. The Windſor beans. The firſt and ſecond ſorts are to be planted in October and November, under warm walls and hedges, where, if they ſtand through the winter, they produce beans early in the ſpring. They may alſo be raiſed very cloſe in beds, and covered with hoops and mats in the winter, and in ſpring planted out; but there is ſome hazard in the tranſplanting, and they will be a fortnight or more later than thoſe which have ſtood the winter abroad.

The Liſbon bean is preferred to the Spaniſh: and the curious ought to have freſh ſeed every two years from abroad, for they are apt to degenerate, though not in goodneſs, yet in their earlineſs.

The Spaniſh and Windſor beans are not to be planted till after Chriſtmas; but eſpecially the Windſor, which are ſubject, more than any other kind, to be hurt by the cold. Theſe beans ſhould have an open ground, and be planted at the diſtance of three feet and an half row from row, and five or ſix inches from one another in the rows. The Sandwich beans are hardier than the Windſor, and may be planted to come in between the early crops and them; and though not much regarded at preſent, they are a very good bean.

The firſt plantation of Windſor beans ſhould be made in the middle of January; and after that, a new plantation ſhould be made every three weeks till the middle of May, that there may be a ſucceſſion of crops.

The Toker bean comes about the ſame time with the Sandwich, and is a great bearer; therefore it is now much planted. The white and black bloſſom beans are alſo much eſteemed; but, unleſs their ſeeds are preſerved with care, are apt to degenerate.

There is ſcarce any plant, whoſe ſeed ſo well ſerves the purpoſe of the inquirer into the nature and ſtructure of ſeeds in general, as the bean.

Trials have not long ſince been made in France to raiſe garden beans in open fields, on the principles of the new huſbandry; and the reſult ſufficiently indicated, that with proper care large crops might be raiſed in this way. The medicinal and dietetic qualities of beans are ſaid to be nutritive, but flatulent: the pods yield a water, which is held good againſt the gripes in children. Some have uſed the horſe bean as a ſuccedaneum to coffee; which in principles it much reſembles; only that it contains but half the quantity of oil.

BEAN, in antiquity, denoted both the ſigns of reſpect and diſcredit. In the uſage of both the Greek and Roman commonwealths on gathering the ſuffrages of the people, beans of black and white colours determined the election of magiſtrates. Alſo in giving their verdicts on the trials of criminals, a white bean denoted abſolution, but a black one condemnation.

Horſe **BEANS**. The horſe bean is the only kind propagated by the plough; it delights chiefly in a ſtiff and moiſt clay: three buſhels will ſow an acre, and this is to be done in February. The common produce is about twenty buſhels from an acre. They muſt lie ſome time upon the ground after they are cut, before they are carried in. Some farmers ſow tares and horſe beans together, which is a very good way, for the ſeeds are eaſily ſeparated by a riddle; for by the new huſbandry, leſs than one buſhel of ſeed will plant an acre of land; and the produce has exceeded that of the old by more than ten buſhels an acre.

BEAN, *Bog*, menyanthes, in botany, is a plant common in boggy places, but never cultivated. It is a genus of the pentandria order and monogynia claſs, with a hairy corolla, a bifid ſtigma, and a ſingle celled capſule.

BEAN *Gooſe*, in ornithology, is a ſpecies of Anas.

Kidney **BEAN**, in botany, is a ſpecies of the diadelphia order and decandria claſs, called Phaſeolus.

BEAN *Tree*, binding, mimoſa, is the ſame as the Senſitive plant.

BEAN, *Molucco*, a name given by Sir Robert Sibbald in his Prodromus, and by Mr. Wallace in his deſcription of the Orkney iſlands to a ſort of fruit frequently caſt on the ſhore in the north weſt iſlands of Scotland; eſpecially on the coaſts more expoſed to the waves of the great ocean. Sir Hans Sloane procured four ſpecies of them little injured by the ſea, and found on examination that all of them were the common produce of the iſland of Jamaica.

BEAN *Cod*, in naval language, ſignifies a ſmall fiſhing veſſel or pilot boat, commonly on the ſea coaſts and in the river of Portugal. It is extremely ſharp forward, having its ſtem bent inward above into a great curve. The ſtem is alſo platted on the foreſide with iron, into which a number of bolts are driven to fortify it, and reſiſt the ſtroke of another veſſel, which may fall athwart-hauſe. It is commonly navigated with a large lateen ſail, which extends over the whole length of the deck, and is accordingly well fitted to ply to the windward.

BEAN *Caper*, zygophyllum, or fabago, in botany, is a genus of the decandria order and monogynia claſs. Its characters are theſe: the empalement of the flower is compoſed of five oval obtuſe leaves; the flower has five obtuſe petals, which are longer than the empalement, indented at their points: a cloſed nectarium, which includes the germen, compoſed of ſeveral ſmall leaves, to which the baſes of the ſtamina are faſtened. It has ten awl ſhaped ſtamina, terminated by oblong ſummits and an oblong germen, ſupporting an awl ſhaped ſtyle, crowned by a ſingle ſtigma. The germen becomes an oval five cornered capſule with five cells, containing ſeveral roundiſh ſeeds. There are four ſpecies, neither of which admit of particular deſcription.

BEAN *Fly*, in entomology, is a very beautiful fly, of a pale purp'e colour, frequently found on bean-flowers. It is produced from the worm or maggot called mida.

BEAN, in anatomy, denotes the glans of the penis, on account of its figure and reſemblance to that pulſe.

BEAR, in tetrapodology, is a genus of animals called urſus.

BEAR's *Fleſh* was much eſteemed by the ancient: even at this day, the haunches are cured in the ſame manner as thoſe of hogs for hams, and great numbers imported into England.

BEAR's *Greaſe* was formerly eſteemed a ſovereign remedy againſt cold diſorders, eſpecially rheumatiſms. It is alſo uſed as a preventative againſt baldneſs and a decay of hair; but its efficacy is merely ideal, as any common greaſe to moiſten the hair will anſwer the ſame intention.

BEAR's *Skin* makes a fur in great eſteem, and is converted to various uſes.

Order of the **BEAR**, was a military order in Switzerland, erected by the emperor Frederic II. in 1213, by way of acknowledgment for the ſervice the Switzers had done him, and in favour of the abbey of St. Gal. To the collar of the order hung a medal, on which was repreſented a bear raiſed on an eminence of earth.

BEAR, or **BERE**, in botany, is a variety of barley cultivated in Scotland and Ireland, and the Northern parts of England. It yields a large return, but is not eſteemed ſo good for malting as the common barley.

BEAR's *Breech*, in botany, is the ſame as Acanthus.

BEAR, in aſtronomy, a name given to two conſtellations called the greater and the leſſer bear; or Urſa major and minor.

BEARD, in natural hiſtory, ſignifies the hair that grows on the chin, and adjacent parts of the face, of male adults.

Various are the ceremonies and cuſtoms the beard has been liable to. The Tartars, out of a religious principle, waged a long war with the Perſians, and declared them Infidels, though in other reſpects, of the ſame faith with themſelves, merely becauſe they would not cut their whiſkers after the mode or rite of the Tartars.

The Greeks wore their beards till the time of Alexander the Great, who commanded the Macedonians to be ſhaven, leſt the length of their beards ſhould give a handle to their enemies. According to Pliny the Romans did not begin to ſhave till the year of Rome 454, when P. Ticinius brought over a ſtock of barbers from Sicily; he adds, that Scipio Africanus was the firſt who introduced the mode of ſhaving every day.

To let the beard grow is a token of mourning among the Jews, and to ſhave it, is ſo in ſome parts of the Eaſt Indies.

Among the Turks, it is more infamous for any one to have his beard cut off, than among us to be publicly whipt, or branded with a hot iron. They who ſerve in the ſeraglio have their beards ſhaven as a token of ſervitude; and when they are ſet at liberty, they permit it to grow. With them and the Perſians, the beard is a mark of authority and liberty. There are many in that country who would prefer death to this kind of puniſhment. The Arabs make the preſervation of the beard a capital article of religion, becauſe Mahomet never cut his. The Jews wear a beard on their chin, but not on the upper lip or cheeks.

Anointing the Beard, with unguents, is an ancient practice both among the Jews and Romans, and ſtill continues in uſe among the Turks.

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The bearings of places on the ground are uſually determined from the magnetic needle: in the managing of theſe lies the principal part of ſurveying; ſince the bearing and diſtance of a ſecond point from the firſt being found, the place of that ſecond is determined; or the bearings of a third point from two others, whoſe diſtance from each other is known, being found, the place of the third is determined: inſtrumentally we mean; for to calculate trignometrically, there muſt be more data.

Bearing, in the ſea language, is when a ſhip ſails towards the ſhore, ſhe is ſaid to bear in with the land. When a ſhip that was to windward comes under another ſhip's ſtern, and ſo gives her the wind, ſhe is ſaid to bear under her lee. If a ſhip ſails into a harbour with the wind ſtrong, or before the wind, ſhe is ſaid to bear in with the harbour. To let the ſhip ſail more before the wind is to bear up. To put her right before the wind is to bear round. A ſhip that keeps off from the land is ſaid to bear off.

Bearing, in carpentry, denotes the ſpace between one extreme or end of a piece of timber, and a poſt, brick, wall, or the like, trimmed up between the ends to ſhorten its bearing.

Bearing *of an Arch or Vault*, denotes the effort which the ſtones make to burſt open the piers, or piedroits.

Bearing *of an Organ Pipe*, in acouſtics and muſic, denotes an error or variation from the juſt ſound it ought to yield.

Bearing *down of the Matrix*, is a diſorder in pregnant women, being a ſenſation of a weight at the bottom of the abdomen, or preſſure on the neck of the womb, ſo as to hinder the perſon from walking without pain; and ſometimes occaſioning difficulty of urine, numbneſs of the lips, uneaſineſs in going to ſtool, and in the end abortion.

Bearing *Claws*, among cock-fighters, denote the foremoſt toes, on which the bird goes; and if they be hurt or gravelled, he cannot fight.

Bearing *of a Stag*, ſignifies the ſtate of his head, or the croches which he bears on his horns.

BEAST, in a general ſenſe, is an appellation given to all four footed animals.

Beasts *of Chaſe*, in our ſtatute books, are five, viz. the buck, doe, fox, martin, and roe.

Beasts *of the Foreſt*, are five alſo, viz. the hart, hind, hare, boar, and wolf.

Beasts *and Fowls of the Warren*, are four, viz. the hare, coney, pheaſant, and partridge.

BEAT, in fencing, denotes a blow or ſtroke given with the ſword. See Treatiſe on the Art of Fencing.

Beat, in the menage, is when a horſe beats the duſt, at each ſtroke or motion, and does not take in ground or way enough with his fore legs.

Beat *of the Drum*, in the military art, is differently performed, according to the purpoſes deſigned. By it notice is given of any ſudden change; ſoldiers are ſummoned to repair to their arms and quarters; and the various movements before and after, and during the engagement, are denoted by different beats of the drum.

The chief beats or beatings on the drum are, the general, the aſſembly, the march, the reveille, and the retreat.

Gold BEATERS, are artiſans, who, by beating gold and ſilver with a hammer on a marble, in moulds of vellum and bullocks guts, reduce them to thin leaves fit for gilding, or ſilvering of copper, iron, ſteel, wood, &c.

Tin Beaters, are artiſans employed in the looking glaſs trade, whoſe buſineſs is to beat tin on large blocks of marble, till it be reduced to thin leaves, fit to be applied with quickſilver behind looking glaſſes.

BEATIFICATION, in the Romiſh church, is the act by which the pope delares a perſon happy, after death.

BEATING, among ſportſmen, denotes the noiſe which hares and deer make in rutting time.

Beating, *Pulſation*, in medicine, is applied to the reciprocal agitation or palpitation of the heart and pulſe.

Beating *Flax*, or *Hemp*, is an operation in the dreſſing of theſe matters, contrived to render them more ſoft and pliant.

Beating, in book binding, denotes the knocking a book in quires on a block, with a heavy broad faced hammer, after folding, and before binding or ſtitching it. On the beating it properly, the elegance and excellence of the binding, and the eaſy opening of the book, principally depends.

Beating, in the paper works, ſignifies the beating of paper on a ſtone with a heavy hammer, with a large, ſmooth head, and ſhort handle, in order to render it more ſmooth and uniform, and fit for writing.

Beating *Time*, in muſic, is a method of meaſuring and marking the time for performers in concert, by a motion of the hand or foot up and down ſucceſſively, and in equal times.

Beating, in navigation, is the operation of making a progreſs at ſea againſt the wind, in a ziggag line or traverſe.

Beating *in the Flanks*, is a diſtemper to which black cattle are ſubject, and is an indication of a great inflammation in the bowels.

Beating, in huſbandry, ſignifies burning of plowed land.

BEATITUDE, imports the ſupreme good, or the higheſt degree of happineſs human nature is ſuſceptible of; or the moſt perfect ſtate of a rational being.

BEATS, in a watch or clock, are the ſtrokes made by the fangs or pallets of the ſpindle of the balance; or of the pads in a royal pendulum.

BEAVER, in tetrapodology, is the ſame as Caſtor.

Beaver *Skins*, in commerce, are very valuable articles, and diſtinguiſhed by merchants into three ſorts, viz. the new, the dry, and the fat.

The new caſtor, called alſo winter caſtor, and Muſcovite caſtor, becauſe ordinarily reſerved to ſend itno Muſcovy, is that taken in the winter huntings, and moſt eſteemed for rich furs, as having loſt none of its hair by moulting.

Dry caſtor, or lean caſtor, is the reſult of the ſummer huntings; when the beaſt is moulted, and has loſt part of its hair; this being much inferior to the former, is little uſed in furs, but moſtly in hats.

The fat caſtor, uſually called old coat, or coat beaver, is that which has contracted a certain fat, unctuous humour, by ſweat exhaled from the bodies of the ſavages, who have wore it for ſome time; this, though better than the dry, is uſed only for hats.

When the hair is cut off the ſkin to be uſed in hats, the pelt or ſkin itſelf is uſed for various purpoſes, ſuch as covering of trunks, in ſlippers, &c. The ſkins are chiefly imported by the Hudſon's-bay company, from the Northern parts of America; where the animal abounds.

BEAUFET, Buffet, or Bufet, was anciently a little apartment ſeparated from the reſt of a room by ſlender wooden columns, for china and glaſs, called alſo a cabinet.

It is now, properly, a large table in a dining room, called alſo a ſide-board, for the plate, glaſſes, bottles, and baſons, to be placed, as well for the ſervice of the table as for magnificence.

BEAUTY, with reſpect to perſon, implies a juſt and true proportion of the various parts which conſtitute the human frame. In architecture, painting, and other polite arts, it denotes the harmony and juſtneſs of the whole compoſition.

BECAH, or Bekah, a Jewiſh coin, being half a ſhekel. In Dr. Arbuthnot's table of reductions, the bekah amounts to $13\frac{11}{16}$d. in Dr. Prideaux's computation to 1s. 6d. Every Iſraelite paid an hundred bekahs annually, for the ſupport of the temple.

BECALMING, in the ſea language, is when any thing keeps the wind off or away from the veſſel, or when there is no wind ſtirring.

BECASSINE, in ichthyology is a name given by many to the tringa minor, or, as we commonly call it, the ſand piper.

BECCA, in the materia medica of the ancients, was a name given to a fine kind of reſin collected from the turpentine and maſtich-trees of Greece and Syria, and mixed together for uſe. It was much eſteemed formerly, and not only uſed in the country where it was produced, but carried in great quantities to Mecca, and other parts of the Turkiſh dominions, where it was valued at a very great rate.

BECCIFAGO, in ornithology, is the name of a ſmall bird, ſcarce ſo large as the common linnet, and with a very remarkable ſhort body. Its head, neck, back, wings, and tail, are of a greeniſh grey, and in ſome of the birds of a greeniſh brown. It feeds on vegetables, berries, &c. and is common in the North of England, where it is called the pettychaps.

BECHICS, Bechica, ſignify medicines proper for relieving coughs.

BECKETS, in the marine, ſignify large hooks, or circular wreaths of rope, or wooden brackets, uſed to confine ropes, tackles, oars, or ſpars, in a convenient place, till they are wanted.

And to put the tacks and ſheets in the beckets, is to hang up the weather main and fore ſheet, and the lee main and fore tack, to a little knot and eye becket on the fore maſt, main, and fore ſhrouds, when the ſhip is cloſe hauled, to prevent them from hanging in the water.

BED, is a place prepared to ſtretch and compoſe the body on, for reſt and ſleep; made chiefly of feathers incloſed in a ticken caſe. In gardening, a piece of made ground enriched with dung, &c. for raiſing plants and other vegetables; the channel of a river. In natural hiſtory, a range or layer of earth, or mineral ſubſtance; a ſtratum. In gunnery, a ſolid piece of each hollowed in the middle, to receive the breech and half the trunnions.

Bed *of Juſtice, lit de Juſtice*, in the French laws, denotes a throne whereon the king is ſeated in parliament. In this ſenſe, the king is ſaid to hold his *lit de Juſtice*, when he goes to the parliament of Paris, and holds a ſolemn ſeſſion, under a high canopy erected for the purpoſe. The *Bed of Juſtice* is only held on affairs relating to the ſtate; on which occaſion, all the officers of the parliament appear in red robes; at other times they wear black ones.

Bed *Algenſe*, a name given by the Arab aſtronomers to a fixed ſtar of the firſt magnitude in the right ſhoulder of Orion. It is of a ruddy colour, by which it is eaſily diſtinguiſhed.

BEDAUBE, in natural hiſtory, is a name given by French authors to a ſort of prickly caterpillar found on the elm.

BED CHAMBER, lords or gentleman of the bed chamber, are perſons of the firſt rank, ten in number, who attend in their turns, each one week in the king's bed chamber, lying by the king on a pallet bed all night, and waiting on him when he eats in private. The firſt of theſe is called Groom of the Stole.

BEDDING, *Lectoria*, in reſpect to horſes and other cattle, denotes ſtraw or litter ſpread under them to lie on. In ſpeaking of a roe, it is uſed by ſportſmen, for the lodging of that beaſt. A roe is ſaid to bed, a hart to harbour; a fox to kennel.

BEDENGIAN, in botany, is the trivial, though popular name of the poma amoris, or love apple.

BED MOULDING, or Bedding Moulding, in architecture, is a term uſed by the workmen of thoſe members in a corniche, which are placed below the coronet. A bed moulding uſually conſiſts of theſe four members, an ogee, a liſt, a large outline, and another liſt under the coronet.

BEDOUINS, or Bedouis, are the people commonly called Arabs. In the empire of Turkey, the whole nation of the Arabians, whether ſituated in Aſia or Africa, are only known by this name, which is by interpretation, *the men of the ſun*; alluding to the tawny colour of their complexion.

BEDYTA, in commerce, is the American phraſe for Indian corn; by which name all the tribes, from north to ſouth, of the whole Continent, call that ſort of grain.

BEDOTA, in natural hiſtory, is the down of the bogmint, frequently gathered as a ſubſtitute for feathers, and when well dried and beaten, it is ſaid to be equal to ſwan down, for ſoftneſs and durability. Contiguous to the lake of Salerno, in Italy, and alſo to that of Geneva, the natives gather it annually, and diſpoſe of it when prepared as an article of valuable conſideration.

BEE, in entomology, is a genus of a winged favificous inſect, bred from maggots that are apoda, belonging to the order of hymenoptera, comprehending 55 ſpecies, of which there are 248 varities. In the claſſification of this work, the Bee comes under Apis, according to which the definition is given; and under that article the peculiarities of this induſtrious inſect are enumerated.

Bee is a figurative expreſſion to denote induſtry in literary compoſition. Thus Zenophon is called the attic bee, on account of the ſweetneſs and elegance of his ſtile. Antonius, the induſtrious bee, on account of his laboured performance, in collecting and ſelecting the common places or heads of univerſal hiſtory.

Bee Eater, in ornithology, ſignifies the merops.

Bee Flower, in botany, ſignifies the ophrys.

Bee Glue, was called by the ancients propolis, is a ſoft unctuous, glutinous matter, employed by the bees to cement the combs to the hives, and to cloſe up the cells when quite full.

BEECH Tree, in botany, is deſcribed under the article Fagus.

BEEF, in commerce, ſignifies the fleſh of black cattle, prepared for food. Dr. William Cullen, in his lectures on the Materia Medica, ſays, "That beef, though of a ſtronger texture, and leſs ſoluble than mutton, yet is equally alcaleſcent, perſpirable and nutritious." Therefore we may pronounce it good food.

BEELE, or Tubber, in mining, denotes an inſtrument ſomewhat reſembling a pick-ax, to enable the miners to collect and pick out the oar from the rocks

The Corniſh miners are diſtinguiſhed into two claſſes, namely, Beelmen and Shovelers: ſo denominated from the inſtruments they uſe. Phil. Tranſ. N° 69, p. 2104.

BEEMEN, in aſtronomy, ſignify the ſeven ſtars which follow each other in the fourth flexure of the conſtellation Eridanus. They are very bright and ſparkling, and of the fourth magnitude.

BEEMORASI, in natural hiſtory, denote the third kingdom of nature, uſually called foſſilogy; in alluſion to Beemoras a Cyrophenician, who was the firſt author that profeſſedly wrote upon the ſubject of inanimate nature. According to Bergman, this ſyſtem has never been new modelled from the text of Beemoras; but additions and amendments have occaſionally taken place, as beſt ſuited the diſpoſition of authors.

BEEMUS, in the materia medica, ſignifies the reduced ſubſtance of liquids, ſo as to be anſwerable to the ſtrength of the patient; which, for the moſt part, are brought to ſuch a conſiſtence by acrimonious juices: thus milk is reduced by vinegar to whey, and of courſe poorer in its diminiſhed ſtate; therefore leſs liable to clog the ſtomach of a ſick perſon.

BEER is a common drink, prepared from malt and hops. It is a ſpirituous liquor, prepared from any farinaceous grain, but generally from barley. The meal being extracted by a ſufficient quantity of water, and remaining at reſt in a degree of heat requiſite for the ſpirituous fermentation, is ſoon changed into a vinous liquor. This extract is ſufficiently evaporated by boiling and hopping, after which it is caſked and allowed to ferment until it is quite cleanſed. For the Engliſh method, which is univerſally allowed to be the beſt, ſee the Treatiſe on the Art of Brewing.

BEESTINGS ſignify the firſt milk in the elder or udder of a cow, after calving. It is of a thick conſiſtence, and very yellow, and taſtes as though it was impregnated with ſulphur. If taken raw, it is of a ſtrong purgative nature; but when boiled, it yields a very hard curd, and a light thin whey.

BEET Fly, in entomology, ſignifies the ſmall fly which inhabits the ſtems of the beta.

BEETLE, in entomology, is deſcribed under the article Scarabæus.

BEETLE, in mechanics, ſignifies a piece of wood, either curved, conic, or ſtraight, uſed by bleachers, whitſters, wool ſorters, or paviors, either to beat with the ſide, or the thicker end.

BEEVES, denote a general name for oxen, or other fatted black cattle.

BEG, or Bey, denotes a Turkiſh title, equivalent to that of lord. In Egypt, the Ottoman Porte, deputes twelve beys or begs to command the national militia, in order to ſecure the country from the inroads of the Arabs, as well as to protect pilgrims in their annual expeditions to Mecca.

BEGLERBEG, in the Turkiſh polity, is a governor of one of the principal governments in the empire, and next in dignity to the grand vizir. To every beglerbeg the grand ſignior gives three enſigns or ſtaves, trimmed with an horſe tail, to diſtinguiſh them from the baſhaws, who have but two, and from ſimple begs, who have but one.

The title beglerbeg ſignifies lord of lords, which is well ſuited to the ignorance and arrogance of muſſulmen.

BEGUARDS, or Beghards, a denomination given to a religious order of Saint Francis. They were eſtabliſhed, A. D. 1228, and took Begghe for their patroneſs, whence they had their name.

BEGUINES, were a congregation of devout nuns, founded on the principle of the beguards, and had the ſame patroneſs. They took their riſe in the 12th century, and ſtill continue in ſeveral parts of the Low Countries.

BEHEADING, implies a capital puniſhment, by decolating or cutting off the head from the trunk of the body.

Among the Romans, it was a military puniſhment performed with an ax; and is ſtill retained in England and Ireland. In France, Germany, and the United Netherlands, it is performed with a ſword. In Scotland they uſe a machine, called a maiden, to perform this office when neceſſary.

BEHEMOTH, in the Scripture language, ſignifies the hippopotome, or river horſe.

BEIZA, or Beizath, in the Jewiſh antiquity, ſignifies an egg. The beiza was likewiſe a gold coin, weighing 40 drachms. By this mode of recoming, the Jews gave dowries to their daughters.

BEL and the Dragon, in Scripture, denotes an apocryphal uncanonical book, which was rejected by the Jewiſh church, and is neither extant in the Hebrew nor the Chaldee language, nor is there any proof that it ever was ſo. St. Jerome reputes it a moral fable.

BELEMITES, in natural hiſtory, vulgarly called thunderbolts or thunderſtones. They are compoſed of ſeveral cruſts encircling each other, of a canonical form, and various ſizes; uſually a little hollow, and ſomewhat tranſparent, formed of ſeveral ſtriæ, radiating from the axis to the ſurface of the ſtone. Their ſize is various, from a quarter of an inch to eight inches, and their colour and ſhape differ.

BELFRY, in architecture, ſignifies that part of the ſteeple of a church, where bells are hung; or the timber frame by which they are ſupported.

Anointing the BEARD, with unguents, is an ancient practice both among the Jews and Romans, and ſtill continues in uſe among the Turks.

BEARD *of a Muſcle*, oyſters, or the like, is a flat ſpongy ſubſtance, at the extremity of the animal, which being applied to the ſurface of a ſtone, ſticks to it like the wet leather ſuckers uſed by boys.

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BEARING, in a general ſenſe, in blazonry, ſignifies the whole coat of arms of a nobleman, whoſe ſupporters are covered with a diſtinguiſhing mark of a coronet. Hence the uſe of armorial bearings, to ſhew precedence in rank.

BEARING, in geography, and navigation, denotes the ſituation of one place from another, with regard to the points of the compaſs; or the angle which a line drawn through the two places makes with the meridians of each: the bearing from one to the other is diſcovered by the following analogy, as the meridinal difference of latitude is to the difference of longitude; ſo is the radius to the tangent bearing.

The bearings of places on the ground are uſually determined from the magnetic needle: in the managing of theſe lies the principal part of ſurveying; ſince the bearing and diſtance of a ſecond point from the firſt being found, the place of that ſecond is determined; or the bearings of a third point from two others, whoſe diſtance from each other is known, being found, the place of the third is determined: inſtrumentally we mean; for to calculate trignometrically, there muſt be more data.

BEARING, in the ſea language, is when a ſhip ſails towards the ſhore, ſhe is ſaid to bear in with the land. When a ſhip that was to windward comes under another ſhip's ſtern, and ſo gives her the wind, ſhe is ſaid to bear under her lee. If a ſhip ſails into a harbour with the wind ſtrong, or before the wind, ſhe is ſaid to bear in with the harbour. To let the ſhip ſail more before the wind is to bear up. To put her right before the wind is to bear round. A ſhip that keeps off from the land is ſaid to bear off.

BEARING, in carpentry, denotes the ſpace between one extreme or end of a piece of timber, and a poſt, brick, wall, or the like, trimmed up between the ends to ſhorten its bearing.

BEARING *of an Arch or Vault*, denotes the effort which the ſtones make to burſt open the piers, or piedroits.

BEARING *of an Organ Pipe*, in acouſtics and muſic, denotes an error or variation from the juſt ſound it ought to yield.

BEARING *down of the Matrix*, is a diſorder in pregnant women, being a ſenſation of a weight at the bottom of the abdomen, or preſſure on the neck of the womb, ſo as to hinder the perſon from walking without pain; and ſometimes occaſioning difficulty of urine, numbneſs of the lips, uneaſineſs in going to ſtool, and in the end abortion.

BEARING *Claws*, among cock-fighters, denote the foremoſt toes, on which the bird goes; and if they be hurt or gravelled, he cannot fight.

BEARING *of a Stag*, ſignifies the ſtate of his head, or the croches which he bears on his horns.

BEAST, in a general ſenſe, is an appellation given to all four footed animals.

BEASTS *of Chaſe*, in our ſtatute books, are five, viz. the buck, doe, fox, martin, and roe.

BEASTS *of the Foreſt*, are five alſo, viz. the hart, hind, hare, boar, and wolf.

BEASTS *and Fowls of the Warren*, are four, viz. the hare, coney, pheaſant, and partridge.

BEAT, in fencing, denotes a blow or ſtroke given with the ſword. See Treatiſe on the Art of FENCING.

BEAT, in the menage, is when a horſe beats the duſt, at each ſtroke or motion, and does not take in ground or way enough with his fore legs.

BEAT *of the Drum*, in the military art, is differently performed, according to the purpoſes deſigned. By it notice is given of any ſudden change; ſoldiers are ſummoned to repair to their arms and quarters; and the various movements before and after, and during the engagement, are denoted by different beats of the drum.

The chief beats or beatings on the drum are, the general, the aſſembly, the march, the reveille, and the retreat.

Gold BEATERS, are artiſans, who, by beating gold and ſilver with a hammer on a marble, in moulds of vellum and bullocks guts, reduce them to thin leaves fit for gilding, or ſilvering of copper, iron, ſteel, wood, &c.

Tin BEATERS, are artiſans employed in the looking glaſs trade, whoſe buſineſs is to beat tin on large blocks of marble, till it be reduced to thin leaves, fit to be applied with quickſilver behind looking glaſſes.

BEATIFICATION, in the Romiſh church, is the act by which the pope delares a perſon happy, after death.

BEATING, among ſportſmen, denotes the noiſe which hares and deer make in rutting time.

BEATING, *Pulſation*, in medicine, is applied to the reciprocal agitation or palpitation of the heart and pulſe.

BEATING *Flax*, or *Hemp*, is an operation in the dreſſing of theſe matters, contrived to render them more ſoft and pliant.

BEATING, in book binding, denotes the knocking a book in quires on a block, with a heavy broad faced hammer, after folding, and before binding or ſtitching it. On the beating it properly, the elegance and excellence of the binding, and the eaſy opening of the book, principally depends.

BEATING, in the paper works, ſignifies the beating of paper on a ſtone with a heavy hammer, with a large, ſmooth head, and ſhort handle, in order to render it more ſmooth and uniform, and fit for writing.

BEATING *Time*, in muſic, is a method of meaſuring and marking the time for performers in concert, by a motion of the hand or foot up and down ſucceſſively, and in equal times.

BEATING, in navigation, is the operation of making a progreſs at ſea againſt the wind, in a ziggag line or traverſe.

BEATING *in the Flanks*, is a diſtemper to which black cattle are ſubject, and is an indication of a great inflammation in the bowels.

BEATING, in huſbandry, ſignifies burning of plowed land.

BEATITUDE, imports the ſupreme good, or the higheſt degree of happineſs human nature is ſuſceptible of; or the moſt perfect ſtate of a rational being.

BEATS, in a watch or clock, are the ſtrokes made by the fangs or pallets of the ſpindle of the balance; or of the pads in a royal pendulum.

BEAVER, in tetrapodology, is the ſame as Caſtor.

BEAVER *Skins*, in commerce, are very valuable articles, and diſtinguiſhed by merchants into three ſorts, viz. the new, the dry, and the fat.

The new caſtor, called alſo winter caſtor, and Muſcovite caſtor, becauſe ordinarily reſerved to ſend itno Muſcovy, is that taken in the winter huntings, and moſt eſteemed for rich furs, as having loſt none of its hair by moulting.

Dry caſtor, or lean caſtor, is the reſult of the ſummer huntings; when the beaſt is moulted, and has loſt part of its hair; this being much inferior to the former, is little uſed in furs, but moſtly in hats.

The fat caſtor, uſually called old coat, or coat beaver, is that which has contracted a certain fat, unctuous humour, by ſweat exhaled from the bodies of the ſavages, who have wore it for ſome time; this, though better than the dry, is uſed only for hats.

When the hair is cut off the ſkin to be uſed in hats, the pelt or ſkin itſelf is uſed for various purpoſes, ſuch as covering of trunks, in ſlippers, &c. The ſkins are chiefly imported by the Hudſon's-bay company, from the Northern parts of America; where the animal abounds.

BEAUFET, BUEFET, or BUFET, was anciently a little apartment ſeparated from the reſt of a room by ſlender wooden columns, for china and glaſs, called alſo a cabinet.

It is now, properly, a large table in a dining room, called alſo a ſide-board, for the plate, glaſſes, bottles, and baſons, to be placed, as well for the ſervice of the table as for magnificence.

BEAUTY, with reſpect to perſon, implies a juſt and true proportion of the various parts which conſtitute the human frame. In architecture, painting, and other polite arts, it denotes the harmony and juſtneſs of the whole compoſition.

BECAH, or BEKAH, a Jewiſh coin, being half a ſhekel. In Dr. Arbuthnot's table of reductions, the bekah amounts to $13\frac{11}{11}$d. in Dr. Prideaux's computation to 1s. 6d. Every Iſraelite paid an hundred bekahs annually, for the ſupport of the temple.

BECALMING, in the ſea language, is when any thing keeps the wind off or away from the veſſel, or when there is no wind ſtirring.

BECASSINE, in ichthyology is a name given by many to the tringa minor, or, as we commonly call it, the ſand piper.

BECCA, in the materia medica of the ancients, was a name given to a fine kind of reſin collected from the turpentine and maſtich-trees of Greece and Syria, and mixed together for uſe. It was much eſteemed formerly, and not only uſed in the country where it was produced, but carried in great quantities to Mecca, and other parts of the Turkiſh dominions, where it was valued at a very great rate.

BECCIFAGO, in ornithology, is the name of a ſmall bird, ſcarce ſo large as the common linnet, and with a very remarkable ſhort body. Its head, neck, back, wings, and tail, are of a greeniſh grey, and in ſome of the birds of a greeniſh brown. It feeds on vegetables, berries, &c. and is common in the North of England, where it is called the pettychaps.

BECHICS, Bechica, ſignify medicines proper for relieving coughs.

BECKETS, in the marine, ſignify large hooks, or circular wreaths of rope, or wooden brackets, uſed to confine ropes, tackles, oars, or ſpars, in a convenient place, till they are wanted.

And to put the tacks and ſheets in the beckets, is to hang up the weather main and fore ſheet, and the lee main and fore tack, to a little knot and eye becket on the fore maſt, main, and fore ſhrouds, when the ſhip is cloſe hauled, to prevent them from hanging in the water.

BED, is a place prepared to ſtretch and compoſe the body on, for reſt and ſleep; made chiefly of feathers incloſed in a ticken caſe. In gardening, a piece of made ground enriched with dung, &c. for raiſing plants and other vegetables; the channel of a river. In natural hiſtory, a range or layer of earth, or mineral ſubſtance; a ſtratum. In gunnery, a ſolid piece of each hollowed in the middle, to receive the breech and half the trunnions.

Bed *of Juſtice*, *lit de Juſtice*, in the French laws, denotes a throne whereon the king is ſeated in parliament. In this ſenſe, the king is ſaid to hold his *lit de Juſtice*, when he goes to the parliament of Paris, and holds a ſolemn ſeſſion, under a high canopy erected for the purpoſe. The *Bed of Juſtice* is only held on affairs relating to the ſtate; on which occaſion, all the officers of the parliament appear in red robes; at other times they wear black ones.

Bed *Algenſe*, a name given by the Arab aſtronomers to a fixed ſtar of the firſt magnitude in the right ſhoulder of Orion. It is of a ruddy colour, by which it is eaſily diſtinguiſhed.

BEDAUBE, in natural hiſtory, is a name given by French authors to a ſort of prickly caterpillar found on the elm.

BED CHAMBER, lords or gentleman of the bed chamber, are perſons of the firſt rank, ten in number, who attend in their turns, each one week in the king's bed chamber, lying by the king on a pallet bed all night, and waiting on him when he eats in private. The firſt of theſe is called Groom of the Stole.

BEDDING, *Lectoria*, in reſpect to horſes and other cattle, denotes ſtraw or litter ſpread under them to lie on. In ſpeaking of a roe, it is uſed by ſportſmen, for the lodging of that beaſt. A roe is ſaid to bed, a hart to harbour; a fox to kennel.

BEDENGIAN, in botany, is the trivial, though popular name of the poma amoris, or love apple.

BED MOULDING, or Bedding Moulding, in architecture, is a term uſed by the workmen of thoſe members in a corniche, which are placed below the coronet. A bed moulding uſually conſiſts of theſe four members, an ogee, a liſt, a large outline, and another liſt under the coronet.

BEDOUINS, or Bedouis, are the people commonly called Arabs. In the empire of Turkey, the whole nation of the Arabians, whether ſituated in Aſia or Africa, are only known by this name, which is by interpretation, *the men of the ſun*; alluding to the tawny colour of their complexion.

BEDYTA, in commerce, is the American phraſe for Indian corn; by which name all the tribes, from north to ſouth, of the whole Continent, call that ſort of grain.

BEDOTA, in natural hiſtory, is the down of the bogmint, frequently gathered as a ſubſtitute for feathers, and when well dried and beaten, it is ſaid to be equal to ſwan down, for ſoftneſs and durability. Contiguous to the lake of Salerno, in Italy, and alſo to that of Geneva, the natives gather it annually, and diſpoſe of it when prepared as an article of valuable conſideration.

BEE, in entomology, is a genus of a winged ſavificous inſect, bred from maggots that are apoda, belonging to the order of hymenoptera, comprehending 55 ſpecies, of which there are 248 varities. In the claſſification of this work, the Bee comes under Apis, according to which the definition is given; and under that article the peculiarities of this induſtrious inſect are enumerated.

Bee is a figurative expreſſion to denote induſtry in literary compoſition. Thus Zenophon is called the attic bee, on account of the ſweetneſs and elegance of his ſtile. Antonius, the induſtrious bee, on account of his laboured performance, in collecting and ſelecting the common places or heads of univerſal hiſtory.

Bee Eater, in ornithology, ſignifies the merops.

Bee Flower, in botany, ſignifies the ophrys.

Bee Glue, was called by the ancients propolis, is a ſoft unctuous, glutinous matter, employed by the bees to cement the combs to the hives, and to cloſe up the cells when quite full.

BEECH Tree, in botany, is deſcribed under the article Fagus.

BEEF, in commerce, ſignifies the fleſh of black cattle, prepared for food. Dr. William Cullen, in his lectures on the Materia Medica, ſays, "That beef, though of a ſtronger texture, and leſs ſoluble than mutton, yet is equally alcaleſcent, perſpirable and nutritious." Therefore we may pronounce it good food.

BEELE, or Tubber, in mining, denotes an inſtrument ſomewhat reſembling a pick-ax, to enable the miners to collect and pick out the oar from the rocks

The Corniſh miners are diſtinguiſhed into two claſſes, namely, Beelmen and Shovelers: ſo denominated from the inſtruments they uſe. Phil. Tranſ. N° 69, p. 2104.

BEEMEN, in aſtronomy, ſignify the ſeven ſtars which follow each other in the fourth flexure of the conſtellation Eridanus. They are very bright and ſparkling, and of the fourth magnitude.

BEEMORASI, in natural hiſtory, denote the third kingdom of natnre, uſually called foſſilogy; in alluſion to Beemoras a Cyrophenician, who was the firſt author that profeſſedly wrote upon the ſubject of inanimate nature. According to Bergman, this ſyſtem has never been new modelled from the text of Beemoras; but additions and amendments have occaſionally taken place, as beſt ſuited the diſpoſition of authors.

BEEMUS, in the materia medica, ſignifies the reduced ſubſtance of liquids, ſo as to be anſwerable to the ſtrength of the patient; which, for the moſt part, are brought to ſuch a conſiſtence by acrimonious juices: thus milk is reduced by vinegar to whey, and of courſe poorer in its diminiſhed ſtate; therefore leſs liable to clog the ſtomach of a ſick perſon.

BEER is a common drink, prepared from malt and hops. It is a ſpirituous liquor, prepared from any farinaceous grain, but generally from barley. The meal being extracted by a ſufficient quantity of water, and remaining at reſt in a degree of heat requiſite for the ſpirituous fermentation, is ſoon changed into a vinous liquor. This extract is ſufficiently evaporated by boiling and hopping, after which it is caſked and allowed to ferment until it is quite cleanſed. For the Engliſh method, which is univerſally allowed to be the beſt, ſee the Treatiſe on the Art of Brewing.

BEESTINGS ſignify the firſt milk in the elder or udder of a cow, after calving. It is of a thick conſiſtence, and very yellow, and taſtes as though it was impregnated with ſulphur. If taken raw, it is of a ſtrong purgative nature; but when boiled, it yields a very hard curd, and a light thin whey.

BEET Fly, in entomology, ſignifies the ſmall fly which inhabits the ſtems of the beta.

BEETLE, in entomology, is deſcribed under the article Scarabæus.

BEETLE, in mechanics, ſignifies a piece of wood, either curved, conic, or ſtraight, uſed by bleachers, whitſters, wool ſorters, or paviors, either to beat with the ſide, or the thicker end.

BEEVES, denote a general name for oxen, or other fatted black cattle.

BEG, or Bey, denotes a Turkiſh title, equivalent to that of lord. In Egypt, the Ottoman Porte, deputes twelve beys or begs to command the national militia, in order to ſecure the country from the inroads of the Arabs, as well as to protect pilgrims in their annual expeditions to Mecca.

BEGLERBEG, in the Turkiſh polity, is a governor of one of the principal governments in the empire, and next in dignity to the grand vizir. To every beglerbeg the grand ſignior gives three enſigns or ſtaves, trimmed with an horſe tail, to diſtinguiſh them from the baſhaws, who have but two, and from ſimple begs, who have but one.

The title beglerbeg ſignifies lord of lords, which is well ſuited to the ignorance and arrogance of muſſulmen.

BEGUARDS, or Beghards, a denomination given to a religious order of Saint Francis. They were eſtabliſhed, A. D. 1228, and took Begghe for their patroneſs, whence they had their name.

BEGUINES, were a congregation of devout nuns, founded on the principle of the beguards, and had the ſame patroneſs. They took their riſe in the 12th century, and ſtill continue in ſeveral parts of the Low Countries.

BEHEADING, implies a capital puniſhment, by decolating or cutting off the head from the trunk of the body.

Among the Romans, it was a military puniſhment performed with an ax; and is ſtill retained in England and Ireland. In France, Germany, and the United Netherlands, it is performed with a ſword. In Scotland they uſe a machine, called a maiden, to perform this office when neceſſary.

BEHEMOTH, in the Scripture language, ſignifies the hippopotomé, or river horſe.

BEIZA, or Beizath, in the Jewiſh antiquity, ſignifies an egg. The beiza was likewiſe a gold coin, weighing 40 drachms. By this mode of recoming, the Jews gave dowries to their daughters.

BEL and the Dragon, in Scripture, denotes an apocryphal uncanonical book, which was rejected by the Jewiſh church, and is neither extant in the Hebrew nor the Chaldee language, nor is there any proof that it ever was ſo. St. Jerome reputes it a moral fable.

BELEMITES, in natural hiſtory, vulgarly called thunderbolts or thunderſtones. They are compoſed of ſeveral cruſts encircling each other, of a canonical form, and various ſizes; uſually a little hollow, and ſomewhat tranſparent, formed of ſeveral ſtriæ, radiating from the axis to the ſurface of the ſtone. Their ſize is various, from a quarter of an inch to eight inches, and their colour and ſhape differ.

BELFRY, in architecture, ſignifies that part of the ſteeple of a church, where bells are hung; or the timber frame by which they are ſupported.

BELIEF, ſignifies the aſſent of the mind to the truth of any propoſition.

BELL, is a well known machine, ranked by muſicians among the muſical inſtruments of percuſſion.

The conſtituent parts of a bell are the body, or barrel, the clapper on the inſide, and the ear or canon, by which it hangs to the beam of wood.

The ſound of a bell is conjectured to conſiſt in a vibratory motion of its parts, much like that of a muſical chord.

The ſtroke of the clapper muſt neceſſarily change the figure of the bell, and of a round make it oval: but the metal having a great degree of elaſticity, that part will return back again which the ſtroke drove fartheſt off from the center, and that even ſome ſmall matter nearer the center before; ſo that the two parts, which were extremes of the largeſt diameter, do then become thoſe of the ſhorteſt; and thus the external ſurface of the bell undergoes alternate changes of figure, and by that means gives that tremulous motion to the air, in which the ſound conſiſts.

Bell Animal, ſignifies a ſpecies of animalculæ, enumerated under the article Microſcopical Objects. Claſs I.

Bell Flower, in botany, ſignifies the campanula, of which it is a ſynonyme.

BELLADONA, in botany, is the trivial name of the atropa.

BELLATRIX, in aſtronomy, is a ruddy glittering ſtar, of the ſecond magnitude, in the left ſhoulder of Orien.

BELLES Lettres, among the literati, ſignify polite learning, and are thus characterized:

1. Grammar
2. Logic
3. Rhetoric
4. Poetry
5. Muſic
6. Mathematics
7. The learned languages (Latin and Greek)

Uſually called Heptatechny, or the Seven Liberal Arts.

BELLIS, in botany, ſignifies that well known plant called the daiſy. It is a genus of the ſyngeniſia order, belonging to the polygamia ſuperflua claſs of plants. There are three ſpecies which may be thus characteriſed, viz.

1. The perennis, with a naked ſtalk, having one flower, which is the common daiſy, a native of all Europe. It is ſaid to be antiſcorbutic, and a reſolvent of coagulated blood in hypochondrical diſorders.

2. The annua with leaves on the lower part of the ſtalk; an annual plant; a native of the Alps. It ſeems a degenerated variety of the former.

3. The hortenſis, or garden daiſy, with a large double flower. There are five varieties of it, viz. red, white, variegated, childing, and coxcomb daiſies.

Their culture is common to gardens, and well known to gardeners, who uſually make them as edges to their plots and beds; but care muſt be taken to give them ſhelter from the ſun, or they will ſoon die, if expoſed to the ſummer heat.

BELLON, or **Belland**, a diſtemper very common in Derbyſhire, and other counties, where they ſmelt lead ore; to which beaſts, and even poultry, as well as men, are ſubject; and for this reaſon, a certain ſpace round the ſmelting houſes is called bellon ground, indicating its being dangerous for any animal to feed on. This diſorder is attended with languors, weakneſs, and intolerable pains, ſenſation of gripings in the belly, and generally coſtiveneſs. It frequently proves fatal.

BELLONA, in mythology, a bello, the goddeſs of war, ſiſter to Mars.

BELLONARII, in antiquity, were prieſts of Bellona, the goddeſs of war and battles.

BELLONIA, in botany, is a genus of the monogynia order, belonging to the pentandria claſs of plants, of which there is but one ſpecies, namely, the aſpera, which is thus characterized; it has a woody ſtem, which riſes to about 12 feet in height, ſending out many lateral branches, garniſhed with rough oval leaves in looſe panicles, and are ſucceeded by oval capſules, ending in a point, and filled with ſmall round ſeeds.

It is a native of Africa; but may eaſily be propagated in any part of Europe, by cuttings and warmth in its early ſtages.

BELLOWS is a pneumatic machine, well known in the culinary art for encreaſing the fire on any occaſion: it is ſo contrived as to expire or inſpire, the airs by turns, by enlarging and contracting its capacity. There are various ſorts and ſizes of bellows, all ſuited to the purpoſes for which they are intended.

BELLUÆ, in tetrapodology, is the ſixth order of the firſt claſs of animated nature. The characters of which are; their fore teeth are obtuſe; their feet are hoofed; and they walk heavy: their food, vegetables.

In this order there are ſix ſpecies, viz.

1. Horſe, with his varieties.
2. Aſs, with his varieties.
3. Zebra, with his varieties.
4. Hippopotome, or river horſe, two varieties.
5. Hog, with five varieties.
6. Rhinoceros, no variety.

BELLUGA, in ichthyology, is a ſpecies of fiſhes, called by Artedi, accipenſer tuberculis carens, and of the ſturgeon kind, of which it is an enlarged variety, being 36 feet in length when full grown. What is moſt remarkable in the nature of this animal is, that it produces a curious ſtone in its belly, whoſe medical virtues are ſaid to be very great. It is a native of the Wolga, in Ruſſia.

BELLULA Bos, in ichthyology, is a ſpecies of ray, called, according to the Artedian claſſification, the variegated ray, with ten tubercles on the middle of the back.

BELLY, in a general ſenſe, denotes the whole abdomen, or that region of the body contained between the ſeptum, tranſverſum, the hypochondria, and pubes.

Belly *of a Muſcle*, in anatomy, denotes the body thereof; as contradiſtinguiſhed from the two extremities, or tendons. From the conditions of this, muſcles are divided into monogaſtric, or ſingle bellied; and diagaſtric, or double bellied. Phil. Tranſ. N° 258.

BELONE, in ichthyology, called by ſome of the naturaliſts acus oppiani, and by others the horn fiſh, or gar fiſh. It is a ſpecies of the eſox.

BELT, **Baltheus**, denotes a kind of military girdle, uſually of leather, wherewith the ſword or other weapons are ſuſtained. It was an eſſential piece of ancient armour. In later ages, it was given to a perſon when he was raiſed to knighthood; whence it has alſo been uſed as a badge or mark of that order.

Belt is alſo a frequent diſeaſe in ſheep, cured by cutting their tails off, and laying the ſore bare; then caſting mould on it, and applying tar and gooſe-greaſe.

Belts, in navigation, denote certain ſtreights near the ſound, through which ſhips muſt paſs going between the Baltic and the German ocean. They belong to the king of Denmark, who exacts a toll of all ſhips which paſs them excepting the Swedes, who are exempt from it.

BELVIDERE, an Italian term, given to a pavilion on the top of a building, or an eminence in manner of a platform in a garden, ſuſtained by a terrace wall, or a maſſive of turf, contrived for the ſake of commanding a large or beautiful proſpect.

Belvidere, in botany, a ſpecies of the chenopodium.

BELULCUM, a chirurgical inſtrument of various figures, contrived for extracting darts, arrows, or the like, from wounds.

BEMA, in antiquity, denotes a kind of itinerary meaſure among the Greeks, whoſe length was equivalent to one cubit, and two thirds, or ten palms.

Bema, in eccleſiaſtical hiſtory, ſignifies an altar, or chancel in the body of a church.

BEMETRE, in ornithology, the name of a greeniſh black bird of the ſtarling kind, common in the Brazils.

BEN, or **Behen**, in pharmacy, denotes a medicinal root, celebrated among the Arabs for its aromatic virtues. Its fruit is about the ſize and ſhape of a nut, from whence it is called the ben nut. Theſe nuts produce oil, which will not become rancid.

BENCH, in a law phraſe, denotes the ſeat of a judge, juſtice or magiſtrate. Figuratively, the perſons ſitting in the trial of cauſes.

BENCHERS, in an inn of court, the ſenior barriſters, who have the government and direction of it; and out of whom is yearly choſen a treaſurer, &c.

BEND, in heraldry, ſignifies an ordinary or bearing, formed by two lines drawn acroſs the ſhield, from the upper part on the right to the lower on the left. This is called likewiſe the bend dexter; the bend ſiniſter is formed by drawing the lines from the left ſide of the ſhield to the right.

BENDING, in a general ſenſe, implies the reduction of a ſtrait body into that of a curved appearance. In navigation, it ſignifies the tying of ropes or cables together. Thus to bend the cable is to make it faſt to the ring of the anchor; and to bend the ſheet is to make it faſt to the yard.

BENDS, in a ſhip, are the ſame with wailes, or wales, which are the outermoſt timbers of a ſhip, on which men ſet their feet in climbing up. They are reckoned from the water, the firſt, ſecond, and third bend; they help much to ſtrengthen the ſhip, and have the beams, knees, and foothooks bolted into them.

BENDY, **Bande**, in blazonry, denotes the dividing an eſcutcheon into an equal number of partitions.

BENEAPED, in navigation, ſignifies when he water does not flow high enough to bring a ſhip off the ground out of a dock, or harbour.

BENEDICITE, in theology, ſignifies the ſong of the three children in the fiery furnace.

BENEDICTINES, in eccleſiaſtical hiſtory, denote an order of monks who profeſs to follow the rules of St. Benedict. They are called black friars, from the gowns and caps they wear being of that colour.

BENEDICTION, in a general ſenſe, implies the act of giving praiſe to God, or returning thanks for benefits received. It is alſo applied to the act of ſaying grace before or after meals.

Benediction, *Nuptial*, the external ceremony performed by the prieſt in the office of matrimony. The nuptial benediction is not eſſential to, but the confirmation of, a marriage in the civil law.

Benediction is alſo uſed for an eccleſiaſtical ceremony, whereby a thing is rendered ſacred, or venerable.

BENEFACTION, implies a good and benevolent action; and is generally applied to charitable gifts for the relief of perſons in diſtreſs.

BENEFICE, Beneficium, in an eccleſiaſtical ſenſe, ſignifies a church endowed with a revenue for the performance of divine ſervice; or the revenue itſelf, aſſigned to a clergyman for life, in return for his paſt ſervices.

All church preferments, except biſhoprics, are called benefices; and all benefices are, by the canoniſts, ſometimes called dignities: but we now ordinarily diſtinguiſh between benefice and dignity, by applying the word dignity to biſhoprics, deanries, archdeaconries, and prebends; and benefice to perſonages, rectories, vicarages, and donatives.

Regular or Titular **Benefices**, are thoſe held by a religious, or a regular, who has made profeſſion of ſome religious order. Such are abbeys, priories, conventual, &c.

Secular **Benefices**, are thoſe which are only to be given to ſecular prieſts, i. e. to ſuch as live in the world, and are not engaged in any monaſtic order. All benefices are reputed ſecular, till the contrary is made appear. They are called ſecular benefices, becauſe held by ſeculars. Some benefices regular in themſelves, have been ſeculariſed by the pope's bull.

Benefice, in commendam, is that, the direction and management whereof, upon a vacancy, is given, or recommended to an eccleſiaſtic for a certain time, till it may be conveniently provided for.

BENEFICENCE, implies a diſintereſted inclination to do a good action, or to promote the welfare of another.

BENEFICIARII, in a general ſenſe, denotes ſomething that relates to benefices.

BENEFIT, in a general ſenſe, implies ſome advantage, immunity, or gift, whether in church or ſtate.

BENENAIM, or **Benenath**, in aſtronomy, ſignifies the outermoſt ſtar, of the ſecond magnitude, in the tail of the urſa major.

BENEVOLENCE, in morality, denotes the love of mankind in general, accompanied with a deſire to promote their happineſs.

BENZOIN, or **Benjamin**, in pharmacy, ſignifies a reſinous juice produced from a ſpecies of the laurus, which grows in the iſland of Siam and Sumatra in the Eaſt Indies. It is uſed both as a perfume and a coſmetic. The flour it produces is highly recommended for diſorders of the breaſt.

BEQUEST, implies ſomething left by will; a legacy.

BERBERIS, **Barberry**, or **Pipperidge Bush**, in botany, is a genus of the monogynia order, belonging to the hexandria claſs of plants. There are three ſpecies thus characterized, viz.

1. The vulgaris, or common barberry, or native of Great Britain and Ireland. It riſes to eight or ten feet in height; has many ſtalks; white bark; the branches are armed with thorns; the leaves are oval, obtuſe, and ſlightly ſawed on the edges; the flowers proceed from the wings in ſmall ramoſe branches; the fruit ſucceeds; firſt green, but matures into a rediſh colour.

2. The canadenſis; is a native of America.

3. The cretica, a native of warm climates. Both of theſe ſpecies reſemble the former; but are larger leaved, and lower in height, as neither exceed four feet.

The firſt ſort is propagated by ſuckers or ſhoots. The other ſorts may be propagated in the ſame manner; but is hardly worth notice, as they never come to perfection in England.

The berries are very acid, moderately aſtringent, and are given with ſucceſs in bilious fluxes, and diſeaſes proceeding from heat, acrimony and thinneſs of the juices.

BERCHEROIT, or **Berkcoits**, a weight uſed at Archangel, and in all the Ruſſian dominions. It is equal to about 364 pounds Engliſh avoirdupois.

BERDASH, in antiquity, was a name formerly uſed in England for a certain kind of neck dreſs; and hence a perſon who made or ſold ſuch neckcloths was called a haberdaſher, from which is derived our word haberdaſher.

BEREWICHA, or **Berewica**, in antient writings, denotes a village or hamlet belonging to ſome town or manor, ſituate at a diſtance therefrom. The word frequently occurs in doomſday book.

BERFISCH, in ichthyology, a name given by the Germans to the common pearch, or perca.

BERGAMOT, in perfumery, denotes a ſpecies of citron, engrafted on a pear tree; the firſt has both a fine taſte and ſmell; and its eſſential oil is in high eſteem as a perfume. A water is alſo diſtilled from the peel of the fruit, which alſo partakes highly of the grateful effluvia.

BERG Gruen, in mineralogy, ſignifies the name of an earth uſed in painting, and properly called green ochre. It is found in many parts of Germany, Italy, and England, commonly in the neighbourhood of copper mines, from particles of which metal it receives its colour. The characters by which the native kind is known from other green earths, are theſe: it is a denſe, compact ſubſtance, conſiderably heavy, and of a pale, but not diſagreeable green; of a rough and uneven, but not duſty ſurface, and ſomewhat unctuous to the touch. It adheres firmly to the tongue: does not break eaſily between the fingers: nor at all ſtain the hands. It is of a brackiſh diſagreeable taſte, and will not ferment with acids.

BERGANDER, in ornithology, a name by which ſome have called the ſhell drake, or burrough duck, a very beautiful ſpecies of duck, common on the coaſts of Lancaſhire; but not much eſteemed for eating.

BERGHMOT, or **Berghmote**, vulgarly **Barmote**, is a court held on a hill for deciding pleas and controverſies among the Derbyſhire miners. The word is formed from the Saxon *berg*, *mons*; and *mote*, *conventus*, *aſſembly*, or *meeting*.

BERIBERI, the name of a diſeaſe among the Indians, being a ſpecies of palſy.

BERICARIA, **Bercaria**, or **Berquaria**, a ſheep down, or ground, to feed ſheep.

BERITH, mentioned in Scripture, ſignifies earth for cleanſing or taking out ſpots.

BERLIN, in mechanics, a ſort of vehicle, of the chariot kind, taking its name from the city of Berlin in Germany.

It is a very convenient machine to travel in, being lighter, and leſs apt to be overturned, than a chariot. The body of it is hung high on ſhafts, by leathern braces; there being a kind of ſtirrup, or footſtool, for the convenience of getting into it: inſtead of ſide windows, ſome have ſcreens to let down in bad and draw up in good weather.

BERLUCCIO, in ornithology, ſignifies the name of a ſmall bird of the hortulanus kind, and much reſembling the yellowhammer; but ſomething ſmaller, and longer bodied.

BERME, in fortification, implies a ſmall ſpace of ground, four or five feet wide, left without the rampart, between its foot and the ſide of the moat, to receive the earth that rolls down from the rampart, and prevent its falling into, and filling up the moat. Sometimes for greater ſecurity, the berme is paliſaded.

BERNARDINS, or **Bernardites**, the name of a religious order, differing very little from the Ciſtercians. Their uſual habit is a white gown, with a black ſcapulary; but when they officiate, they put on a large white coul with great ſleeves, and a hood of the ſame colour, from whence they are called white friars.

BERNICLE, in ichthyology, is the name of a ſpecies of ſhell fiſh, called by ſome authors *concha anatifera*. It is compoſed of five ſhells or valves, and agrees, according to Liſter, with the pholas, as well in the diſpoſition as in the number of the valves.

BEROE, in ichthyology, is an animal found on the Engliſh coaſts. It is of a gelatinous tranſparent nature, and of an oval or ſpherical form, about half an inch to an inch diameter, divided like a melon into longitudinal ribs, each of which is furniſhed with rows of minute fins, by means of which this animal, like the animalia infuſoria, can ſwim in all directions with great ſwiftneſs.

BERRY, or **Bacca**, implies a grain, fruit, or ſeed, produced by ſeveral herbs, trees, and ſhrubs, thence called bacciferous, for the conſervation, and reproduction of their kind. They are of various ſizes, forms, properties, and uſes, according to the plants whereon they grow. Some are uſed in medicine, as juniper berries, buckthorn berries, &c. Others, in dying, as French or yellow berries, &c.

BERSARII, in antiquity, were a kind of hunters or ſportſmen, who purſued wild beaſts in foreſts and chaces.

BERSE, in botany, the name given by the French writers to the ſphondylium, or cow parſnep, a ſpecies of umbelliferous plants common in our meadows, and known by its large rough leaves and remarkable height.

BERTH, in navigation, denotes the ſafe harborage of a ſhip at anchor.

BERTHING, in navigation, denotes the raiſing or bringing up a ſhip's ſides.

BERYL, in mineralogy, denotes a tranſparent ſtone, or gem, of a light, or pale green colour, found in the Eaſt Indies, as alſo in Mexico and Peru, in South America. In its perfect ſtate it approaches to the hardneſs of the garnet. Its ſize is from that of a pea to a walnut.

Beryl Chrystal, is a name given by lapidaries to brown clear-grained chryſtal.

Mr. Boyle alſo ſpeaks of a white kind of beryl.

BES, or **Bessis**, an ancient Roman weight, containing two thirds of the as; that is, eight unciæ. It was a term alſo uſed in the menſuration of lands, to denote two thirds of a jugerum or acre.

BESAILE, in the common law, ſignifies a writ that lies where the great grand father or great grandmother was ſeiſed the day that he or ſhe died of any lands or tenements in fee-ſimple; and after his or her death, a ſtranger entered the ſame upon him, and keeps out the heir.

BESANT, or **Bezant**, was a ſort of coin, or wedge of gold, ſtruck at Byzantium, in the time of the Chriſtian emperors, but of what value is not known. The gold offered by kings at the altar, on feſtivals, is ſtill called beſant, or biſant.

Thus the offering of King George III. on the 23d of April, 1789, at St. Paul's cathedral, on the recovery of his health, is a beſant of national diſtreſs, and a pious memorial.

BESISTAN, in the commercial traffic of the Ottomans, denotes the ſhop or arch, in which each individual expoſes his goods for ſale.

BESORCH, ſignifies a coin of tin, or of ſome alloyed metal, current at Ormus, at the rate of about $\frac{7}{47}$ parts of a farthing ſtarling.

BESTARCHA, a dignity in the courts of the emperors of Conſtantinople, ſuppoſed to anſwer to that of the maſter of the wardrobe among us.

BESTIARII, in Roman antiquity, denote thoſe who were hired to combat with beaſts, or expoſed to them, by the ſentence of law.

BETA, the beet, in botany, is a genus of the dignia order belonging to the pentandria claſs of plants. There are three ſpecies, beſides ſome varieties, which may be thus characterized, viz.

1. The maritima, or wild ſea beet.

2. The hortenſis, or common white garden beet; the leaves of which are uſed in ſoups. Its varieties are: 1. White; 2. Green; 3. Swiſs, beet.

3. The vulgaris or red beet, with a pyramidal root, thick ſucculent leaves, of a dark green niching to a purple colour. The root is large and red, and much eſteemed as a ſallad.

The varieties are, 1. Common red; 2. Turnip; 3. Green leaved red, beet.

The culture of the ſecond and third ſpecies, are common and well known to every gardener, but the firſt is for the moſt part rejected as a mere weed.

Decoctions of beet are very ſafe looſeners in coſtive habits; hence they have been ranked amongſt emolient herbs. The juice expreſſed from the roots is a powerful errhine.

BETEL, in botany, in an Indian plant in great uſe and eſteem throughout the Eaſt, where it makes a conſiderable article of commerce. It bears ſome reſemblance to the pepper-tree. Its leaves are like thoſe of ivy, only ſofter, and full of red juice, which among the Orientals, is reputed of wonderful virtue for preſerving the teeth and rendering the breath ſweet. The Indians are almoſt continually chewing theſe leaves, which renders their lips red, and teeth black, a colour they greatly prefer to the whiteneſs of the Europeans.

The conſumption of betel leaves is incredible, no perſon, rich or poor, being without their box of betel, which they preſent to each other by way of civility, as we do ſnuff. In many places they chew the areca nut, either alone or mixt with the betel leaf and lime, and the leaves of this plant are ſometimes chewed alone; but they are too ſharp, and uſually injure the teeth, and it is not uncommon to find men of twenty-five wholly toothleſs in this part of the world, merely from their having chewed this plant to an exceſſive degree. The prepared betel is a very common preſent among the poorer ſort; and, on taking leave of a friend, it is always the cuſtom to make him a preſent of a purſe of the leaves prepared for uſe. When the poorer ſort are to appear before the rich, they always chew a large quantity of betel, to give them a ſweet breath. On all viſits, the company is regaled with prepared betel, and the principal time of uſing it is after dinner. They never abſtain from it, except on the ſolemn occaſions of the funerals of their relations, and their days of faſting. Moderately uſed, it ſtrengthens the gums, corroborates the heart and ſtomach, diſcuſſes flatulencies, and purges both the ſtomach and brain. If chewed after breakfaſt, it makes the breath ſweet for the whole day. The Portugueſe women are as fond of the betel as the Indians themſelves, and practice the uſe of it with equal conſtancy.

BETELGEULE, or BEDELGAEZE, a fixed ſtar of the firſt magnitude in Orion's hind ſhoulder.

BETHLEHEMITES, or BETHLEMITES, were a ſort of monks introduced into England in the year 1257. They were habited like the Dominicans, except that, on their breaſt, they wore a ſtar with five rays, in memory of the ſtar or comet which appeared over Bethlehem at the nativity of our Saviour. They were celled at Cambridge, and had only one houſe in England.

BETON, a name given by the French engineers to a kind of mortar, which they uſe in raiſing the foundations of maſonry under water.

BETONY, BETONICA, in botany, a genus of plants, of the didynamia gymnoſpermia claſs, the characters of which are theſe: the flower is of one leaf, of the lip kind, with a cylindrical incurved tube; the upper lip is roundiſh, plain, erect, and entire; the lower lip is cut into three parts. It hath four ſtamina, two long, and two ſhorter, which incline to the upper lip. The germen is quadripartite, which afterward becomes four naked oval ſeeds, lodged in the empalement. According to ſome it has four, and to others ſeven ſpecies.

Its principal uſe is in herb ſnuffs, and as a ſubſtitute for tea. Its root, like the root of hellebore, operates both upwards and downwards.

BETROTHMENT, ſignifies a mutual promiſe or compact between two parties for a future marriage. The word imports as much as giving one's troth; that is, true faith, or promiſe.

BEVEL, in maſonry, an damong joiners, is a kind of ſquare, one leg of which is frequently ſtraight, and the other crooked, according to the ſweep of an arch, or vault; being withal moveable, on a point, or centre, ſo that it may be ſet to any angle. The make and uſe of the bevel are pretty much the ſame as thoſe of the common ſquare and mitre, except that theſe latter are fixed; the firſt at an angle of ninety degrees, and the ſecond at forty five; whereas the bevel, being moveable, may, in ſome meaſure, ſupply the office of both, and yet, which it is chiefly intended for, ſupply the deficiencies of both, ſerving to ſet off, or transfer angles, either greater or leſs than ninety, or forty five degrees. Bricklayers have alſo a bevel, by which they cut the under ſides of the bricks of arches ſtraight or circular, to ſuch oblique angles, as the arches require, and alſo for other uſes.

BEVELLING, in ſhip building, the art of hewing timber with a proper and regular curve, according to a mould which is laid on one ſide of its ſurface.

BEVERAGE, in a general ſenſe, ſignifies drink. Hence nectar is ſaid to be the beverage of the gods.

BEVILE, in heraldry, denotes a thing broken, or opening like a carpenter's rule, Thus he beareth argent a chief bevile vert, by the name of bever lis. See Syſtem of HERALDRY.

BEVY, implies a flock or number of birds, collected together; an aſſembly or company.

BEWITS, in falconry, denote pieces of leather to which a hawk's bells are faſtened, and buttoned to his legs.

BEXUQUILLO, in the materia medica, a name given to the white ipecacuanha, which the Spaniards bring from Peru, as the Portugueſe do the brown from Braſil.

BEY, or BEG, denotes a governor of a country, or town, in the Turkiſh empire.

BEZANTLER, among ſportſmen, that branch of a deer's horn next below the brow antler.

BEZOAR, or BEZOARD, in its primary ſenſe, denotes an antidote, or counter poiſon. In its ſecondary, it ſignifies a medicinal ſtone, brought from the Eaſt or Weſt Indies, compoſed of ſeveral coats, or laminæ, laid one over another, like an onion, generated in the ſtomach of an animal of the goat kind, and eſteemed a powerful antidote and cardiac.

This is ſometimes alſo called the true bezoar; and is of two kinds, oriental and occidental. The oriental is in the moſt eſteem, and is brought from ſeveral parts of the Eaſt Indies, chiefly Golconda and Cananor: it is there found mingled with the dung of an animal of the goat kind, called pazan; in the belly whereof this ſtone is found. It ordinarily grows to the bigneſs of an acorn, ſometimes to that of a pigeon's egg; it is compoſed of ſeveral ſhining ſkins, or coats, like an onion, ſometimes of a blood colour, ſometimes a greeniſh yellow, a browniſh red, and honey colour. The number of bezoars produced by each animal is various, ſome yielding one, two, &c. to ſix, and others none at all. The larger the ſtone, the more valuable it is held; its price increaſing like that of the diamond. A ſtone of one ounce is ſold in the Indies for 100 livres, and one of four ounces and a quarter for 2000 livres. The genuine bezoar ſtones are ſo ſcarce even in the Indies, that few, if any of them, are brought into Europe. The greater number are no other than artificial compounds made there.

BEZOAR, in a more extenſive ſenſe, includes all animal ſubſtances formed *ſtratum ſuper ſtratum*, in the ſtomachs or inteſtines of animals. In which ſenſe, pearls, the ſtones found in caſtoreum, &c. belong to the claſs of bezoars.

BEZOAR *Goat*, in tetrapodology, ſignifies a name uſed for the Indian antelope, on account of the bezoar ſtone found in its ſtomach.

BEZOAR is alſo applied to a kind of foſſile figured ſtone, formed like the animal bezoar of ſeveral coats, or ſtrata, ranged round ſome extraneous body, which forms a nucleus, and is ſuppoſed to have the ſame virtues with the other. It is found in Italy and France.

BEZOARDIC is applied to certain medicinal powders, ſtones, &c. wherein bezoar is an ingredient.

BEZOLA, in ichthyology, the name of a truttaceous fiſh of the albula kind. It reſembles the herring in ſhape, is of a duſky bluiſh colour, and does not eſſentially differ from the lavaretus.

BIA, a name given by the Siameſe, to a ſort of little white ſhells brought from the Maldive iſlands, and uſed throughout moſt part of the Eaſt Indies for ſmall money. Nine of theſe are equal in value to the French *denier*. They are otherwiſe called *coris* or *cowries*.

BIÆUM, in the Grecian laws, was an action brought againſt thoſe who raviſhed women, or uſed violence to any man's perſon. It alſo denotes a kind of ſaline or ſea wine, uſed by the ancient Greeks in various diſorders. It was made of grapes gathered a little before ripe, and dried in the ſun; then preſſed, the juice put up in caſks, and mixed with a large proportion of ſea water.

BIAFORA, in the cuſtoms of the middle age, was a form of cry, or alarm to arms: on the hearing whereof, the inhabitants of towns or villages were to iſſue forth, and attend their prince. The word ſeems originally from Gaſcony; and the Italians even now, on a ſudden inſurrection of the people, commonly cry, Via fora, by an uſual change of the letter B into V.

BIARCHUS, an officer in the court of the emperors of Conſtantinople, intruſted with the care and inſpection of the proviſions of the ſoldiery.

BIARUM, in botany, a name by which the people of Egypt at this time call the root of the nilufar, or faba Ægyptia, growing on the Nile.

BIAS, or Biaſs, the tendency or propenſity of a thing towards one ſide more than the other; particularly the deviation of a body, or a plane, from its rectilinear courſe, or its level.

Bias of a bowl, is a piece of lead put into one ſide, to make it incline towards that ſide.

BIBIO, in entomology, ſignifies a very ſmall fly, found frequently among empty wine-caſks. It is produced from a ſmall, oblong, red worm, very common in the ſediments of wine.

BIBLE, a book, by way of eminence ſo called, containing the Scriptures, i. e. the writings of the Old and New Teſtament. It is known by various other appellations, as the ſacred books, the inſpired writings, holy writ, ſacred text, &c. By the Jews it is called mikra, that is, lecture, or reading; by the Chriſtians uſually ſcripture, q. d. writing; ſometimes alſo the book of God, the canon, rule of faith, &c. It is written in various languages, as Hebrew, Greek, Latin, Chaldee, Syriac, Arabic, Cophtic, &c.

BIBLIOMANIA, ſignifies an extravagant paſſion for books, to a degree of madneſs; or a deſire of accumulating them beyond all reaſon and neceſſity.

BIBLIOTHECA, from βιϐλος, *book*, and θηκη, *repoſitory*, from τιθημι, *I lay up*, properly ſignifies a library, or repoſitory of books. It is alſo uſed for a compilation of all that has been written on a certain ſubject; or a digeſtion of all the authors who have treated on it.

BIBLIOTHECARIAN, a library keeper, otherwiſe called librarian.

BIBLISTS, *Bibliſtæ*, an appellation given by ſome Romiſh writers to thoſe who profeſs to adhere to Scripture alone, as the ſole rule of faith, excluſive of all tradition, and the ſuppoſed authority of the church. In which ſenſe, all proteſtants are, or ought to be, bibliſts.

BIBLUS, in botany, an aquatic plant in Egypt, called alſo papyrus; of the ſkin whereof the ancient Egyptians made their paper. Hence alſo the Greeks gave the denomination βιϐλος, to books made hereof.

BICAUDA, in ichthyology, ſignifies the name of a fiſh of the xiphias or ſword fiſh kind. It is five feet long, or more, and a foot and half broad at the breaſt, tapering gradually towards the tail. It is covered with a thick and rough ſkin, and is brown on the back and ſides; and has there ſeveral ſhort bony prickles: its belly is white: its fins are all of a browniſh grey, and the back one has ſeveral beautiful black ſpots. It is a very well-taſted fiſh.

BICAUDALIS, in anatomy, an appellation given by ſome to a muſcle of the external ear, on account of its having two tails; but which is ſubject to great variety, having ſometimes only one, and ſometimes three tails; in which caſes, it is called intricalis and tricaudalis.

BICE, or Biſe, among painters, a blue colour, prepared from the lapis armenus, formerly brought from Armenia, but now from the ſilver mines in Germany. Phil. Tranſ. N° 179, p. 26. It bears the beſt body of all bright blues uſed in common work; but it is the paleſt in colour. It works indifferently well; but inclines a little to be ſandy, and therefore requires good grinding on a very hard ſtone, and ſhould be waſhed before it is uſed. It lies beſt near the eye of any blue now in uſe, except ultramarine. We have alſo a green bice, made of the blue, with the addition of the orpiment.

BICEPS, in anatomy, is a name common to ſeveral muſcles, which are ſeparated into two diſtinct portions, called heads.

BICHET, is a corn meaſure, containing about a Paris minot, chiefly uſed in Burgundy and the Lyonois. It denotes alſo a certain quantity of land, as much as may be ſown by a bichet of corn.

BICORNE Os, in anatomy, the ſame with the os hyoides.

BICORNES, in botany, ſignify plants, whoſe antheræ have the appearance of two horns. The term likewiſe expreſſes an order of plants in the fragmenta methodi naturalis of Linnæus.

BICORPOREA, ſignify thoſe of the zodiac, which have two bodies, or conſiſt of two figures. Such are Gemini, or the Twins; alſo Piſces, and Sagittarius, conſiſting of a man and a horſe.

BICUIBA, in botany, the name of an Indian nut, uſed for relieving colics; and from which an oil is extracted for the cure of cancers.

BIDDING, is a term uſed for proclaiming or notifying; alſo for offering a price for goods put up by auction.

BIDENTES, denote two yearlings, or ſheep of the ſecond year. The wood of theſe bidentes, or two year old ſheep, being the firſt ſheering, was ſometimes claimed as a heriot to the king, on the death of an abbot. Among the ancient Romans, the word was extended further to any ſort of beaſts uſed for victuals, eſpecially thoſe of that age: whence we meet with ſues bidentes.

BIDON, is a liquid meaſure of about five quarts Engliſh meaſure; ſeldom uſed except among ſhip's crews.

BIER, a kind of wooden carriage, in which the bodies of the dead are borne to their grave.

Among the Romans, the common bier, whereupon the poorer ſort were carried, was called ſandapila: that uſed for the richer ſort, lectica, lectica funebris, ſometimes lectus. The former was only a ſort of wooden cheſt, vilis arca, which was burnt with the body; the latter was enriched and gilded for pomp. It was carried bare, or uncovered, when the perſon died a natural and eaſy death; when he was much diſfigured or diſtorted, it was veiled or covered over.

BIFFA, ſignifies a machine for caſting ſtone, and darts, having a moveable counterpoiſe, which turned round its yard.

BIFID *Leaf*, in botany, a leaf cloven into two parts.

BIGAMY, a double marriage, or the poſſeſſion of two wives at the ſame time. Among the ancient Romans, thoſe convicted of bigamy were branded with a note of ignominy; and, in France, they were anciently puniſhed with death.

Bigamy, in the canon law, is alſo where a perſon either marries two women ſucceſſively; or only marries one woman who had been married before. Each of which the canoniſts account impediments to be a clerk, or to hold a biſhopric without a diſpenſation: a point of diſcipline founded on that of St. Paul, *Let a biſhop be the huſband of one wife*, 1 Tim. chap. iii. ver. 2. Apoſt. Conſt. 17, 18.

BIGATI, in Roman antiquity, was a kind of ancient ſilver coin, on one ſide of which was repreſented a biga, or chariot, drawn by two horſes. The bigatus was properly the Roman denarius, whoſe impreſſion, during the times of the commonwealth, was a chariot driven by Victory, and drawn either by two horſes, or four, according to which it was either denominated bigatus, or quadrigatus.

BIGGEL, in tetrapodology, is a quadruped about the colour and bigneſs of a rein-deer; its head is ſaid to be like that of a horſe; its mane like that of an aſs, with black cloven feet, and two black horns on his head. It is found in the Eaſt Indies.

BIGHT, in navigation, denotes any part of a rope, as it is taken compaſſing, coiled up; or the double part of a rope, when it is folded, in contradiſtinction to the end. It ſignifies alſo a ſmall bay between two points of land.

BIGOT, implies a perſon fooliſhly obſtinate, or perverſely attached to an opinion. Camden relates, that the Normans were firſt called bigots, on occaſion of their duke Rollo; who receiving Giſſa, daughter of king Charles, in marriage, and with her the inveſtiture of the dukedom, refuſed to kiſs the king's foot in token of ſubjection, unleſs he would hold it out for that purpoſe: and being urged to it by thoſe preſent, anſwered haſtily, *No by God*; whereupon the king, turning about, called him bigot; which name paſſed from him to his people.

BIJUGUM *Folium*, in botany, denotes a winged leaf, bearing two pair of foliola.

BIL, in ichthyology, is a name given in ſome parts of England to a particular ſpecies of cod-fiſh, called aſellus luſcus. It is diſtinguiſhed from the cod by its ſmallneſs, by its being ſhorter and broader in its ſhape, by the paleneſs of its colour, and largeneſs of its ſcales; though it agrees with it, in having a beard under the chin.

BILARIUS Porus, Bilary *Pore*, or *Hepatic Duct*, in anatomy, is a conſiderable appendage of the liver, formed from the concurrence of a multitude of ſmall ramifications ſpringing from the glands of the liver, which unite into ſeveral trunks equal in magnitude to the branches of the hepatic arteries; and accompany them branch for branch through the whole ſubſtance of the liver; being wrapped up in the ſame capſula with the porta. Theſe branches are about the ſize of a wheat-ſtraw, the biggeſt large enough to admit the little finger; and are diſtinguiſhable from the porta by their contents, being always full of bile. Beſides the capſula common to theſe and the porta, each has a thick white coat, proper to itſelf, like the muſculous coat of an artery. On the concave ſide of the liver the ſeveral ramifications meet, and form one trunk, or channel, properly called the bilary pore, about the bigneſs of a gooſe quill, which deſcending about two inches, meets with the cyſtic duct, and together with it forms what we call the ductus communis; which deſcending in a right line, about four inches, diſcharges itſelf into the duodenum, by an oblique inſertion, oftentimes at the ſame aperture with the pancreatic duct. The porus bilarius communicates with the gall-bladder, by a duct firſt deſcribed by Dr. Gliſſon, and afterwards by Blaſius and Perrault, who gave it the name of the cyſthepatic duct. Verheyen, in oxen, found two, three, or four of theſe cyſthepatic ducts; and the like has been obſerved in a dog, and a man.

BILBERRY, in botany, is the ſame as whortle-berry.

BILBOWS, a ſee phraſe for a puniſhment anſwering to the ſtocks at land.

BILCOCK, in ornithology, a name given by ſome to the water-tail, a bird of the moor-hen kind, but ſmaller.

BILDGE, or Bilge, *of a Ship*, denotes the bottom of her floor; or the breadth of that part which ſhe reſts on, when ſhe is a-ground.

Bildge *Water*, is that which, by reaſon of the flatneſs of the ſhip's bottom, lies on her floor, and cannot go to the well of the pump. The Dutch, whoſe ſhips are often of this form, uſe a ſort of pumps called bildge-pumps; or, as we call them, burr-pumps, to carry off the bildge-water. When a ſhip ſtrikes on a rock, they all ſay, ſhe is bilged, or buldged.

BILE, Bilis, a yellow bitter juice, ſeparated from the blood in the liver, collected in the porus bilarius, and gall-bladder, and thence diſcharged by the common duct into the duodenum.

It is of two kinds; hepatic and cyſtic. The firſt, moſt properly called bile, is ſeparated immediately from the glands of the liver, into the porus bilorius. The ſecond, more properly called gall, is ſeparated likewiſe from the glands of the liver into the gall bladder, by roots or ducts proper to itſelf.

The cyſtic bile is thicker, of a deeper yellow, and bitter; tho' it has varied in colour and taſte in different ſubjects, and different circumſtances; is not evacuated continually, but only when its receptacle is replete: in which caſe, the contraction of the irritated fibres propels it into the duodenum. The hepatic bile is greener, thinner, more mild and pellucid, reſembling lymph, ſub-alcaline, and rather oily, and is continually ouſing out; being expelled by the ſole action of the neighbouring parts. The cyſtic bile reſiſts acids, and, mixed with other fluids, gives them the like property: it abſterges like ſoap, and renders oils capable of mixing with water; it reſolves and attenuates reſins, gums, and other tenacious bodies, rendering them homegeneal to itſelf. It is neither alcalous nor acid, but ſeems a concretion of oil, ſalt, and ſpirits, diluted with water. By a chemical analyſis, Dr. Drake obſerves it affords ſome ſulphur, or oil, ſome volatile ſalt, a good deal of fixt ſalt (in which particular it differs from all other animal liquors), and a moderate quantity of caput mortuum, or earth; the baſis is phlegm.

BILIMBI, in botany, is the name of an Eaſt India tree, very famous throughout that part of the world for its uſes in medicine. European botaniſts have called it malus *Indica fructu pentagono*, or the Indian apple tree, with a five cornered fruit. It ſeldom grows to above twelve feet high, and is not commonly wild, even in the Eaſt Indies, but is carefully cultivated in gardens, where it flowers all the year round. The juice of the root is drank as a cure for fevers. The leaves boiled, and made into a cataplaſm with rice, are efficacious in all ſorts of tumors, and the juice of the fruit is uſed in almoſt all external heats, dipping linen rags in it, and applying them to the parts. It is drank mixed with arrack, to cure diarrhœas; and the dried leaves, mixed with betel leaves, and given in arrack are ſaid to promote delivery. The fruit is pleaſant to the taſte when fully ripe, and is commonly eaten; when ſmaller, and unripe, it makes a very pleaſant pickle.

BILIOUS *Fever*, is a term uſed by medical writers to expreſs ſuch fevers as ariſe from an immediate effuſion of the bile. Theſe often ariſe from violent fits of anger in the patient, of which nature are the cholerica febris, and cauſus. The bilious or putrid fever is epidemic in camps, eſpecially in low and marſhy countries, where the air being fully of moiſt and putrid effluvia, tends to relax the fibres and promote putrefaction.

BILL, in huſbandry, denotes an edge tool, of the ax kind, with a hooked point, fitted to a handle, and uſed to lop boughs of trees, &c. When ſhort, it is called an hand bill; when long, an hedge bill.

Bill, in commerce, denotes a ſecurity for money under the hand and ſometimes ſeal of the debtor, without any condition, or forfeiture, in caſe of non-performance. In which it is diſtinguiſhed from a bond or obligation.

It has uſually been defined a writing, wherein one man is bound to another to pay a ſum of money, on a future day or preſently on demand, according to the agreement of the parties at the time when it is drawn, and the dealings between them.

Bill, in law, denotes a declaration in writing, expreſſing a wrong, or grievance, which the complaint hath ſuffered from the partycomplained of; or elſe ſome offence committed by him againſt ſome law or ſtatute of the realm. This bill, contains the fact complained of, the damages ſuſtained, and the petition of proceſs againſt the defendant for redreſs. It is commonly addreſſed to the Lord Chancellor.

Bill *in Parliament*, denotes a paper containing propoſitions offered to the houſes, to be paſſed by them, and then to be peſented to the king to paſs into an act or law.

Bill *of Exchange*, a ſhort note, or writing, ordering the payment of a ſum of money in one place, to ſome perſon aſſigned by the drawer, or remitter, in conſideration of the like value paid to him in another. It is an inſtrument ſo imported that though it wants thoſe formalities required by the common law; as ſeal, delivery and witneſſes; and ſo cannot be deemed a ſpecialty; yet it is ſuperior to any body or ſpecialty by the reſpect that is paid it, and the punctuality and preciſeneſs of the payment.

Bills *of Exchange* were unknown in the ancient Roman commerce, as well as juriſprudence. According to the common opinion, they were the invention of the Jews: who, being baniſhed France, for ſome enormous crimes charged on them, retired into Lombardy, about the twelfth century, and found means to withdraw their effects, which they had lodged in the hands of friends, by ſecret letters and bills conceived in ſhort preciſe terms, like the modern bills of exchange; and this, by the aſſiſtance of merchants and travellers.

That which conſtitutes the form and eſſence of a bill of exchange, is, the ceſſion, or transferring of a ſum of money made by the drawer, to him on whoſe account it is drawn, to be received of his correſpondent in another place; which ceſſion, or transfer, is made, in the mercantile terms, for value received, i. e. for a like ſum given by the perſon for whoſe ſake the bill is drawn, to the drawer, in money, merchandiſe, or other effects. There are therefore three things neceſſary to conſtitute a bill of exchange: 1ſt, That it be drawn in one city on another. 2dly, That there be three perſons concerned; the drawer, the preſenter, or the perſon for whom it is drawn, and the acceptor, or he on whom it is drawn. 3dly, That it make mention, that the value which the drawer has received, is either in bills of exchange, in money, merchandize, and other effects, which are to be expreſſed; otherwiſe it is no bill of exchange.

When a bill of exchange is expreſſed to be value in myſelf, it is not ſuppoſed the drawer has received the ſum; but the perſon for whom it is drawn, ſtands debtor to him for it. When a bill of exchange bears, for which ſum I promiſe to furniſh bills of exchange to ſuch a place, the perſon for whom the bill is drawn may compel him to give the bills, or to return the money.

Bills of exchange may be divided into inland and outland. Outland or foreign bills are thoſe made for money taken up in ſome other country, and are to be paid in England; or vice verſa. Inland bills are thoſe made for money taken up in one part of the kingdom, and to be repaid in another. By the ſtat. 9 and 10 W. III. theſe latter are made equally binding with the former: and the method of proteſting ſuch bills is farther regulated by 3 and 4 Anne.

Bills, *Lombard*, are inſtruments of an uncommon kind and figure, uſed in Italy and Flanders, and of late alſo in France; conſiſting of a piece of parchment, cut to an acute angle about an inch broad at top, and terminating in a point at bottom; chiefly given where private perſons are concerned in the fitting out a ſhip on any long voyage. The manner is this: the party who is deſirous to be concerned in the cargo or venture, carries his money to the merchant, who fits out the ſhip, where it is entered down in a regiſter: at the ſame time the merchant writes down on a piece of parchment, upwards of an inch broad, and ſeven or eight inches long, the name of the lender, and the ſum lent, which being cut diagonalwiſe, or from corner to corner, each party retains his half. On the return of the veſſel, the lender brings his moiety to the merchant, which being compared with the other, he receives his dividend accordingly. Much the ſame is practiſed in Holland by thoſe who lend money on pledges: the name of the borrower, and the ſum, are written on a like ſlip of parchment which is cut in two, and half given to the borrower, and the other half ſtitched to the pledge; that, upon comparing them together again, the borrower may receive his goods on paying the money ſtipulated.

Bank **Bills**, are notes or obligations ſigned on behalf of the company of the Bank, by one of their caſhiers, for value received.

Bill *of Parcels*, is an account of the particular ſorts and prices of goods bought, given by the ſeller to the buyer.

Bill *of Lading*, is an inſtrument ſigned by the maſter of a ſhip, acknowledging the receipt of a merchant's goods, and obliging himſelf to deliver them, at the place to which they are conſigned, in good condition. Of ſuch bills there are uſually three: the firſt, the merchant keeps; the ſecond is ſent to the factor to whom the goods are conſigned; and the third is kept by the maſter of the ſhip.

Bill *of Sale*, is when a perſon, wanting a ſum of money, delivers goods as a ſecurity to the lender, to whom he gives this bill, impowering him to ſell the ſaid goods, in caſe the ſum borrowed is not repaid, with intereſt, at the time appointed.

Bill *of Store*, is a kind of licence granted at the cuſtom houſe to merchants, to carry ſuch ſtores and proviſions as are neceſſary for their voyages, cuſtom free.

Bill *of Sufferance*, is a licence granted at the cuſtom houſe to a merchant, to ſuffer him to trade from one Engliſh port to another, without paying cuſtom.

Bill *of Entry*, implies an account of goods entered at the cuſtom houſe, both inward and outward; wherein is expreſſed, the merchant importing or exporting, the quantity of goods, and the ſorts, and from whence imported, or to what place exported.

Bills *of Mortality*, are weekly liſts compiled by the pariſh clerks in and about London, containing the numbers of ſuch as die of each diſeaſe, as well as of thoſe that are born, every week.

Bill, in ornithology, is a cartilaginous ſubſtance covered with a ſkin or cutis, which forms the beak, or roſtrum, of a bird. The bill does the office of teeth in ſome birds; alſo of weapons of offence. In the parrot kind it is hooked, and ſerves to climb, and catch hold of boughs. The upper bill of this bird is filled with rows of croſs bars; and the under bill, which is much ſhorter, ſhuts within the upper, and draws againſt the roof of the mouth; by which means a kind of maſtication is effected, before the meat paſſes into the craw. The phoenicopter's bill is a true hyperbola, pointed at the end like a ſword; and what is remarkable, the upper bill of this bird moves in eating, the lower being fixed, which is the contrary of what is found in all other kinds. The wood pecker's bill is ſtrong, and ſharp enough to dig holes, and build in the heart of the hardeſt timber. Phil. Tranſ. N° 211. p. 155. N° 350. p. 509.

Billa Vera, *the Bill is true.* The grand jury indorſing a bill whereby any crime puniſhable in that court, is preſented to them, with the words *billa vera*, ſignify thereby that the preſenter has furniſhed his preſentment with probable evidence, and worthy of farther conſideration; whereupon the party preſented is ſaid to ſtand indicted to the crime, and bound to make anſwer thereto, either by confeſſing or traverſing the indictment.

BILLARD, in ichthyology, is an Engliſh name for the young of the coal fiſh, or rowling pollack, up to a certain ſize, as the cod to a certain ſize is called a codling.

BILLET, in heraldry, is a bearing, in form of a long ſquare. Billets are ſaid to be couched, or inverted, when their longeſt ſide is parallel to the top of the ſhield, and the ſhorteſt perpendicular. They are ſuppoſed to repreſent pieces of cloth of gold or ſilver, longer than broad, placed at a diſtance by way of ornament, on cloaths, and afterwards tranſlated to their coat armour; though Guillim takes the billet to repreſent a letter ſealed up. A coat is ſaid to be billetted, when it is charged with billets; thus, he bears argent-billette a croſs engrailed gules by the name of Heath.

BILLET, *Billette*, in the French cuſtoms, a little ſign in form of a caſk, hung up at places where toll is to be paid, to advertiſe paſſengers either on horſeback or in carriages, that before they advance farther, the dues are to be paid to the king, or the lord who is charged with the care of repairing the high ways.

BILLETS for fuel, are to be three feet four inches long, and the band twenty four inches round.

BILLETING *of Soldiers*, ſignifies the lodging or quartering them in the houſes of the inhabitants of any city or town.

BILLIARDS is a game played on a large table, covered with green cloth, the dimenſions of which are generally about four yards long, and two and a half wide; it has ſix pockets for the purpoſe of receiving ivory balls, which are ſtruck into them with ſticks made for the purpoſe, the one has a point at the end, which is called a cue, and the other is flat, which is called a mace.

BILLON, in coinage, is a kind of baſe metal, either of gold or ſilver, in whoſe mixture copper predominates.

BILOCULAR, in botany, is a term applied to a capſule, having two cells.

BIMEDIAL, in mathematics, a term uſed when two medial lines, as AB, and BC, commenſurable only in power, and containing a rational rectangle, are compounded; the whole AC ſhall be irrational, with reſpect to either of the two, and is called a firſt bimedial line.

BINARY *Number*, ſignifies that compoſed of two units.

BINARY *Meaſure*, in muſic, is that which is beaten equally; or where the time of riſing is equal to that of falling.

BINATED *Leaf*, in botany, a digitate leaf, conſiſting of two foliola.

BINDING *Joiſts*, in architecture, are thoſe joiſts in a floor, into which the trimmers of ſtair caſes, or well holes of the ſtairs, and chimney ways, are framed, and ſhould be ſtronger than common joiſts.

BINDING, in the art of defence, is a method of ſecuring or croſſing the adverſary's ſword with a preſſure, accompanied with a ſpring from the wriſt. See Treatiſe on the Art of FENCING.

BINDING, in falconry, is a term which implies tiring, or when a hawk ſeizes.

BINN, *Binna*, implies a ſort of cheſt or cupboard, wherein to lock up bread, meat, or other proviſions. The word is alſo uſed for a place boarded up to put corn in.

BINOCLE, or BINOCULAR *Teleſcope*, from *binus*, double, and *oculus*, eye, is a kind of inſtrument to which both the eyes may be applied, and conſequently the ſame object be obſerved at the ſame time by both. It conſiſts of two tubes, with two ſets of glaſſes of the ſame power, and adjuſted to the ſame axis.

BINOMINAL, or BINOMIAL, in algebra, ſignifies a root conſiſting of two parts, or members connected by the ſign +, or —.

Thus $a+b$ and $5-3$ are binomials, conſiſting of the ſum and difference of thoſe quantities; though the latter is uſually called reſidual. See Syſtem of ALGEBRA.

BIOGRAPHER, an author who writes a hiſtory, or life, of one or more perſons.

BIOGRAPHY, is the art of deſcribing or writing lives. It is a branch or ſpecies of hiſtory more entertaining, as well as more uſeful in many reſpects, than general hiſtory, as it repreſents great men more diſtinctly, unincumbered with a croud of other actors, and deſcending into the detail of a man's actions and character, and gives more light into human nature, as well as excites us more to imitation.

BIOUAC, BIVOUAC, or BIOVAC, in the military art, ſignifies a nightly guard performed by the whole army, when there is an apprehenſion of danger from the enemy.

BIPARTITE *Leaf*, in botany, ſignifies a leaf divided into two ſegments.

BIPENNIS, in Roman antiquity, was a two edged ax, uſed anciently by the Amazons in fight; as alſo by the ſeamen, to cut aſunder the ropes and cordage of the enemy's veſſels. The bipennis was a weapon chiefly of the oriental nations, made like a double ax, or two axes, joined back to back, with a ſhort handle. Some compare it to a figure of a pen, and ſuppoſe it hence to have acquired the name bipennis; the tube or barrel of the pen repreſenting the handle, and the point or nib the head. Modern writers uſually compare it to our halbard, or partizan; from which it differed in that it had no point, and that its ſhaft or handle was much ſhorter.

BIQUADRATE, or BIQUADRATIC, is the next power above the cube, or the ſquare multiplied by itſelf. See Syſtem of ALGEBRA.

BIQUADRATIC *Equation*, in algebra, an equation raiſed to the fourth power; or where the unknown quantity of one of the terms has four dimenſions: thus $x^4+ax^3+bx+cx+d=0$ is a biquadratic equation. See Syſtem of ALGEBRA.

BIQUADRATIC *Parabola*, in geometry, a curve line of the third order, having two infinite legs tending the ſame way.

BIQUALAR, in the cuſtoms of the Algerines, is a cook of the divan. The janizaries, whom the Algerines call oldachis, after ſerving a certain time as common ſoldiers, are preferred to be biqualars, or cooks of the divan, which is the firſt ſtep towards arriving at higher preferment. Biqualars have the care of furniſhing the officers and commanders of the Algerine ſoldiery with meat and drink in the camp, in garriſon, &c. From biqualars they are made odobachis; that is, corporals of companies, or commanders of ſquadrons.

BIRAO, in botany, is the name given by the inhabitants of the Philippine iſlands to a plant more commonly known among botanical writers by the name Tugus, and ſuppoſed to be the true Amomum of the ancient Greeks.

BIRCH TREE, *Betula*, in botany, a genus of trees of the monœcia tetrandria claſs; the characters of which are theſe: it hath male and female flowers, at ſeparate diſtances on the ſame tree; the male flowers collected in a cylindrical catkin. The flower is compoſed of three equal florets, fixed to the empalement by a ſingle ſcale, having four ſmall ſtamina. The female flowers grow in a catkin, in the ſame manner as the male, which are heart-ſhaped. They have no viſible petals, but a ſhort oval germen. It hath no pericarpium, but the ſeeds are included in the ſcales of the catkin, which are oval and winged. There are four ſpecies, the firſt of which is the common birch tree, ſo well known as to need no deſcription. This is not much eſteemed for its wood, but however may be cultivated to advantage upon barren land, where better trees will not thrive; for there is no ground ſo bad but this tree will thrive in it; it will grow in moiſt ſpringy land, or in dry gravel or ſand, where there is little ſurface. The beſt method of cultivating this tree, is to procure young plants from the woods, where they grow naturally; but where no young plants are near, they may be raiſed from ſeeds, which ſhould be carefully gathered in autumn, as ſoon as the ſcales under which they are lodged begin to ripen, otherwiſe they will ſoon fall out and be loſt: and being ſmall, ſhould not be buried deep in the ground. Autumn is the beſt ſeaſon for ſowing them; and in a ſhady ſituation they will thrive better than when expoſed to the full ſun.

If the plants take kindly to the ground, they will be fit to cut in about two years; after which they may be cut every ſeventh or eighth year, when deſigned for the broom makers only; but when they are intended for hoops, they ſhould not be cut oftener than every twelfth year.

In ſome places theſe trees are tapped in the ſpring, and the ſap drawn to make birch wine, which has been recommended for the ſtone and gravel, as is alſo the ſap unfermented. The piercing and bleeding of birch is performed thus: about the beginning of March, when the buds begin to be proud and turgid, and before they expand to leaves, with a chiſſel and a mallet cut a ſlit almoſt as deep as the pith, under ſome branch of a well ſpreading birch; cut it oblique, and not long ways, as a ſurgeon does a vein; and inſert a ſmall ſtone or chip, to keep the lips of the wound a little open; laſtly, to this orifice faſten a bottle, or other convevenient veſſel, appendant, into which will diſcharge a limpid and clear water, retaining an obſcure ſmack both of the taſte and odour of the tree. The wonder is, that, in the ſpace of twelve or fourteen days, as much juice will be gathered, as will outweigh the whole tree, body and roots. Phil. Tranſ. N° 43, p. 854. N°. 44, p. 880. N° 46. p. 917 and 963. The liquor or juice, thus procured, is uſed, in ſome northern countries, as a preſervative againſt the ſtone.

A great difference is found between the efficacy of that liquor which diſtils from the bold, or parts of the tree nearer to the root, and that which weeps out from the more ſublime branches; the former being more crude and watery, the latter purer and more refined.

BIRCH, *Fungus of*, an excreſcence growing on its trunk: it is aſtringent, and good againſt hæmorrhages; when boiled, beaten, and dried in an oven, it makes excellent ſpunk, or touchwood.

BIRCH *Leaves* are of uſe in the dropſy, itch, &c. either internally or externally applied.

BIRD, *Avis*. For names, characters, and claſſification of this part of the animal kingdom, ſee Syſtem of ORNITHOLOGY.

BIRD, in aſtronomy, avis indica.

BIRD *of Phœbus*, the raven, one of the ſouthern conſtellations.

BIRDS, in heraldry, are figures frequently borne in arms. Birds are eſteemed a more honourable bearing than fiſhes; and wild, ravenous birds, than tame ones. The terms armed, cloſe, creſted, diſplayed, jeſſed, jowlopped, languid, and membered, are applied to birds, which ſee.

BIRD *of the Wiſe*, among chemiſts, is the philoſophical mercury;

and, in general, ſublimations or ſubſtances ſpiritualized by the ſeparation of their terreſtrial part.

Bird *Call*, a little ſtick cleſt at one end, in which is put a leaf of ſome plant, wherewith to counterfeit the crier's call of ſeveral birds, and bring them to the net, or ſnare, to be taken.

A laurel leaf fitted on the bird call, counterfeits the voice of lapwings; a leek, that of nightingales, &c.

Bird's *Eye View*, is a view taken from a conſiderable height.

Bird's *Foot*, ornithopus, in botany, a genus of the diadelphia decandria claſs. Its characters are theſe: the empalement of the flower is permanent, of one leaf, tubulous, and indented in five equal ſegments at the brim; the flower is of the butterfly kind, the ſtandard heart ſhaped and entire, the wings oval, erect, and almoſt as large as the ſtandard, and the keel is ſmall and compreſſed; it has ten ſtamina, nine of which are joined, and one ſtanding ſeparate, terminated by ſingle ſummits; the germen is narrow, ſupporting a briſtly aſcending ſtyle, terminated by a punctured ſtigma. The germen becomes a taper incurved pod, having many joints connected together, which ſeparate when ripe, each containing one oblong ſeed. Linnæus enumerates four, and Miller five ſpecies.

Bird, or Fowl-mead Grass, a ſpecies of graſs, which has been lately cultivated with a particular attention. It is a fine, ſweet, ſilky graſs, with a durable verdure: throws out a great crop, and produces a large quantity of ſeed. One rood of ground yielded a hundred weight of ſeed, and a very large load of hay. It is moſt proper for upland meadow: the ſeed ſhould be left uncovered on the ground.

Bird's *Neſt*, in botany, a name uſed by ſome for the daucus, or carrot; and by others for ophrys.

Bird's *Neſts*, in cookery, the neſts of a ſmall Indian ſwallow, very delicately taſted, and frequently mixed among ſoups. On the ſea-coaſts of China, at certain ſeaſons of the year, there are ſeen vaſt numbers of theſe birds; they leave the inland country at their breeding time, and come to build in the rocks, and form their neſts out of a ſpumous matter, which they find on the ſhore, waſhed thither by the waves. They are of a hemiſpheric figure, and of the ſize of a gooſe's egg, and in ſubſtance much reſemble the ichthyocolla, or iſinglaſs. The Chineſe gather their neſts, and ſell them to all parts of the world: they diſſolve in broths, &c. and make a kind of jelly, of a very delicious flavour.

BIRDLIME, a viſcid ſubſtance, prepared various ways, and from various materials, for the catching of birds, mice, and other vermin.

The birdlime ordinarily uſed among us, is made from holly-bark, boiled ten or twelve hours; when the green coat is ſeparated from the other, it is covered up a fortnight in a moiſt place, then pounded into a tough paſte, ſo that no fibres of the wood be left, and waſhed in a running ſtream till no motes appear, put up to ferment four or five days, ſkimmed as often as any thing ariſes, and laid up for uſe. To uſe it, a third part of nut oil, or any thin greaſe, which muſt be incorporated with it over the fire.

BIRRETUM, a thin black cap or cover for the head, made of linnen, fitted cloſe to the head, and pointed by a pyramid, anciently worn by prieſts, ſoldiers, doctors, &c.

The word birretum, ſometimes written birrettum and biretum, is alſo applied to a cap or coif of a judge, or ſerjeant at law.

The birretum alſo denotes the cap worn by the novices in the jeſuits order, formerly of a ſquare, now a round figure.

The birret was the ordinary cover of the head in France five hundred years ago. It took its denomination from birrus or birrum, the coat anciently uſed by eccleſiaſtics; with which the cap was then of a piece, and made part of it; ſo that the whole covered not only the head, but the ſhoulders. Afterwards when they began to retrench the lower part, ſtill retaining the upper, it was no longer called birrus, or birrum, but diminutively birret, or birretum.

BIRTH, the natural excluſion of a perfect fœtus from the womb by the vagina. See Syſtem of Midwifery.

Birth, or Birthing, among ſeamen, denotes the due diſtance obſerved between ſhips lying at an anchor, or under ſail. A convenient place a-board for a meſs to put their cheſts, ſleep, &c. is alſo called a birth. There is uſually one of theſe in ſhips of war between every two guns. And a proper place to moor a ſhip in is called by the ſame name, as is alſo the ſtation in which a ſhip rides at anchor.

Birth, *Expoſition of*, among the ancients, was where a new born infant was expoſed or caſt away, and left to the mercy of the firſt comer, who might either take and bring it up, or ſuffer it to periſh.

Birth, *Suppreſſion of, partus ſuppreſſio*, is the crime of a woman, who endeavours, by medicines, to deſtroy or hinder the birth of a child: or, after its being born, hides, expoſes, or even ſtrangles it.

Birth *Day*, the anniverſary return of the day whereon a perſon was born.

The ancients made much of their religion to conſiſt in the celebration of birth days, and took omens from thence of the felicity of the coming year. We meet with birth days of the gods, emperors, great men, poets, and even private perſons. What is more, the birth days of cities, as Rome and Conſtantinople, were celebrated with great pomp by the inhabitants. Virgil's birth day was held very ſtrictly by the wits and poets who ſucceeded him. Pliny aſſures us, that Silius kept it with more ſolemnity than he did his own. Epiſt. lib. iii. ep. 7.

The manner of celebrating birth days was by a ſplendid dreſs; wearing a ſort of rings peculiar to that day; offering ſacrifices, the men to their genius, of wine, frankincenſe: the women to Juno; giving ſuppers, and treating their friends and clients; who, in return, made them preſents, wrote and ſung their panegyrics, and offered vows and good wiſhes for the frequent happy returns of the ſame day.

The birth days of emperors were alſo celebrated with public ſports, feaſts, vows and medals ſtruck on the occaſion.

But the ancients, it is to be obſerved, had other ſorts of birth days beſides the days on which they were born. The day of their adoption was always reputed as a birth day, and celebrated accordingly.

The emperor Adrian, obſerved three birth days; viz. the day of his nativity, of his adoption, and of his inauguration. Fabr. Bib. Græc. tom. xii. lib. vi. cap. 6. In thoſe times it was held, that men were not born only on thoſe days when they firſt came into the world, but on thoſe alſo when they arrived at their chief honours and command in the commonwealth, e. gr. the conſulate. Hence that of Cicero in his oration Ad Quirites, after his return from Exile: *A parentibus id quod neceſſe erat, parvus ſum procreatus, a vobis natus ſum conſularis.*

Beſides, thoſe who returned from baniſhment, were alſo conſidered as being born again, renati, and ever after called the day of their return their birth day. Thus Cicero to Atticus: *Diemque natalem reditus mei cura, a in tuis ædibus amæniſſimis agam tecum, & cum meis.*

Cenſorinus has a treatiſe De Die Natali, addreſſed to Quintus Cerellius; as a compliment on his birth day.

Birth *Days of the Saints and Martyrs, natales ſanctorum*, denote the days of their deaths.

Birth *Wort*, in botany, the Engliſh name of the plant Ariſtolochia, a genus of the gynandria hexandria claſs. Its characters are theſe: the flower is of one leaf, which is unequal, the baſe is ſwelling and globular; it is afterward extended in a cylindrical tube, which ſpreads open at the brim, where the lower part is ſtretched out like a tongue; the oblong angular germen ſits under the flower, which afterwards turns to a large ſeed veſſel, differing in form, which opens in ſix cells, filled with ſeeds, for the moſt part compreſſed. There are nine ſpecies, one of which is the ſnake root, which is greatly uſed in medicine; theſe roots are brought over from Virginia and Carolina. There are ſome of theſe plants preſerved in the gardens of thoſe who are curious; but as they are ſometimes killed by froſt in winter, ſo they are not very common in the Engliſh gardens.

BIS *Annual*, a name given by botaniſts to thoſe plants which ordinarily do not flower till the ſecond year.

BISA, or Biza, a coin in Pegu, current there for half a ducat. The denomination is alſo given to a kind of weight uſed in the ſame country, equivalent to two Venetian pounds five ounces, or to three pounds nine ounces of the ſmaller weight of that city.

BISACUTA, in middle age writers, is an axe with two edges, or which cuts either way; or a miſſive weapon, pointed at both ends.

BISARCA, in botany, a name uſed by ſome authors for the herb tarragon.

BISBÆA, a feaſt celebrated by the Meſſapii, after the pruning of their vines, to obtain of the gods that they might grow again the better.

The word is formed from βισϐη, uſed by ſome for a vine.

BISCAIAN *Language* denotes the Cantabrian, or ancient language of Spain, being a branch of the Celtic, which firſt gave way to the Romanſe.

BISCIA, in ichthyology, a name by which ſome have called the acus, or, as we call it in Engliſh, the tobacco-pipe-fiſh, the needle-fiſh, or trumpet-fiſh.

BISCUIT, a kind of hard flat bread, or ſweet cake; for the method how to make them, ſee Treatiſe on the Art of Confectionary.

BISERRULA, in botany, a genus of the diadelphia decandria claſs. We have no Engliſh name for this plant. Its characters are theſe: the flower is papilionaceous, having a large roundiſh ſtandard, whoſe edges are reflexed;, the wings are oblong, and the keel is of the ſame length with the wings. It hath ten ſtamina, nine of which are joined, and the other ſingle: in the centre is ſituated an oblong compreſſed germen, which afterwards becomes a flat, narrow pod, indented on both edges, like the ſaw of a ſword-fiſh, having two cells filled with kidney-ſhaped ſeeds. There is but one ſpecies, which is an annual plant, and grows naturally in Italy, Sicily, Spain, and the ſouth of France.

BISETÆ, in entomology, is a term uſed to expreſs a genus of flies of the claſs of the Seticaudæ, diſtinguiſhed from the others by their having two hairs or briſtles growing out of their tail. There are many ſpecies uſually divided by authors into two principal kinds; ſuch as have ſharp ends, and ſuch as have blunt ones, the former of which are found in our hedges.

BISHOP, is a prelate, or perſon conſecrated for the ſpiritual government and direction of a dioceſe.

A biſhop differs from an archbiſhop in this, that an archbiſhop with biſhops conſecrate a biſhop, as a biſhop with prieſts, ordain a prieſt; that the archbiſhop convocates a provincial ſynod, as the biſhop a dioceſan one; and that the archbiſhop has canonical authority over all the biſhops of his province, as the biſhop over the prieſts in his dioceſe. The election of biſhops was anciently placed in the clergy, and the people of the pariſh, province, or dioceſe; but afterwards, princes and magiſtrates, patriarchs and popes, uſurped the power. The election was to be within three months after the vacancy of the ſee; and the perſon to be choſen out of the clergy of that church. Formerly the biſhop claimed a ſhare in the election of an archbiſhop; but this was ſet aſide by the popes.

In England, during the Saxon times, all eccleſiaſtical dignities were confirmed by the king in parliament. At length, however, after ſeveral conteſts, eſpecially between archbiſhop Anſelm and Henry I. in conſequence of a grant of king John, recogniſed in Magna Charta, and eſtabliſhed by ſtat. 25 Edw. III. ſtat. 6. § 3. biſhops were elected by the chapters of monks or canons, ſome ſhadow of which ſtill remains in the preſent method of diſpoſing of biſhopricks. But by ſtat. 25 Hen. VIII. cap. 20. the right of nomination was reſtored to the crown.

Three biſhops are required in the ceremony of conſecrating a biſhop; but, in ſome caſes, a ſingle one may ſuffice. The Engliſh ſucceſſion of proteſtant biſhops ſtands on this laſt ground.

In England, the king being certified of the death of a biſhop by the dean and chapter, and his leave requeſted to elect another, the choice muſt be made within twelve days after, otherwiſe the king by letters patent appoints whom he pleaſes; and the chapter, in caſe of refuſing the perſon named by the king, incurs a præmunire. After election, the king grants a mandate under the great ſeal for confirmation, which the archbiſhop conſigns to his vicar-general, conſiſting moſtly in a ſolemn citation of ſuch as have any objections to the biſhop elect, a declaration of their contumacy in not appearing, and an adminiſtration of the oaths of allegiance and ſupremacy, of ſimony, and canonical obedience. This being read by the vicar general, the biſhop is inſtalled in the province of Canterbury by the archdeacon: the fact is recorded by a public notary; and the biſhop is inveſted with full powers to exerciſe all ſpiritual juriſdictions, though he cannot ſue for his temporalities till after conſecretation. Then follows the conſecration by the archbiſhop, or ſome other biſhop appointed by lawful commiſſions, and two aſſiſtant biſhops; the ceremony of which is much the ſame as in the Romiſh church, except having put on the epiſcopal robes, the archbiſhop and biſhops lay their hands on the new prelate's head, and conſecrate him with a certain form of words. The fees of the whole proceſs are ſaid to amount to about 600 l.

The proceſs of the tranſlation of a biſhop to another biſhopric only differs in this, that there is no conſecration. The age of a perſon choſen to a biſhopric muſt be at leaſt thirty years.

The function of a biſhop in England may be conſidered as twofold; viz. what belongs to his order, and what belongs to his juriſdiction. To the epiſcopal order belong the ceremonies of dedication, confirmation, and ordination; to the epiſcopal juriſdiction, by the ſtatute-law, belong the uniting ſmall pariſhes (though this laſt privilege is now peculiar to the biſhop of Norwich), aſſiſting the civil magiſtrate in the execution of ſtatutes relating to eccleſiaſtical matters, and compelling the payment of tenths and ſubſidies due from the clergy.

By the common law, the biſhop is to certify the judges, touching legitimate and illegitimate births and marriages; and by that and the eccleſiaſtical law, he is to take care of the probate of wills, and granting adminiſtrations; to collate the benefices, grant inſtitutions on the preſentation of other patrons, command induction, order the collecting and preſerving the profits of vacant benefices for the uſe of the ſucceſſors, defend the liberties of the church, and viſit his dioceſe once in three years. To the biſhop alſo belong ſuſpenſion, deprivation, depoſition, degradation, and excommunication.

The biſhops of England are all barons. Barons in a two-fold manner; viz. feudal, in regard of lands and baronies annexed to their biſhoprics; and by writ, as being ſummoned by writ to parliament. They have the precedence of all other barons, and ſit in the upper houſe as barons. They are twenty-four in number, excluſive of the biſhop of Soder and Man, who is excluded the privileges they enjoy from his being nominated by the lord of that Iſle; whereas the others are nominated by the king. With reſpect to order of precedency among one another, the archbiſhop of Canterbury takes the lead; then the archbiſhop of York; next to him the biſhops of London, Durham, and Wincheſter. The other biſhops follow according to the ſeniority of their conſecration; excapting only, that a biſhop being a privy counſellor, takes place after the biſhop of Durham. See Syſtem of Peerage.

Biſhops have two ſpecial privileges next to regal; the firſt, that in their courts they ſit, and paſs ſentence of themſelves, and by their own authority: the biſhops courts being not like other courts, but writs are ſent out in their own name, teſte the biſhop, not in the king's name, as is done in the king's courts. The ſecond, that, like the king, they can depute their authority to another, as their ſuffragan, chancellor, commiſſary, &c.

They have alſo this advantage over lay-lords, that, in whatever Chriſtian country they are, their epiſcopal degree and dignity are acknowledged; and they may, quatenus biſhops, ordain, &c.

They have ſeveral immunities, as from arreſts, outlawries, diſtreſs, &c. liberty to hunt in the king's foreſts, &c. to have certain tuns of wine, duty-free, &c. Their perſons may not be ſeized, as lay-peers may, upon contempt, but their temporalities alone. They may qualify as many chaplains as a duke, viz. ſix. But, as they have no right to be tried themſelves in the court of the lord-high ſteward, as peers, they ought not to be judges there.

Bishop *Abbot*, was an abbot inveſted with the epiſcopal order; of which we meet with ſeveral in the more conſiderable monaſteries.

Bishop, *Cardinal*, a biſhop in chief, or in capite.

Bishop *Elect*, is he who has the king's nomination, with the ſanction of the chapter; but without conſecration.

Bishops, *Suffragan*, are coadjutors or aſſiſtants of dioceſan biſhops, authoriſed by commiſſion from him.

Bishops, *Exempt*, thoſe freed from the juriſdiction of the metropolitan, and immediately ſubject to the ſee of Rome alone.

Bishops, *Commendatory, or Biſhops in Commendam*, are cardinals not of the order of biſhops, or other prelates, yet hold biſhopricks in commendam. The appellation had its origin during the reſidence of the papal ſee at Avignon, whence ſcarce any cardinal, prieſt, or deacon, was created, who held not one, two, three, or more biſhopricks in commendam.

Bishop, *Univerſal* or *Catholic*, is a title given to the patriarch of Armenia.

Bishop *of the Catholic or Univerſal Church*, a title ſometimes aſſumed by the popes.

Bishop's *See* denotes the city or place where the reſidence of the biſhop is fixed.

Bishop, in entomology, is a little ſpotted beetle, commonly called the lady cow or lady bird.

Bishop's *Weed*, in botany, is a genus belonging to the pentandria digynia claſs of Linnæus. Its characters are theſe: it is an umbelliferous plant, with difform flowers, each having five heart ſhaped petals; they have five ſlender ſtamina, and two reflexed ſtyles, crowned with obtuſe ſtigmas; the germen becomes a ſmall, round ſtriated fruit, compoſed of two ſeeds. There are three ſpecies, neither of which admit of particular deſcription.

Bishop, in ornithology, is a name given to a beautiful ſinging bird in Louiſiana.

BISHOPING, in horſemanſhip, is a term denoting the arts uſed by jockies for making old horſes appear young, &c.

BISHOPRIC, the juriſdiction of a biſhop: or the diſtrict within which it is compriſed; called alſo dioceſe.

BISK, or **Bisque**, in cookery, a rich ſort of broth or ſoop, made of pigeons, chickens, force-meat, mutton gravy, and other ingredients.

BISKET, or **Bisqet**, uſually denotes a kind of bread prepared by the confectioners, of fine flour, eggs, ſugar, and roſe or orange water; or of flour, eggs, and ſugar, with aniſe ſeeds and citron peel; baked in the oven in tin or paper moulds.

Sea **Bisket**, is a ſort of bread much dried, by paſſing the oven twice, to make it keep for the ſervice of the ſea. For long voyages they bake it four times, and prepare it ſix months before the embarkation. It will hold good a whole year. To preſerve ſea biſkets from inſects, Dr. Hales adviſes to make the fumes of burning brimſtone paſs through the caſks full of bread. It may likewiſe be preſerved a long time, by keeping it in caſks well calked, and lined with tin.

BISLINGUA, in botany, a name uſed by many authors for the narrow leaved ruſcus, or butchers broom; called by many others, the Alexandrian bay, or laurus Alexandria.

BISMILLAH, is a ſolemn word uſed by the Mahometans at the beginning of their books and writings, and ſignifies, in the name of the moſt merciful God.

It is alſo uſed among the Arabs, as a word of invitation to eat.

BISMUTH, in mineralogy, is a ſubſtance of the ſemimetallic kind, and found uſually in tin mines, though ſometimes alſo in ſilver mines. Its weight and colour diſcover it to be of a mercurial or metallic nature. In common menſtruums, it undergoes much the ſame alterations, and aſſumes much the ſame forms as lead. Its ſubſtance is hard, ponderous, and brittle, of a large grain, gloſſy, white, and ſhining. It is alſo called tin glaſs; becauſe, when broken, it ſhews a vaſt number of little poliſhed laminæ like glaſs: it is alſo called marcaſite, by way of excellence, becauſe ſurpaſſing all other marcaſites, or ſemimetals, in whiteneſs and beauty.

It appears to be compoſed of cubes, formed by the application of plates upon each other. Its colour is leſs white than that of the regulus of antimony, and has a reddiſh tinge, eſpecially when expoſed to the air. It is the heavieſt of the ſemimetals, and loſes in water about a ninth part of its weight: its ſpecific quantity being from 9.600 to 9.700. Like the other ſemimetals, it is ſemi volatile; when expoſed to the fire, flowers riſe from it; it is calcined and converted into a litharge and glaſs nearly as lead is, and, like it, may be employed to the purification of gold and ſilver by cupellation. It eaſily combines with ſulphur, and amalgamates with mercury, and unites with all metallic matters, excepting zinc and arſenic.

BISOMUM, in antiquity, a tomb for two bodies, or the aſhes of two. The ancients frequently buried two, three, or four bodies in the ſame ſepulchre, diſpoſed a-ſide of each other; for it was held an impiety to lay one on the other. Hence the ſepulchres of the primitive Chriſtians had the words *biſomi*, *triſomi*, *quadriſomi*, &c. inſcribed on them, to indicate the number of bodies depoſited in them.

BISON, in tetrapodology, is a trivial name for a ſpecies of the bos.

BISSACRAMENTALES, a denomination given by ſome Romiſh writers to proteſtants, on account of their only holding two ſacraments, viz. baptiſm and the ſupper of the Lord.

BISSECTION, in geometry, the diviſion of any quantity into two equal parts, otherwiſe called bipartition.

BISSELÆON, in the materia medica, a name uſed to expreſs the oil of pitch, or that fluid ſubſtance which ſwims at the ſurface of melted pitch, and which was taken up by means of wool or cotton by the ancients, and uſed in many external diſorders. The common name of this oil was piſſelæum; and this other name is only a corrupt way of ſpelling it. The old authors, in many other words as well as this, have changed the initial P into B.

BISSEXTILE, or Leap Year, in chronology, ſignifies a year conſiſting of 366 days, happening once in four years, and which takes place by reaſon of the addition of a day in the month of February, to recover the ſix hours which the ſun ſpends in his courſe each year, beyond the 365 days uſually aſſigned to it.

BISTI, in commerce, is a Perſian coin valued at ſixteen or eighteen French *deniers*.

BISTORT, in botany, is the trivial name of the polygonum.

BISTOURY, a kind of ſurgeon's cutting inſtrument, of the knife kind; much uſed in making inciſions.

BISTRE, among painters, ſignifies the oil extracted from the ſoot of wood.

BIT, or Bitt, in the menage, is an eſſential part of a bridle. It is made of iron, and held by the horſe in his mouth, which the reins draw as a curb, and direct his courſe in travelling.

Bit, in commerce, is a Spaniſh coin in the Weſt Indies, valued at 7½ Engliſh.

Bit is alſo uſed for a little tool, fitted to a ſtock or handle, to bore withal. In this ſenſe we ſay, the bit of a piercer, an augre, or the like; meaning that iron part of thoſe tools, wherewith the holes are bored.

Bit *of a Key* is that part fitted at the right angles to the ſhank of the key, wherein the wards are made.

Bits, or *Bitts*, in a ſhip, are two great pieces of timber uſually placed abaſt the manger in the ſhip's loof, through which the croſs piece goes, their lower parts being faſtened to the rudders; and their middle parts, in great ſhips, bolted to two large beams, croſs the bows. Their uſe is to belay the cable to, when the ſhip rides at anchor.

BITTACLE, or Binacle, a ſquare box, or frame of timber. placed in the ſteerage of a ſhip, wherein the compaſs is placed.

BITTER, in the materia medica, is an epithet given to all bodies which excite a hot, pungent, and aſtringent taſte, like that of wormwood. Figuratively, the word implies, wretched, miſerable, painful, diſagreeable, unpleaſing and hurtful. In navigation, it ſignifies any turn of the cable round the bitts, ſo that it may be let out gradually, or by degrees. When a ſhip is ſtopped by the cable, ſhe is ſaid to be brought up by a bitter; likewiſe the end of the cable wound about the bitts is called the bitter end.

BITTERN, in ornithology, is the name of a bird of the heron kind, called by authors *ardea ſtellaris*; and by ſome *taurus*, *betaurus*, *butorious*, and *ocnus*: in Engliſh, the butterbump, and mire drum. It builds on the ground, and lays five or ſix eggs, which are roundiſh, and of a greeniſh white. When wounded, and going to be taken, it ſtrikes at the perſon's eye, and ought carefully to be guarded againſt.

BITUMENS, in natural hiſtory, are oily matters of a ſtrong ſcent, and of different conſiſtencies, found in various parts of the world in the bowels of the earth.

BITUMINOUS, ſomething that relates to, or partakes of the nature and qualities of bitumen. All bituminous bodies are offenſive to the head. Their ſcent or ſtench diſcovers the diſorder called the epilepſy.

BIVALVE, in botany, ſignifies the capſules, or pods, which incloſe ſeeds. It alſo implies thoſe fiſh that have two ſhells, as muſcles, cockles, oyſters, &c.

BIVENTER, in anatomy, is the ſixth muſcle of the lower jaw.

BIUMBRES, in geography, an appellation given to the inhabitants of the torrid zone, becauſe at two different ſeaſons of the year, their ſhadows are projected two different ways. They are the ſame with thoſe otherwiſe denominated Amphiſcii.

BIXA, in botany, is a genus of the polyandria monogynia claſs; its characters are theſe: the flower hath a double ſeries of petals, the outer conſiſting of five, which are large, the inner of the ſame number and ſhape, but narrower. It hath a great number of briſtly ſtamina: in the centre is ſituated an oval germen, which afterwards becomes an oval heart ſhaped capſule, covered with ſharp briſtles, opening with two valves, with one cell, and filled with angular ſeeds. We have but one ſpecies of this genus; which muſt be conſtantly kept in a bark ſtove, or they will not thrive in England,

BIZZARRE, in botany, a term uſed among floriſts for a particular kind of carnation, which has its flowers ſtriped or variegated with different colours.

BLACK, ſignifies ſomething opake and porous, that imbibes all the light falling on it, reflects none, and therefore exhibits no colour. There are various kinds of *blacks* in commerce: viz. *blue black*, *dyers black*, *painters black*, *German black*, *ivory black*, *Spaniſh black*, *lamp black*, *Indian black*, *&c.*

Black, in heraldry, is properly called ſable.

Blue Black is the coal of ſome kind of wool, or other vegetable matter: the beſt ſort is ſaid to be made of vine ſtalks and tendrils.

Dyers Black is one of the five ſimple and mother colours, uſed in dyeing; and given differently, according to the different quality and value of the ſtuffs to be dyed.

Ivory Black is made of ivory burnt or charred, ordinarily between two crucibles, well luted: which, being thus rendered perfectly black, and in ſcales, is ground in water, and made into troches, or little cakes, uſed by the painters; as alſo by the jewellers to blacken the bottom or ground of the collets, wherein they ſet diamonds to give them their teint or foil. There are particular machines and contrivances for burning the ivory for theſe purpoſes, by which the colour is rendered more beautiful than that of the coal which remains in the diſtillation. The goodneſs of ivory black may be perceived by its fullneſs, without a blue caſt; and by the fineneſs of the powder.

Lamp or *Lam* Black, is generally prepared by melting and purifying reſin or pitch in iron veſſels; then ſetting fire to it under a chimney, or other place made for the purpoſe, lined on the top with ſheep ſkins, or thick linen cloth, to receive the vapour or ſmoak, which is the black: in which manner they prepare vaſt quantities of it at Paris. In England it is ordinarily prepared from the reſinous and fatty parts of woods, burnt under a kind of tent, which receives it; but the greateſt part is brought from Sweden and Norway, where it is frequently obtained, not from pure reſin or pitch, but from the dregs; and pieces of the bark of the tree, ſeparated in preparing them. The droſs left on ſtraining the reſin is burnt for lamp black, in a low oven, from which the ſmoak is conveyed by a long paſſage into a ſquare chamber, having an aperture in the top, upon which is faſtened a large ſack. The ſoot concretes partly in the ſack, aud partly in the chamber and canal. It is uſed on various occaſions, particularly in printers ink; for which it is mixed with oils of turpentine and linſeed, all boiled together.

It muſt be obſerved, that this black takes fire very readily, and when on fire is very difficultly extinguiſhed; the beſt method of putting it out is with wet linen, hay, or ſtraw; for water alone will not do it.

Black *Berry*, in botany, a ſpecies of the raſp-berry.

Black *Bird*, in ornithology, is a bird ſo called from the colour of its feathers. Its bill is yellow, and its ſong reſembles that of a man's whiſtling, which it imitates with great exactneſs and docility.

Black *Canons*, is a name given to the regular canons of St. Auguſtine, who wore a black mantle over their ſurplice, by way of diſtinction from the Præmonſtratenſes.

Black *Cap*, in ornithology, is a name given by the common people of many counties of England to the pewit, a bird of the gull kind.

It is alſo the common Engliſh name for the parus paluſtris, or marſh titmouſe.

This is one of the ſmalleſt birds: the crown of the head in the male is black, but in the female of a dull duſt colour. It ſings finely, with a full, ſweet, deep, loud, wild pipe: its ſtrains are ſhort, and motions deſultory. Its notes are ſuperior to thoſe of any of our feathered warblers, the nightingale excepted: and it is therefore called in Norfolk the mock-nightingale.

Black *Diver*, in ornithology, a name given by many to a ſpecies of duck very common about the coaſts of Lancaſhire, Yorkſhire, and ſome other counties, and called more generally the Scoter.

Black *Legs*, a name given in Leiceſterſhire, to a diſeaſe frequent among calves and ſheep. It is a kind of jelly, which ſettles in their legs, and often in the neck, between the ſkin and fleſh.

It is alſo a term for ſuch perſons as live by gambling and fraud.

BLADDER, in anatomy, is a thin expanded membranous body, which ſerves as the receptacle of the urine after its ſecretion from the blood in the kidneys, ſituated in the pelvis of the abdomen: in men immediately on the rectum; in women, on the vagina uteris. It likewiſe ſignifies a paſtule, bliſter, or the ſwelling ſing of a membrane filled with any juice or fluid, ſuch as that which ariſes after ſcalding or burning. See Syſtem of ANATOMY.

BLADDER *Nut*, in botany, a genus of the pentandria trigynia claſs. Its characters are theſe: the empalement is concave, coloured, and ſo large as to encloſe the flower, which has five oblong erect petals, and a pitcher ſhaped concave nectarium, at the bottom of the flower, with five oblong erect ſtyles terminated by ſingle ſummits, and a thick germen divided in three parts, ſupporting three ſtyles to which there are obtuſe ſtigmas contiguous. The germen afterward becomes two hard almoſt globular ſeeds, included in three bladders, joined by a longitudinal ſeam, with an acute point, opening within. There are two ſpecies; the bladder nut with winged leaves; and, the bladder nut, with trifoliate leaves, or three leaved Virginian bladder nut. The firſt makes a pretty variety, when intermixed with others; though the flowers are not very beautiful. The nuts of this tree being hard and ſmooth, are ſtrung for beads by the Roman catholics in ſome countries; and the children of the poor inhabitants eat the nuts, though they have a diſagreeable taſte. It is ſaid that from the ſeeds are extracted an oil, having a reſolvent virtue.

BLADE, in botany, ſignifies the ſpine, or leaf of graſs, before it grows to ſeed; the green ſhoots, or leaves of corn, which riſe from the ſeed. Hence that part of a ſword, or knife, is called a blade, from its reſembling a blade of graſs.

BLADE, or BLADE BONE, in anatomy, is the ſcapula, or ſcapular bone, of a flat and triangular form. See Syſtem of ANATOMY.

BLADE *of a Saw*, the thin part wherein the teeth are cut, which to be good, muſt be ſtiff, yet bend equally into a regular bow all the way, without yielding more in one place than another.

BLÆRIA, in botany, a genus of the tetrandria monogynia claſs of plants. Its characters are: that the calyx is quadripartite, the corolla quadrified, the ſtamina inſerted in the receptacle, and the fruit a capſule, with four cells, containing many ſeeds. There are two ſpecies.

BLÆSUS, among medicinal writers, the ſame with balbus. Dr. Holder calls the letters F and Th *bleſe*, on account of the difficulty multitudes find of pronouncing them.

The word is alſo uſed to denote an irregularity in the figure or the limbs, eſpecially the legs, when bent outwards.

BLAIN, a diſtemper incident to beaſts, conſiſting in a bladder growing on the root of the tongue againſt the wind pipe, which, at length ſwelling, ſtops the breath.

It is perceived, by the beaſt's gaping, holding out the tongue, and foaming at the mouth: to cure it, caſt the beaſt, take forth his tongue, and then ſlitting the bladder, waſh it gently with vinegar and a little ſalt. See FARRIERY.

BLAKEA, in botany, a genus of the claſs of dodecandria monogynia: with a calyx compoſed of ſix leaves below, and entire above; ſix petals, and a ſix celled polyſpermous capſule. There is only one ſpecies.

BLANC *Mange*, pronounced *bleau-mange*, Fr. q. d. *white food*, is a preparation of diſſolved iſinglaſs, milk, ſugar cinnamon, &c. boiled into a thick conſiſtence, and garniſhed for the table with blanched almonds. It is cooling and ſtrengthening. See the Art of CONFECTIONARY.

BLANCARDS, half bleached, a name given to linen cloth, thus called, becauſe the thread uſed to weave them, has been half blanched or bleached before it was uſed. They are manufactured in Normandy, particularly in the places which are in the diſtrict, or under the juriſdiction of Pont-Audemer, Bernay, and Liſieux.

BLANCHERS, a name given to thoſe employed in branching, i. e. the art or manner of bleaching or whitening.

BLANCHING, in gardening, is an operation performed on certain ſallads, roots, &c. as of celery, and endives; to render them fairer and better for the table.

BLANCHING alſo denotes the operation of covering iron plates with a thin coat or cruſt of tin.

BLANCHING *of Copper*, for ſale, in imitation of ſilver; or mixing blanched copper with ſilver, or expoſing the ſame to ſale; or any malleable compoſition or mixture of metals or minerals heavier than ſilver, and which looks, touches, and wears like gold, but is manifeſtly worſe than ſtandard, is made felony, 8 and 9 W. III. &c. 26.

BLANCHING *of Wax*, ſee WAX.

BLANCHING, in coinage, the operation of preparing the pieces before ſtriking, to give them the requiſite luſtre and brightneſs.

The blanching, as now practiſed, is performed by nealing or heating the pieces in a kind of pan or ſhovel, with a wood fire, in manner of a reverberatory furnace, ſo that the flame paſſes over the ſhovel. The pieces being ſufficiently heated, and cooled again, are put ſucceſſively to boil in two copper pans, wherein are aqua fortis, common ſalt, and tartar of Montpellier; when they have been well drained of this firſt water in a copper ſieve, they throw ſand and freſh water over them; and when dry they are well rubbed.

BLANK, a ſmall copper coin, formerly current in France, at the rate of five deniers Tournois.

BLANK, or *Blank Ticket*, in lotteries, that to which no prize is allotted.

The French have a game, called *blanque*, anſwering to our lottery.

BLANK, in coinage, a plate, or piece of gold, or ſilver cut and ſhaped for a coin, but not yet ſtamped.

BLANK, in ichthyology, a name given by authors to a ſpecies of the cod fiſh, called gelbe, kolmulen, and aſellus flaveſcens.

BLANK *Bar*, in law, is uſed for the ſame with what we call a common bar, and is the name of a plea in bar, which in an action of treſpaſs is put in to oblige the plaintiff to aſſign the certain place where the treſpaſs was committed.

Likewiſe certain void ſpaces ſometimes left by miſtake. A blank (if ſomething material be omitted) in a declaration, abates the ſame; and ſuch a blank is a good cauſe of demurrer.

BLANK *Verſe*, verſe which terminates without rhyme. See VERSE.

BLANKET, in commerce, a warm woolly ſort of ſtuff, light and looſe woven; chiefly uſed in bedding.

The manufacture of blankets is chiefly confined to Witney in Oxfordſhire, where it is advanced to that height, that no other place comes near it. Some attribute a part of the excellency of the Witney blankets to the abſterſive nitrous water of the river Windruſh, wherewith they are ſcoured; others think they rather owe it to a peculiar way of looſe ſpinning, which the people have thereabouts. Be this as it will, the place has ingroſſed almoſt the whole trade of the nation for this commodity; inſomuch, that the wool fit for it centres here, from the farthermoſt parts of the kingdom. Attempts have been frequently made to eſtabliſh this branch of manufacture in various parts of the kingdom, but without ſucceſs.

Blankets are made of felt wool, i. e. wool from off ſheep ſkins; which they divide into ſeveral ſorts.

Of the head wool, and bay wool, they make blankets of twelve, eleven, and ten quarters broad; of the ordinary and middle ſort, blankets of eight and ſeven quarters broad; of the beſt tail wool, blankets of ſix quarters broad, commonly called cuts, ſerving for ſeamen's hammocks.

Toſſing in a BLANKET, a ludicrous kind of puniſhment, of which we find mention in the ancients, under the denomination *ſagatio*. Martial deſcribes it graphically enough. *Ibis ab excuſſo, miſſus ad aſtra, ſago.* A diſcipline ſometimes practiſed at the preſent refined æra; particularly at Weſtminſter ſchool, and other large ſeminaries.

BLANQUILLE, a ſmall ſilver coin, equivalent to about 1½d. ſterling, current in Morocco, and on the coaſts of Barbary.

BLARE, a ſmall copper coin, containing a little mixture of ſilver, ſtruck at Bern, and valued at much the ſame with the ratze in other places.

BLASIA, in botany, the name of a genus of plants belonging to the claſs of cryptogamia algarum, approaching to the nature of the lichens; the characters of which are theſe: the male flower has a cup compoſed of one leaf, which is oval at the baſe, ſomewhat cylindric in the middle, and expanded and truncated at the top; in this are contained a number of looſe granules, which ſeem to perform the office of apices, and contain the farina fæcundans. The female flower has ſcarce any cup, but produces a ſingle roundiſh fruit, uſually immerſed in the leaves; in this are contained certain round bodies, which appear to be ſeeds. Linnæus is much in doubt, whether theſe flowers are not to be underſtood a contrary way, and ſeems to ſuſpect, that what are called female flowers are really male ones; and what are called male, female.

BLASPHEMY, BLASPHEMIA, or BLASPHEMIUM, in middle age writers, denotes ſimply the blaming or condemning of a perſon or thing.

By the Moſaic law, blaſphemy was puniſhed with death. Levit. chap. xxiv. ver. 13, 16. As alſo by the civil law. Novel. 77. In Spain, Naples, France, and Italy, the pains of death are not now inflicted. In the empire, either amputation, or death, is made the puniſhment of this crime.

By the canon law, blaſphemy was puniſhed only by a ſolemn penance; and by cuſtom, either by a pecuniary or corporal puniſhment. By the Engliſh laws, blaſpheming God, as denying his being, or providence, and all contumelious reproaches of Jeſus Chriſt, &c. are offences by the common law, and puniſhable by fine, impriſonment, and pillory.

According to the law of Scotland, the puniſhment of blaſphemy is death. The firſt ſpecies thereof conſiſts in railing at, or curſing God, and here the ſingle act conſtitutes the crime. The ſecond conſiſts in denying the exiſtence of the Supreme Being, or any of the perſons of the Trinity; and therein obſtinately perſevering to the laſt.

BLAST, *Flatus*, in the military art, a ſudden compreſſion of the air, cauſed by the diſcharge of the bullet out of a great gun.

BLAST is alſo applied, in a more general ſenſe, to any forcible ſtream of wind, or air; excited by the mouth, bellows, or the like.

BLAST is alſo uſed in agriculture and gardening, for what is otherwiſe called a blight.

Blaſts differ from mildews, rubigines.

The ſmut of corn is a ſpecies of blaſt; but is a diſeaſe not immediately proceeding from variation in weather or other ſimilar circumſtances.

BLASTS, or *Blights*, are by ſome ſuppoſed owing to cold; by others, to the want of a due ſupply of ſap; by others, to aſcending fumes of the earth; by others, to ſharp winds and froſts, immediately ſucceeding rains. Phil. Tranſ. N° 44.

That ſpecies, called uredines, or fire blaſts, is ſuppoſed by Dr. Hales owing to the ſolar rays reflected from, or condenſed in the clouds, or even collected by the denſe ſteams in hop gardens, and other places.

Blasts, among miners, ſee Damps.

BLASTED, among the Romans, places blaſted with lightning were to be conſecrated to Jupiter, under the name of Bidentalia, and Putealia.

It was alſo a ceremonial of religion to burn blaſted bodies in the fire.

BLASTING, among miners, a time for the tearing up of rocks, which they find in their way, by gun powder. The method of doing which is this; they make a long hole, like the hollow of a large gun barrel, in the rock they would ſplit: this they fill with gun powder, then they firmly ſtop up the mouth of the whole with clay, except a touch hole, at which they leave a match to fire it. A ſmall quantity of powder does great things this way.

BLASTUM *Moſylitum*, in the materia medica, a term uſed by ſome writers to expreſs the caſſia lignea, or caſſia bark, when not peeled off from the branches, but kept with the wood within it; this was a common way of collecting and preſerving, not only this bark, but the cinnamon, and many others.

BLATTA, in natural hiſtory, a genus of inſects of the order of hemiptera in the Linnæan ſyſtem, the characters of which are, that the head is inclined, the antennæ are ſetaceous, the wings are membranaceous, the thorax is flat, orbiculated, and marginated, the feet are formed for running, and there are two ſmall horns above the tail. There are ſeveral ſpecies.

It is likewiſe the name of a ſpecies of beetle, called by Columna *ſcarabæus teſtudinatus.*

Blatta, in middle age writers, denotes a purple in the wool or ſilk, dyed with the liquor of the fiſh of the blatta.

This was otherwiſe denominated *blatta ſerica*, or *blatto ſericum*; whence alſo *blattiarius*, uſed in ancient writers for a dyer in purple.

Blatta, *Byzantina*, in phyſiology and pharmacy, a teſtaceous body, being the operculum, or lid of a turbinated ſhell, whoſe fiſh yields a purple dye.

Dr. Liſter takes the blatta byzantina to have ſucceeded the unguis odoratus, and to have been brought into the ſhops in its place. In Dioſcorides's time, the beſt was brought from the Red Sea, viz. the paleſt and fatteſt; the blacker and leſs from Babylon, or the Perſian gulf: but it ſeems, latter times took up with thoſe found about Conſtantinople; whence the preſent ſhop-blatta had its name.

The blatta byzantina, when exhibited internally, renders the body ſoluble, ſoftens the ſpleen, and diſcuſſes peccant humours. When uſed externally, by way of fumigation, it reſtores epileptic patients, and women labouring under a ſtrangulation of the uterus. In other diſorders its effects are the ſame with thoſe of moſt other teſtaceous ſubſtances.

BLAZING *Star*, or *Comet*. See Syſtem of Astronomy.

BLAZON, or Blazonry, in heraldry, the art of deciphering the arms of noble houſes; or of naming all the parts in their proper and particular terms.

Various etymologies are given of the word blazon: the moſt probable is that which derives it from the German *blaeſen, to blow a horn*; it being the cuſtom of thoſe who preſented themſelves at the liſts in the ancient tournaments to blow a horn, to notify their coming. See Syſtem of Heraldry.

BLEA, in vegetables, is that part of a tree which lies immediately under the bark, and between that and the hard wood, and is the firſt progreſs of the alteration of the bark into wood by the natural growth and ſtrengthening of the fibres: commonly called the under bark through which the ſap aſcends to the branches.

ART OF BLEACHING OR WHITENING.

Bleaching *of Silk*. While it is yet raw, it is put into a thin linen bag, and thrown into a veſſel of boiling river water, wherein ſoap has been diſſolved, then boiled two or three hours, and the bag being turned ſeveral times, it is taken out beaten and waſhed in cold water, ſlightly wrung out, and thrown into a veſſel of cold water, mixed with ſoap and a little indigo: the indigo gives it the bluiſh caſt always obſerved in white ſilks. After taking it out of the ſecond veſſel, it is wrung out, and all the water and ſoap expreſſed, ſhook out to untwiſt and ſeparate the thread, and hung up in the air, in a kind of ſtove made on purpoſe, wherein is burned ſulphur; the vapour whereof gives the laſt degree of whiteneſs to the ſilk.

Bleaching, or *Scouring of Woollen Stuff*. There are three ways of whitening woollens; the firſt with water and ſoap; the ſecond with vapour of ſulphur; the third with chalk, indigo, and vapour of ſulphur.

For the firſt, the ſtuffs being taken from the fulling-mill, are put into ſoaped water a little warm, and worked afreſh by force of arms over a bench, which finiſhes the whitening the fulling-mill had begun; and laſtly, waſhed out in clear water and dried; this is called the natural way of bleaching.

In the ſecond method, they begin with waſhing the ſtuff in river water; it is then laid to dry on poles, and, when half dry, ſpread out in a kind of ſtove well cloſed, wherein is burnt ſulphur; the vapour whereof diffuſing itſelf, ſticks by little and little over all the ſtuff, and gives it a fine whitening; this is commonly called bleaching by the flower.

In the third method, after the ſtuffs have been waſhed, they are thrown into cold water impregnated with chalk and indigo; after they have been well agitated here, they are waſhed afreſh in clear water, half dried on poles, and ſpread in a ſtove to receive the vapour of the ſulphur: which finiſhes the operation. This is not eſteemed the beſt method of bleaching, though agreeable enough to the ſight.

It may be here obſerved, that when a ſtuff has once received the ſteam of ſulphur, it will ſcarce receive any beautiful dye but black or blue.

Bleaching *of Hollands or fine Linens*. After taking them from the loom, they are ſteeped a day in fair water, waſhed out and cleared of their filth, and thrown into a bucking tub filled with a cold lixivium, or ley of wood aſhes and water. When taken out of the ley, they are waſhed in clear water, ſpread in a meadow, and watered, from time to time, with water from little dikes, or canals, along the ground, by means of ſcoops, or hollow peels of wood, called by the Dutch, who pretend to be the inventors of them, gieters. After lying a certain time on the ground, they are paſſed through a new ley, poured on hot, and again waſhed in clear water, and laid a ſecond time on the ground, and every thing repeated as before; then paſſed through a ſoft gentle ley, to diſpoſe them to reſume the ſoftneſs which the other harſher leys have taken from them, waſhed in clear water, ſoaped with black ſoap, and that ſoap again waſhed out in clear water: they are then ſteeped in cow's milk, the cream being firſt ſkimmed off, which finiſhes their whitening and ſcouring, gives them a ſoftneſs, and makes them caſt a little knap: when taken out of the milk, they are waſhed in clear water for the laſt time. After all this proceſs, they give the linen its firſt blue, by paſſing it through a water wherein a little ſtarch, and ſmalt, or Dutch *lapis lazuli* have been ſteeped. Laſtly, the proper ſtiffneſs and luſtre are given with ſtarch, pale ſmalt, and gums, the quantity and quality whereof may be adjuſted according to occaſion.

In fine weather, the whole proceſs of bleaching is completed in a month's time; in bad weather it takes up ſix weeks or more.

In ſome parts of France, arum, or wake-robin, is uſed in bleaching, being ſuppoſed by its corroſive quality to diſſolve unctuoſities, and make the linen white. It was uſed alſo for ſtarch before the diſcovery of that from wheat; and was ſaid to cauſe a ſoreneſs of the hands hardly relievable by ointments.

Bleaching *of Coarſe Linens*. They are taken from the loom, and laid in wooden frames, full of cold water; where by means of wooden hammers, worked by a water mill, they are beat ſo as to waſh and purge them of their filth; then ſpread on the ground, where the dew, which they receive for eight days, takes off more of their impurity; then put into a kind of wooden tubs or pans, with a hot ley over them. Thus lixiviated, they are again purged in the mill, laid afreſh on the ground, and after eight days more, paſſed through a ſecond ley, and all things repeated, till ſuch time as they have acquired their juſt degree of whiteneſs.

The proceſs of bleaching in Scotland differs in ſome particulars from that above deſcribed, and uſed in France, &c. The following is an abſtract. The linens are folded up, in diſtinct pieces, depoſited in a wooden veſſel, and covered with warm water, or equal parts of water and ley: a wooden cover is laid over them to preſs them down: when the fermentation begins, bubbles of air riſe to the ſurface of the liquor, and there form a kind of pellicle or ſcum; when this begins to ſubſide, which generally happens in the ſpace of thirty ſix or forty eight hours, the linen is taken out, well rinſed, waſhed in a mill, and ſpread on a field to dry. As ſoon as it is thoroughly dry, it is fit for bucking. For this purpoſe another ley is prepared of 30lb. of blue, and as much white pearl aſhes, 200lb. of Marcoſt aſhes, or 300lb. of caſhub, and 300lb. of Muſcovy aſhes, all well pounded, and boiled for a quarter of an hour in a large copper, containing about 126 Scotch gallons of water. This liquor is left to ſettle, and is then uſed for preparing the bucking ley: two gallons of this, with 2lb. of ſoft ſoap, are mixed with thirty eight gallons of water: this ley, made blood warm, is poured on the linens, previouſly diſpoſed in a large wooden veſſel: after a ſhort interval, the liquor is drawn off and heated again to a greater degree, and poured on the linen as before; which proceſs is repeated ſeveral times, till at laſt the ley is thrown on boiling hot. When this is done, the linens are ſpread on the graſs, and watered ſeveral times in the courſe of forty eight hours: this proceſs of bucking and watering is repeated from ten to ſixteen times or more, and the ley is gradually made ſtronger from the firſt to the middle bucking, and weakened in the ſame manner to the laſt. The next operation is that of ſouring, which is performed by pouring ſuch a quantity of butter milk or ſour milk, or inſtead of this, ſour liquor made with bran or rye meal and water, as is ſufficient to cover and well moiſten the linen, which is put in rows into a large veſſel, and kept down by a lid full of holes, and prevented from riſing. A fermentation takes place in this part of the proceſs, which laſts five or ſix days, and when the ſcum, formed by the aſcending air bubbles, begins to ſubſide, the linen ſhould be taken out, rinſed, ſtill waſhed, and then waſhed with ſoap and water. Theſe ſeveral operations are repeated in ſucceſſion, till the linen is ſufficiently whitened; after which it is blued, ſtarched, and dried. In bleaching coarſe cloths, boiling is uſed inſtead of bucking; and they are ſoured with warm water and bran.

Inſtead of the acid of milk, Dr. Home recommends for this purpoſe, water acidulated with ſpirit of vitriol, in the proportion of half an ounce, or at moſt three quarters of an ounce to a gallon. This proceſs is much quicker than the other, requiring only as many hours as the other requires days. Home's Exper. on Bleaching. The method uſed for bleaching coarſe cloaths in Scotland, is like that practiſed in Ireland for both fine and courſe. Perſons appointed by the truſtees for improving the hempen and flaxen manufactures in Scotland, may enter into any bleach-yard, back-houſe, &c. and ſearch all rooms, and the boilers therein, and view the lees, and refuſe and dregs thereof, to ſee whether there have been any lime, pigeons dung, or ſoap dregs, uſed in the bleaching of linen cloth or yarn, contrary to the ſtatute, 13 Geo. I. c. 26. § 16.

Lime, or pigeons dung, are not to be uſed in bleaching and whitening of linen, 10 Ann, c. 21.

Lime water prohibited in bleaching, is made either of ſhell-lime, or of ſtone lime: the former is ſtronger than the latter, and more powerful on the human calculus; and Dr. Home diſcovered by experiment, that it was likewiſe more efficacious in bleaching linen. It whitens more, but weakens more, and extracts more out of the cloth. He concluded from his experiments, that it ought to be conſidered as the moſt expeditious, but at the ſame time as the moſt dangerous material for bleaching yet known. In the courſe of his experiments, this remarkable phenomenon occured, that though lime and lime water preſerve many animal ſubſtances in a ſound ſtate; yet mixed with alkalies, it produces a ley corroſive with reſpect to animals; but the effects on linen were juſt the reverſe, lime water was corroſive, and alkalies in proportion to their quantity weakened its corroſive power; inſomuch that he judged that a mixture of one part of lime with four of pure alkali, might be ſafely uſed in bleaching.

BLEAK, in ichthyology, a name given by us to the fiſh called by authors the alburnus and albula. According to the new ſyſtem of Artedi, it is a ſpecies of the cyprinus. The French call it the ablette.

BLEB, a ſmall bliſter or bubble.

Naturaliſts have obſerved ſmall purple blebs on all the plants of the hypericum kind.

Thick pieces of glaſs, fit for large optic glaſſes, are rarely to be had without blebs.

BLECTINUM, in botany, a genus of plants of the claſs of the cryptogamia filices; the fructifications of which are diſpoſed in parallel lines on the ſides of the leaves.

BLEEDING, phlebotomy. See Syſtem of SURGERY.

BLEMISH, a defect, either natural or artificial.

BLEND *Metal Iron*, a coarſe ſort of iron from the Staffordſhire mines, uſed for making nails and heavy ware: in ſome places alſo for horſe-ſhoes.

BLEND *Water*, a diſtemper incident to black cattle, which comes ſeveral ways. 1. From blood. 2. From the yellows, which is a ringleader of all diſeaſes. And 3. From the change of ground: for being hard, it is apt to breed this evil, which if not remedied in ſix days, will be paſt help.

BLENNA, is a thick phlegm and mucus, flowing from the brain through the noſtrils, and ſhewing ſigns of a beginning concoction.

BLENNIUS, in ichthyology, the name of a genus of fiſh, of the general order of the acanthopterygii, according to the diſtribution of Artedi, and of the jugulares in the Linnæan ſyſtem. The name is derived from the word βλεννα, which ſignifies a tough and mucous matter, ſuch as that which the body of this fiſh is covered with. The characters of this genus are, that the membrane of the gills has ſix bones; the fore-part of the head is very ſlanting; the body is prickly, and the belly-fins have two bones. Of this genus there are ſeveral ſpecies, as the creſted blennius, or galerita, with a triangular lobe red at the edges, and ſituated between the eyes, and a cuticular creſt running tranſverſely over the head; the gattorugine, or blennius, with two little fins at the eyes, and twenty-three bones in the pinna ani; the gunnellus cornubenſium, liparis, or butter-fiſh, with about ten black ſpots, and a white border on each ſide of the back fin; the pholis, or ſmooth-headed blennius, called in Cornwall mulgranoc, and bulcard; the viviparous blennius, &c.

BLESENSIS BOLUS, *Bole of Blois*, in the materia medica, a very valuable medicinal earth dug about Saumur, Blois, and Burgoyne in France, and ſeeming to poſſeſs all the virtues of the Armenian bole of Galen, which it alſo much reſembles in external appearance. Bole armoniac is generally ſubſtituted.

BLEW CAP, or BLUE CAP, an Engliſh name for a peculiar ſpecies of fiſh of the ſalmon kind, diſtinguiſhed by a broad blue ſpot on the head, from whence they have their name. Theſe ſeem not to breed with us; but appear in our rivers only at certain ſeaſons, when there have been very violent north winds. This fiſh is ſeldom found ſingle; ſo that the fiſhermen rejoice at the taking one of them, expecting a large ſhoal near.

ELICEA, in ichthyology, the name of a ſmall fiſh of the harengiform kind, caught in the German and other ſeas, and ſuppoſed by many to be the ſame with what in England we call the ſprat, which to ſome ſeems to be no other than a young herring.

BLIGHT, in huſbandry, a diſeaſe, or caſualty happening to plants, and affecting them variouſly; the whole plant ſometimes periſhing by it, and ſometimes only the leaves and bloſſoms, which will be ſcorched and ſhrivelled up, the reſt remaining green and flouriſhing.

This diſorder ſeldom happens but upon the blowing of ſharp eaſterly winds, which are moſt frequent with us about March and April; whence thoſe months prove, of all others, the moſt fatal to plants. From this circumſtance, ſome imagine the colds that then reign, being exaſperated by the eaſtern winds, effect blights; but Mr. Bradley furniſhes a more plauſible account: for on this principle, it were hard to ſay why one plant, or one part of a plant, ſhould be blighted more than another. He obſerves, that caterpillars and other inſects generally attend thoſe winds; and that they infect ſome kind of tree more than another, and even ſome particular branch more than others; and thence infers, either that the eggs of thoſe inſects, or the inſects themſelves, are brought to us by the eaſterly winds; or that the temperature of the air, when the eaſtern winds blow, is neceſſary to hatch thoſe creatures, ſuppoſing the eggs to have been already laid on the inſected parts. Now each of theſe cauſes ſeems to have its effect: thoſe blights attended with large worms, or caterpillars, ſeem hatched by the eaſtern winds; and thoſe others, which only produce the ſmall inſects, that occaſion the curling of the leaves of trees, may proceed from ſwarms of them, either ready hatched, or in the egg, brought with the wind.

The coldneſs of thoſe winds he ſhews to be no objection againſt their being fitted to hatch inſects; different inſects requiring vaſtly different degrees of heat. To this he adds, that every inſect has its proper plant, or tribe of plants, which it naturally requires for its nouriſhment, and will feed on no other; and in which, therefore it lays its eggs: it is no wonder then, that one kind of tree ſhould be inſected, and all the reſt eſcape. That wind, which brings or hatches the caterpillars on the apple-tree, will not infect the pear, plum, or cherry; becauſe, were the ſhoals of inſects natural to the apple to light on thoſe other trees mentioned, they would either want their proper matrix to hatch in; or, were they ready hatched, would periſh for want of proper food. So that it is impoſſible all kinds of plants ſhould be blighted at the ſame time, unleſs the eggs of every kind of inſect natural to each tree could be brought at one time with the wind; or, that an eaſterly wind could contain in it, at once, as many different degrees of cold, or heat, as would be required to hatch and maintain each different claſs of inſects. Nor is it any objection, that in blights there are not frequently any animals immediately perceivable. By the microſcope, we diſcover animalcules a million of times leſs than the ſmalleſt, which come under ordinary notice; theſe, the gentleſt air may be conceived capable of blowing from place to place; that it is no wonder if they be brought to us from the remoteſt regions.

That blights are frequently no more than an inward weakneſs or diſtemper in trees, evidently appears, if we conſider how often it happens, that trees againſt the ſame wall, expoſed to the ſame aſpect, and equally enjoying the advantages of the ſun and air, with every other circumſtance which might render them equally healthy, are often obſerved to differ greatly in ſtrength and vigour; and as often do we obſerve the weak trees to be continually blighted, when the vigorous ones in the ſame ſituation eſcape. Dr. Hales aſcribes blights to the obſtruction of perſpiration in bloſſoms and leaves, occaſioned by a continued dry eaſterly wind, without ſhowers or dew; in conſequence of which the perſpirable matter becomes glutinous, and adheres to the ſurfaces of leaves, hereby affording a proper nutriment for inſects, which prey on the leaves and tender branches of fruit trees, when the blight happens, tho' they are not the firſt cauſe of it.

To prevent blights, ſome judiciouſly guard againſt them, by burning heaps of weeds, ſtraw, and other combuſtibles, on the wind-ſide of their orchards, that the ſmoak may either poiſon the inſects or their eggs, as they paſs along. It may be added, that theſe fires are often made with good ſucceſs, to deſtroy the caterpillars, even after they are hatched, and have begun to devour the trees. Another method of preſerving trees from blights is, by ſprinkling tobacco duſt, or pepper duſt, or waſhing the leaves with water wherein tobacco ſtalks have been infuſed; which, it is ſaid, is preſent death to all inſects and animalcules. Another is by pulling off the leaves when withered, and cutting off the ſmaller branches when they produce crooked and unnatural ſhoots.

Waſhing fruit and other trees with water, is a great preventative againſt blights, and deſtroys the webs in which inſects are brought to maturity: to facilitate this operation, engines are conſtructed and ſold at moſt of the tin ſhops in town and country.

Fumigating the branches of trees and plants with tobacco ſmoke, is found efficacious in deſtroying inſects; and a kind of bellows for the purpoſe, lately invented, and pretty generally known, renders the ſcheme practicable.

But there is another ſort of blight, againſt which it is more difficult to guard fruit trees; that is occaſioned by ſharp, pinching, froſty mornings, which often happen at a time when the trees are in flower, or while the fruit is very young, and occaſion the bloſſoms or fruit to drop off; and ſometimes the tender parts of the ſhoots and leaves are greatly injured thereby. The only method yet found out to prevent this miſchief is, by carefully covering the walls, either with mats or canvas, &c. Which being faſtened ſo as not to be diſturbed with the wind, and ſuffered to remain on during the night, are to be taken off every day, if the weather permits.

Another ſort of blight, which ſometimes happens in April, May, or as late as Midſummer, and which is often very deſtructive to orchards and open plantations, particularly hop grounds, and againſt which we know of no remedy, is what is called a fire-blaſt, which in a few hours hath not only deſtroyed the fruit and leaves, but many times parts of the trees, and ſometimes whole ones have been killed by it. This more frequently happens in cloſe plantations, where the ſtagnating vapours from the earth, and the plentiful perſpirations from the trees, are pent in, for want of a free air to diſſipate and diſpel them, than in thoſe planted at a greater diſtance, or ſurrounded with hills or woods. For a further account of blights ſee Syſtem of HUSBANDRY.

BLIKE, in ichthyology, a name given by ſome to an anadromous fiſh, ſomewhat reſembling our river chub, and called by Geſner capito anadromus; but more generally known by the name of zarta, or the zerte.

BLIND, *Pore*, or *Pur* BLIND, denotes only a great degree of ſhort-ſightedneſs. Perſons of this deſcription are called myopes.

BLINDS, in the military art, denote every thing ſerving to cover the beſiegers from the enemy, as wool packs, earth baſkets, ſand bags, and the like.

BLINDS are ſometimes only canvas ſtretched to take away the ſight of the enemy; ſometimes they are planks ſet up, properly called mantlets; others are of baſkets, others of barrels.

BLINDS more peculiarly denote wooden frames of four pieces, round or flat, two of which are ſix feet long, and which ſerve as ſpars to faſten the two firſt together. They are fixed upright in the ground, againſt the ſides of the ſaps to ſuſtain the earth, and to faſten faſcines on the upper part, or to cover the ſaps, and to lay faſcines over them, to ſecure the troops from ſtones and granades. They are chiefly uſed, when the trenches are carried on in the face of the place, in a right line, ſo as the enemy might ſcour them with their guns from the walls. See Syſtem of FORTIFICATION.

BLINDNESS, a privation of the ſenſe of ſight, ariſing from a total deprivation of its organs, or an involuntary obſtruction of their functions.

Blindneſs is of divers kinds. Natural blindneſs is that happening according to the ordinary courſe of things; thus that of certain inſects formed without eyes, though it is not eaſy to fix which theſe are, ſince divers animals have been erroneouſly ſuppoſed ſo, on account of their ſmallneſs or imperceptibility; as the cæcilia, commonly called the blind worm, the mole, &c.

Preternatural, or morbid blindneſs, is that owing to diſeaſe or accident.

Total blindneſs, is that wherein all ſight or perception, even of light, is wanting, as in the caſe of thoſe who are ſaid to be ſtone blind.

A blind man, by the civil law, cannot make a teſtament, except under certain modifications; but in every caſe he is diſabled from being a witneſs to a teſtament, on account of his blindneſs.

Partial blindneſs, is that wherein ſome faint glimmering is left, as is always the caſe in people who have ripe cataracts, who are never ſo blind, but they can diſcern day from night; and, for the moſt part, in a ſtrong light, diſtinguiſh black, white, and ſcarlet, though they cannot perceive the ſhape of any thing. The reaſon is, that the light by which thoſe perceptions are made, being let in obliquely through the aqueous humour, or the anterior ſurface of the cryſtalline (by which the rays cannot be brought into a focus upon the retina), they can diſcern in no other manner than a ſound eye can through a glaſs of broken jelly, where a great variety of ſurfaces ſo differently refract the light, that the ſeveral diſtinct pencils of rays cannot be collected by the eye into their proper foci; wherefore the ſhape of an object in ſuch a caſe cannot be at all diſcerned, though the colour may.

Perpetual blindneſs, is that which remains alike under all the diverſity of ſeaſons, times, ages, &c.

Tranſient blindneſs, is that which gives way of itſelf in due time, as that of whelps, which continues for ſeveral days, ſometimes nine, rarely twelve, after they are littered.

The Nogais Tartars, according to father Du Ban the Jeſuit, who lived among them, are born blind, and open not their eyes, till ſeveral days.

The cauſes of blindneſs are either ordinary, as a decay of the optic nerve (an inſtance whereof we have in the Academy of Sciences, where, upon opening the eye of a perſon long blind, the optic nerve was found extremely ſhrunk and decayed, and having no medulla in it); or ſome external violence, vicious conformation, growth of a cataract, gutta ſerena, ſmall-pox, or the like. Hiſt. Acad. Scienc. ann. 1713 and 1721.

Extraordinary cauſes of blindneſs are malignant ſtenches, poiſonous juices dropped into the eye, baneful vermin, long confinement in the dark, or the like.

We find various recompenſes for blindneſs, or ſubſtitutes for the uſe of the eyes, in the wonderful ſagacity of many blind perſons recited by Zahnius in his Oculus Artificialis, and others. In ſome, the defect has been ſupplied by a moſt excellent gift of remembring what they had ſeen; others, by a delicate noſe, or the ſenſe of ſmelling: others, by an exquiſite touch, or ſenſe of feeling, which they have had in ſuch perfection, that, as it had been ſaid of ſome, they learned to hear with their eyes; it may be ſaid of theſe, that they taught themſelves to ſee with their hands.

Some have been enabled to perform all ſorts of curious and ſubtile works in the niceſt and moſt dextrous manner. Aldrovandus ſpeaks of a ſculptor, who became blind at twenty years of age, and yet ten years after made a perfect marble ſtatue of Coſmo II. de Medicis; and another of clay like Urban VIII. Bartholin tells us of a blind ſculptor in Denmark, who diſtinguiſhed perfectly well, by mere touch, not only all kinds of wood, but all the colours; and F. Grimaldi gives an inſtance of the like kind; beſide the blind organiſt lately living in Paris, who is ſaid to have done the ſame.

The moſt extraordinary of all is a blind guide, who, according to the report of good writers, uſed to conduct the merchants through the ſands and deſerts of Arabia. James Bernoulli contrived a method of teaching blind perſons to write.

Yet have not blind perſons any idea of viſible objects, though they can diſtinguiſh them by the touch: thus the gentleman couched by Mr. Cheſelden, though he knew the colours aſunder in a good light during his blind ſtate; yet when he ſaw them after couching, the faint ideas he had of them before, were not ſufficient for him to know them by afterwards. Phil. Tranſ. Nº 403. p. 447.

It was even a conſiderable time before he could remember which was the cat, and which the dog, though often informed, without feeling them. Add, that he had no idea of diſtance; but thought that all the objects he ſaw touched his eyes, as what he felt did his ſkin.

That a deprivation of ſight adds ſtrength and vigour to the mental faculties is incontrovertible, and to confirm this idea there needs no reference further, than to ſome of the brighteſt luminaries of our own country.

The immortal MILTON wrote Paradiſe Loſt in a total ſtate of viſual darkneſs; Profeſſor SAUNDERSON, the mathematician, although blind, was the greateſt antiquarian, and the moſt complete judge of coins, of the age he lived; Mr. HANDEL, whoſe muſical compoſitions will ever be remembered, and we have every reaſon to believe will never be equalled, was totally deprived of ſight; alſo the late Mr. STANLEY, maſter of the king's band of muſic; likewiſe the preſent celebrated Mr. LOCKHART; to which we could add inſtances greatly exceeding our limits.

BLINDNESS, in *Farriery*, is a diſeaſe incident to horſes, when ridden too hard, or backed too young. It may be diſcovered by the walk or ſtep, which, in a blind horſe, is always uncertain and unequal, becauſe he dares not ſet down his feet boldly when led by the hand; though, if the ſame horſe be mounted by an expert horſeman, and the horſe of himſelf be mettled, the fear of the ſpur will make him go more freely; ſo that his blindneſs can hardly be perceived. Another mark whereby a horſe may be known to have loſt his ſight, is, that upon hearing any body enter the ſtable, he will prick up his ears, and move them backwards and forwards as miſtruſting every thing, and being in continual alarm by the leaſt noiſe.

Dr. Lower firſt ſhewed the cauſe of the ordinary blindneſs in horſes, which is a ſpongy excreſcence, growing in one, ſometimes in two or three places of the uvea, which being at length overgrown, covers the pupil when the horſe is brought into the light, though in a dark ſtable it dilates again. See Syſtem of FARRIERY.

BLISTER, in the animal œconomy, denotes a thin bladder, raiſed on the ſkin, and full of a watery or other humour. Bliſters are ſymptoms uſually enſuing on burns, ſcalds, and cauſtic matters applied to the ſkin.

It is diſputed among ſurgeons, whether bliſters, in caſe of burns, are to be opened, or not. Some adviſe it, to prevent further ulcerations underneath; others, unleſs they be large, diſſuade it, as creating the patient needleſs pain. See Syſtem of SURGERY.

BLISTERING, in farriery, is uſed in caſes of ſtrains and ſhrunk finews in horſes, likewiſe to remove fungus excreſcences, and other protuberances. See FARRIERY.

BLITE, ſtrawberry ſpinage, blitum, in botany, a genus of the monandria digynia claſs of plants; the characters of which are theſe: the flower hath no petals, but one briſtly ſtamen, of the length of the empalement. In the centre is ſituated an oval pointed germen; the empalement afterwards becomes an oval compreſſed capſule, including one globular compreſſed ſeed, of the ſize of the capſule. There are two ſpecies. Blite is eſteemed cooling and emollient, and therefore good in dyſenteries and ſpitting of blood.

BLOCK, among bowlers, the mark which is aimed at, being a ſmall a ſmall ſized bowl laid on the green for this purpoſe ; it is called alſo the jack.

Blocks, in ſea language, are pieces of wood belonging to ſhips, in which the ſhivers of pullies are placed, and wherein the running ropes go. Of theſe, ſome are ſingle, ſome double ; and ſome have three, four, or five ſhivers in them. They are named and diſtinguiſhed by the ropes they carry, and the uſes they ſerve for.

The cat block is employed to draw the anchor up the cat head.

The clue garnet blocks ſerve to draw the clues or lower corners of the courſes up to the yard, and are faſtened to the clues of thoſe ſails.

The fiſh block is hung in a notch at the end of the davit, ſerving to haul up the flooks of the anchor to the ſhip's bow. The ſnatch block is a large block with a ſhiver in it, and a notch cut through one of its cheeks, for the more ready receiving a rope, ſince, by means of this notch, the middle part of the rope may be reeved into the block, without paſſing it endwiſe. It is commonly faſtened with a ſtrap about the main maſt cloſe to the upper deck, and is chiefly uſed for the fall of the winding tackle, which is reeved into this block, and then brought to the capſtan.

The top block is uſed to hoiſt up or lower down the top maſt, and is hooked in an eye bolt driven into the cap. Block and block is a phraſe uſed, when on hauling on any tackle, haulyard, or the like, to which two blocks belong, the two meet and touch ; ſo that they can haul no farther.

BLOCKADE, a ſort of ſiege of a place, intended to be taken by famine ; wherein all the paſſages, and avenues, are ſeized, and ſhut up, ſo that no ſupplies of proviſion can be brought in.

The word blockade is ſometimes alſo uſed in ſpeaking of the beginning of a ſiege, when forces are ſent to ſeize the principal avenues where the beſiegers intend to fix their quarters.

There are two ways of forming blockades. The firſt is ſimply by fortifying or ſeiſing poſts at ſome diſtance from the place, chiefly on the banks of rivers both above and below, and on the great roads and inlets, where bodies of foot and horſe are placed, communicating with each other, till the diſtreſs of the place, for want of neceſſaries, occaſions deſertions of the garriſon, and murmurings or inſurrections of the townſmen, whereby the governor is frequently forced to capitulate.

The other ſort is made nearer the place, by lines of circumvallation, wherein an army is poſted, being chiefly uſed when, after a battle, the vanquiſhed party have ſhut themſelves up in ſome town ill provided, and thereby capable of being ſtarved in a ſhort time.

Block *Houſe*, a kind of wooden fort or battery, either mounted on rollers, or on a veſſel, and ſerving either on the water, or in counter ſcarps and counter approaches.

The name is ſometimes alſo given to a brick or ſtone fort built on a bridge, or the brink of a river, ſerving not only for its defence, but for the command of the river both above and below. Such was that noted block houſe anciently on the bridge of Dreſden, ſince demoliſhed on enlarging the bridge.

BLOMARY, or **Bloomary**, the firſt forge in an iron work, through which the metal paſſes after it is melted out of the ore. They are alſo called blomary hearths.

BLOOD, a warm red liquor in animals, circulating, by means of arteries, and veins, through every part of the body, during their life, and the common ſource whence all the neceſſary and ſuperfluous animal liquids are derived.

A DISSERTATION ON THE BLOOD.

Blood, microſcopically examined, appears to conſiſt of little red globules, ſwimming in an aqueous liquor, ſuppoſed to be the cruor and ſerum that appear diſtinct when let out. Mr. Leewenhoeck computes theſe globules to be twenty five thouſand times ſmaller than the ſmalleſt grains of ſand ; and Dr. Jurin makes them ſtill leſs. Upon an accurate menſuration, he found the diameter of one, equal to $\frac{1}{3240}$ of an inch, or leſs than $\frac{1}{324}$ of an ordinary hair of the head.

Blood makes a very common object for microſcopical obſervations. The method of examining it is this : take a ſmall drop of warm blood immediately from the vein, with the nib of a pen or hair pencil, and ſpread it as thin as poſſible on a plate of glaſs ; and applying this to the microſcope with the ſecond, or firſt magnifier, the globules will all be ſeen very diſtinctly, and a little practice will enable us to form a judgment on the alterations that may happen in the ſize, figure, or colour of them. If a little warm water be applied to the blood, the globules will be divided, and many of them break into a number of ſmaller globules. If warm milk be added inſtead of water, the larger globules will be ſeen very diſtinct ; but the ſmaller will be blended with, and loſt in the milk, which is itſelf no other than a congeries of ſuch globules.

The blood, while in its veſſels, appears to the naked eye uniform and homogeneous ; but when let out and cold, it ſeparates ſpontaneouſly into two different parts : the one red and fibrous, which coheres into a maſs, and is called the cruor ; the other thin and tranſparent, which retains its fluidity when cold, and, being ſuppoſed ſpecifically heavier than the other, ſuſtains and bears it up, and is called the ſerum. The proportion of the ſerum to the cruor, Dr. Drake makes at a medium, as one and a half to one : but Mr. Boyle, more accurately, makes the ſerum $\frac{17}{15}$ of the whole blood ; and Dr. Jurin, $\frac{11}{17}$ of the whole weight, or $\frac{3}{4}$ of the bulk.

Boerhaave extends the proportion of the ſerum of blood to $\frac{5}{6}$ parts of the whole maſs ; yet Dr. Morgan ſcruples not to depart from this, and makes the cruor and ſerum equal to each other. Indeed in cold, and ſufficiently coagulated blood, the tough craſſamentum, and its ſurrounding fluid, ſerum, are ordinarily found to the eye pretty nearly equal to one another.

If the red part of the blood bears too great a proportion to the ſerum, which is the caſe of athletic perſons, and others who do not take a ſufficient quantity of drink with their meat, the fault may be corrected by leſſening the meat, or by increaſing their drink. Dr. Brian Robinſon tells us of a young man, who not having for a conſiderable time drank with his meat, had a very florid complexion, and ſcorbutic eruption all over his body, which indicated too great a proportion of the red part of the blood to the ſerum ; he was freed from this diſorder by drinking with his meat, without any farther remedy.

In the beginning of fevers, the proportion of the red part of the blood to the ſerum is greater, and at the end of them leſs, than it is in health. The change of this proportion is owing to perſons under this diſorder living wholly on drink and liquid nouriſhment. And bodies loaded with ſerous moiſture, an argument of too ſmall a proportion of the red part of the blood to the ſerum, have been freed from their load, by abſtaining wholly from drink.

There are other cauſes beſides the bare quantities of meat and drink, which vary the proportion of the red part of the blood to the ſerum : for this proportion is greater in country people than in citizens, in perſons who uſe exerciſe than in perſons who are inactive, and in perſons who live upon fleſh meats, and fermented liquors, than in perſons who live upon vegetables and water. In ſhort, this proportion is increaſed by things which dry the body, and ſtrengthen the fibres ; and leſſened by things of a contrary nature.

Too great a proportion of the red part of the blood to the ſerum, renders bodies ſubject to inflammatory fevers on taking cold.

The blood is found to conſiſt chiefly of phlegm, as the baſis or vehicle ; of volatile ſalts ; of oil, which, by ſome nice examiners, has been found of two kinds ; and of caput mortuum, or earth, which though it may conſiſt of divers ſubſtances, eſſentially different from each other, yields only a little fixed ſalt. From the beſt experiments of this kind it appears, that in ſeven ounces of human blood, there are five ounces two drachms of phlegm, three drachms of a ſubtile ſpirituous oil, a ſmall quantity of a thicker oil, two drachms of ſalt, and about two of earth.

The blood, and other parts of animals, all contain more or leſs of an acid ; and this ſeems wholly owing to the effects of their organs of digeſtion upon the aliments they take in, which, in fine, become aſſimilated to, and make part of their fluids and ſolids.

The origin of the blood is in the chyle, which, paſſing the lacteals, is delivered into the ſubclavian ; where, mixing with the blood, they proceed together to the right ventricle of the heart ; and there, being yet more intimately mixed, they circulate together through the whole body : till, after ſeveral circulations, and ſecretions at the ſeveral ſtrainers of the body, they are aſſimilated, ſo as to make one uniform compound maſs, which appears to be nothing elſe but chyle altered by the artifice of nature, and exalted into blood ; there being no appearance of any thing extraneous mixed with the liquor circulating in the blood-veſſels, but chyle : excepting what had been before ſeparated from it, for ſome particular purpoſes, which being once ſerved, it is returned to it again : unleſs, perhaps, it may receive ſome portion of air in the lungs.

That there is air mixed in the blood, and circulating with it, is paſt doubt ; but, whether any more than was at firſt contained in the food of which the chyle is formed, is a queſtion not yet decided.

The principal arguments urged for it are, the neceſſity of reſpiration ; which may be accounted for on another principle : and the florid colour the blood receives in the lungs, and firſt ſhews in the vena pulmonalis ; which is countenanced by an experiment made with the red grumous part of the blood after coagulation on blood-letting ; for, upon turning the under-ſurface, which was before black, upwards, and expoſing it to the air, by its contact therewith it acquires a florid colour, like that of the blood in the vena pulmonalis. But this effect, others account for from the extraordinary agitation and comminution of the blood in the lungs. Dr. Lower has confuted this notion, by obſerving, that the attrition of the blood is greater in the muſcles, from which, however, it always returns black.

As to the heat of the blood, authors are exceedingly divided about the cauſe thereof : the ancients aſcribe it to a vital flame, or innate heat lodged in the heart, and thence communicated to the blood. Dr. Willis imagines a kind of aſcenſion in the blood ; and thinks its heat reſults from its being, as it were, ſet on fire, and perſevering in that ſtate. Dr. Henſhaw ſolves it from an ebullition conſequent on the mixture of two fluids, ſo diſſimilar as the chyle and blood. Others have recourſe to the chemical principles of alkali and acid; others to the mutual action of the principles, or component parts of the blood, by means whereof an inteſtine motion, and by that means an inteſtine heat, or incaleſcence, is effected.

Dr. Drake, with more reaſon, attributes the heat of the blood to the ſpring of the air incloſed together with it in the veſſels: for, air being incloſed in the blood veſſels, will endeavour to expand itſelf; and conſequently, if it have force enough, will drive outwards the parts of the body that incloſe it; by which means it cauſes the blood to beat againſt the ſides of the veſſels; which, having muſculous, contractile coats, do in their turns compreſs it again, and ſo calls a reciprocal æſtus in the blood, greater than the mere circulatory motion could; whence the parts of the ſolids, or containing veſſels, being put into a conſtant agitation, a heat is produced in both, which they mutually impart to each other.

There is now little doubt that the redneſs of the blood is owing to its contact with air: M. Cigna of Turin found, by putting a little oil on a quantity of blood, that it remained black throughout; but that when he took away the red part, and expoſed to the air the lower laminæ which were black, they alſo became ſucceſſively red, till the whole maſs acquired that colour. Beccaria, at his requeſt, expoſed blood in vacuo, and found that it always continued black; but when he brought it into contact with the air, it became red.

M. Cigna, in his firſt Memoir, publiſhed in the Miſcellanea Taurinenſia, expreſſes his opinion, that the air which is introduced into the blood by means of the chyle, continues to preſerve its redneſs: but in a ſecond Memoir on the ſame ſubject, he doubts whether the change of colour takes place in the lungs: and if it does, he inclines to aſcribe it to the evaporation from the blood in the lungs. The ingenious Mr. Hewſon is fully convinced, that the air in the lungs is the immediate cauſe of this change of colour; and to this purpoſe he obſerves, that he has diſtinctly ſeen the blood of a more florid red in the left auricle of the heart than it was in the right: and though ſome have attributed the effect to nitre abſorbed from the air, he conſiders this as a mere hypotheſis, adding, rather too haſtily, that air contains no nitre: and that moſt of the neutral ſalts produce the ſame effect in ſome degree.

Dr. Prieſtley, who has purſued his enquiries on the ſubject of reſpiration with very conſiderable ſucceſs, apprehends, that the air we breathe may be ſo far decompoſed, as to communicate a nitrous quality to the blood, in its paſſage to the lungs: and this opinion is confirmed by his analyſis of atmoſpherical air, which he has proved to conſiſt of earth and ſpirit of nitre. He has farther demonſtrated, by the moſt accurate and concluſive experiments, that the florid red colour of the blood is owing to the effect which the air has upon it; for the blackeſt parts of the craſſamentum of coagulated blood, ſeparated from the ſerum, aſſumed a florid red colour in common air: and the colour was more florid, and the change produced in leſs time in dephlogiſticated air, which is purer and more fit for reſpiration than common air: on the contrary, the brighteſt red blood became black in any kind of air, that was unfit for reſpiration, as in fixed air, inflammable air, nitrous air, or phlogiſticated air; but upon expoſing the blood, which became black in the phlogiſticated air, to common or dephlogiſticated air, it regained its red colour: and the ſame pieces became alternately black and red, by being transferred from phlogiſticated to dephlogiſticated air; and vice verſa. The blood, in theſe experiments, he ſays, muſt have parted with its phlogiſton to the common air or dephlogiſticated air; and have imbibed it, and have become ſaturated with it, when expoſed to phlogiſticated, nitrous, inflammable, or fixed air. There are, however, he acknowledges, other cauſes to which the blackneſs of the blood may ſometimes be owing, beſides its acquiring phlogiſton: nor can it be expected, that, when blood has become black without having received phlogiſton *ab extra*, it will generally recover its florid colour by being expoſed to the air.

Dr. Prieſtley proceeded to examine, whether the quality of the air, to which pieces of blood had been expoſed, and in which their colour was changed, was at all affected or altered, during the operation. In this experiment he made uſe of dephlogiſticated air, as its quality is more ſuſceptible of alteration than common air; and he found, that a piece of craſſamentum, about the ſize of a walnut, put into the quantity of about five ounce meaſures of this air, and changed about ten or twelve times in the ſpace of twenty-four hours, ſo depraved the air, that a mixture of one meaſure of this, and two of nitrous air, which, at the beginning of the experiment, occupied the ſpace of no more than half a meaſure, afterwards occupied the ſpace of a meaſure and a half. Whence he infers, that the black blood muſt have communicated phlogiſton to the air; and that its change of colour from black to a florid red, muſt have been occaſioned by the ſeparation of phlogiſton from it. He afterwards ſatisfied himſelf, that blood has likewiſe a power of taking phlogiſton from air; for by expoſing blood of a very beautiful florid colour to nitrous and to inflammable air, both were conſiderably diminiſhed by the proceſs. And he concludes, upon the whole, that the air becomes phlogiſticated in paſſing through the lungs, by means of the blood. Dr. Prieſtley anticipates an objection, which may be urged againſt this concluſion; viz. that the blood never comes into actual contact with the air in the lungs, but is ſeparated from it, according to Dr. Hales, at the diſtance of no more than a thouſandth part of an inch; and that the red globules remain in a large quantity of ſerum, which is a fluid of a very different nature. In order to reſolve this difficulty, he put a large quantity of black blood into a bladder, moiſtened with a little ſerum, and tying it very cloſe, hung it in a free expoſure to the air; and the next day he found, that all the lower ſurface of the blood, which had been ſeparated from the common air by the intervention of the bladder, and a ſmall quantity of ſerum, had acquired a coating of a florid red colour, as thick, in his opinion, as it would have acquired, had it been expoſed to the open air. He alſo found that a deep covering of ſerum did not obſtruct the mutual action of the blood and air any more than the bladder had done. From both experiments he infers, that the change of colour cannot be owing, as M. Cigna imagined, to evaporation: nor is the change of colour in the laſt experiment owing to the ſerum, but to the air; for two equal portions of black blood were put into equal cups, containing equal quantities of ſerum, covering them to the depth of half an inch; one cup was expoſed to the open air, and the other placed in an exhauſted receiver; the blood in the former preſently acquired a florid colour, but the other continued after twelve hours as black as at firſt. Dr. Prieſtley infers, from another experiment, that the moſt florid blood contains a conſiderable quantity of phlogiſton; and he obſerves that there is a great difference in the conſtitution of blood, with reſpect to its property of being affected by the air. See on this curious ſubject, Hewſon's Experimental Inquiry into the Properties of Blood, or Phil. Tranſ. vol. lx. p. 368, &c. Prieſtley's Exp. and Obſ. on Air, vol. iii. p. 55. or Phil. Tranſ. vol. lxvi. p. 226, &c.

Changes and Diſorders of the Blood. From the principles, or conſtituent parts of the blood above recited, variouſly combined and diſtributed by the circulatory motion impreſſed by the heart, and by the oſcillatory expanſive motion of the interſperſed air, and the re-action of the contractile veſſels, flow all the properties and operations of the blood. From this mixture of elements, and their lax compoſition, it becomes ſuſceptible of various alterations and impreſſions; the principal of which are, coagulation, which uſually attends it out of the body, ſometimes in it, and ſcarce ever without an artificial procurement, but always mortal: and diſſolution, which is juſt oppoſite to the former, and conſiſts in ſuch a comminution of the fibrous parts of the blood, as indiſpoſes it for a ſeparation of the cruor from the ſerum. This is frequently the conſequence of malignant and peſtilential fevers, &c. and is likewiſe occaſioned by ſome kinds of poiſons.

Theſe two contrary affections of the blood, Dr. Drake aſcribes to the oppoſite kinds of ſalts, acids, and volatile alkalis. For, in a human body, no pure acid is found, nor could it indeed, be conſiſtent with life; yet it may, and does often, enter the blood, ſo compounded as to bridle the volatile, alkalious ſalt of the blood, and ſo hinder the due attenuation and mixture of the ſeveral parts; as in the caſe in a diabetes, and perhaps in a chloroſis, where the blood is thick and torpid: on the other hand, where the alkalious ſalts are too redundant, the blood is rendered too thin and fluid, ſo that the difference of its conſtituent parts is loſt.

Another affection frequent in the blood is, a too great abundance of oils, or oily particles, by means of which the active parts of the blood are too much clogged, and thoſe parts which ſhould be ſecreted, for peculiar uſes in the body, are detained; and perhaps the ſolids, through which it paſſes, too much lubricated, their tone vitiated, ſhrunk, relaxed, &c. whence the ſluggiſhneſs and inactivity of very fat people.

The contrary affection to this is, the defect of oil in the blood; which, being as it were, its balſam, lines and preſerves the part from being fretted and corroded by the ſalts, whoſe ſpicula or edges are, as it were, ſheathed into this ſoft balſamic matter, and their attrition againſt the ſolid parts prevented: this ſtate of the blood is uſually attended with a general atrophy, and a fretting and corroſion of ſome particular parts; whence ſerous defluxions, apoſthumations, and ulcers eſpecially in the lungs, whoſe tender veſiculous ſubſtance is more eaſily annoyed than any other, by the acrimony of the ſaline ſerum.

There are other affections of the blood, reſulting from its inordinate temperature and mixture, with regard to the earthy parts; the conſequences of which are, the ſtone, &c. and others that do not originally ſpring from any dyſcraſy, or undue mixture of the elements, but from an alteration in its motion; ſuch as an augmentation or diminution of its progreſſive motion, or the like changes in its inteſtine motion; whence ſupernatural fermentations are induced. The occaſions here may be various; ſometimes fevers, and other diſorders occaſioned by ſurfeits, debauches, catching cold, violent exerciſe, &c. whence atonias; at other times ſome latent malignity of the air, whence epidemical diſeaſes.

To which may be added divers others morbific conſtitutions depending on the different ſtates and diſpoſitions of the blood, in reſpect of quantity, velocity, fluidity, denſity, ſeroſity, &c. An exceſs in the quantity of blood conſtitutes what we call a plenitude, or plethora; a defect or want of a competent quantity, a leiphæmia.

The ſymptoms of exceſs or defect, of an over-repletion or depletion, in the blood veſſels, are obvious; but caution muſt be uſed not to miſtake every occaſional fluſhing or tide of the blood to the head for a general plethora of the blood veſſels, ſuch tides and fluſhings being very common in caſes where there is yet no blood to ſpare. The æquilibrium of the blood is an uniform and proportional diffuſion of it through all the parts of the body.

Any conſiderable ſtimulus, it is known, will drive the blood in large quantities to the ſtimulated part, which muſt neceſſarily break the æquilibrium and uniformity of its circulation; whence congeſtions, ſtagnations, concretions, &c. of the blood; and hence it is that a great part of regular practice conſiſts in driving, revulſing, diſcuſſing, and variouſly directing, and determining the blood, in order to recover its æquilibrium.

The æquilibrium of the blood againſt any occaſional affluxes and refluxes of this fluid, is preſerved or reſtored, either by raiſing and diffuſing it when too weak and languid by cardiacs; as ſaffron, opium, Virginia ſnake root, &c. or by depreſſing and repelling it when too much raiſed and diffuſed; which is done by the abſorbents, coolers, purgatives, acids of all ſorts, eſpecially apples.

The morbific exceſs or defect of the blood's velocity is as remarkable as that of its quantity; but this cannot be judged from the natural ſtate of the pulſe in health, which is different in different conſtitutions. The ordinary number of pulſations in a minute is from 70 to 80 under a ſtate of waking and moderate heat, and from 80 to 96 during the time of ſleep.

The too great heat and viſcidity of the blood are ſome of its moſt generally prevailing morbific conſtitutions, eſpecially in a country, as ours, abounding with all the temptations to, and proviſions for, eaſe and luxury. This ſtate of the blood is brought on generally by drinking too freely, hot ſpirituous, inflammable liquors, and feeding plentifully on things, which contain a large proporiton of volatile oily ſalts; as fleſh meats half boiled or roaſted, eaten in their bloody gravy, and all hot, ſpicy, and high ſeaſoned broths, ſauces and the like. The blood being by theſe over heated and rarefied, the ſerum is, in conſequence, thickened into a ſort of jelly, by which means it is rendered unfit for motion, coheres too ſtrongly with the craſſamentum, and paſſes but ſlowly through the lymphatic and ſecretory glands. In this ſtate, the thicker and more viſcid parts of the ſerum, lodging on the lymphatics and receptacles of the glands, gradually obſtruct or fill them up. From which obſtruction and diminiſhed or intercepted circulation of the animal fluids, the heat and viſcidity of the blood ſtill increaſe, till a vital flame, raiſed too high, produces a fever. This ſtate of the blood, and its ſymptoms, are aggravated by a ſedentary life, or the want of due motion or exerciſe; for while the natural motion of the muſcular fibrillæ is either not at all, or but little promoted by voluntary action, the glands, and their receptacles, muſt be the ſooner ſtuffed up, and the circulation of the lymph, that powerful means by which nature continually cools and dilutes the blood, ſooner be ſuſpended.

The blood is cooled, diluted, and attenuated by temperance, exerciſe, the uſe of water as beverage, and otherwiſe, and by deobſtruents, eſpecially mercury, in the gentler preparations of it; as æthiops or cinnabar given in moderate doſes, ſo as not ſenſiby to affect the ſtomach, nor excite ſalivation, for a long time.

As to the greater or leſs degree of fluidity and viſcidity of the blood, it is manifeſt, that this humour may either have its parts too intimately divided and attenuated, or, on the contrary, there may be too cloſe a coheſion between its parts, ſo as to render the maſs too thick and viſcous. The firſt of theſe ſtates diſpoſes the blood to a too quick, eaſy, and rapid motion, and ſometimes diſſolves and fuſes it to ſuch a degree, that the globules or craſſamentum paſs, together with the ſerum, through the glandular ſtrainers, and occaſions bloody ſecretions; as in malignant and peſtilential fevers, bloody ſweats, and other preternatural hæmorrhages. The latter or viſcid ſtate renders the blood unapt for motion, and diſpoſes it to ſtick and lodge in the capillaries and lymphatics. Phil. Tranſ. N° 44. p. 891.

The ſpecific gravity of the blood, or the various degrees of its rarefaction and condenſation, depend on the degrees of heat; as the natural heat either riſes too high, or ſinks too low, the blood will, of conſequence, be either too much rarefied, or too much condenſed. In the former caſe, where the blood is overheated and rarefied, the expanſive force of the elementary fire and air contained in the maſs, prevails over the corpuſcular attraction; and then, by the coagulating power of heat upon the ſerum, and its too intimate mixture and coheſion with the craſſamentum, the lymph, which ſhould form the ſecretions, cannot be ſeparated, but the ſerum is, as it were, abſorbed in the creſſamentum; in conſequence of which, the ſecretions muſt be diminiſhed, or quite ſuſpended, and a fever enſue, more or leſs inflammatory, according to the degrees of heat in the blood, and the conſequent ſuſpenſion or interruption of the lymphatic ſecretions.

On the other hand, when the blood is immoderately cooled and condenſed, the corpuſcular attraction prevailing over the expanſive force, the ſerum will be over thinned and diluted, and conſequently ſeparated too faſt, and thrown off too plentifully on the glands and lymphatics; ſo that if the urinary drains happen to be obſtructed, a ſurcharge of ſerum muſt enſue, and in conſequence of this a dropſy: and in caſe the fluid parts of the urine paſs freely enough, and only the groſſer recrements, ſalts, and ſabula, or fine ſands, be kept back, theſe being thrown on the ſeveral organs, will produce the ſymptoms of the ſcurvy.

In order to aſcertain the colour of the different parts of corrupted blood, Dr. Pringle made the following experiment. He took a freſh quantity without any inflammatory cruſt, and divided it into the craſſamentum, the ſerum with a few red globules in it, and the pure ſerum. The phials, containing theſe ſeveral liquors were put into a furnace, where they ſtood ſome days, till they became thoroughly putrid.

The craſſamentum was changed from a deep crimſon to a dark livid colour; ſo that when any portion of it was diluted with water, it appeared of a tawny hue. Of the ſame colour was the ſerum in which the red globules remained. But the pure ſerum, after becoming turbid, dropped a white purulent ſediment, and changed into a faint olive green.

From this experiment he concludes, that the ichor of ſordes and that of dyſentery fluxes, conſiſts of the ſerum tinged with a ſmall quantity of red blood putrefied; and that when the ſerous veſſels are of a tawny caſt, we are not to refer that colour to inflammation, but to a ſudden ſolution of ſome of the red globules, mixed with the ſerum. A few drops of this putrid craſſamentum were mixed with the recent urine of a healthy perſon, which they immediately changed into a flame-coloured water, common in fevers and in the ſcurvy. After ſtanding an hour or two, the ſame gathered a cloud, reſembling what is ſeen in the crude urine of perſons in acute diſtempers.

As to a green ſerum, it is perhaps never to be ſeen in the veſſels of a living body, ſince it is not to be ſuppoſed that a perſon could ſurvive ſo great a change of the blood, in foul ulcers, indeed, and in other ſores, where the ſerum is left to ſtagnate long, the matter is found of a greeniſh colour, and is then always acrimonious. But the effects of a green ſerum are, in no caſe, to be ſo much dreaded as in the caſe of an aſcites, where it is collected in ſo large a quantity: of which he had ſome time ſince, almoſt a fatal inſtance in Mr. Cox, ſurgeon at Peterborough; who upon tapping a woman but a few hours after death, was ſo affected with the poiſonous ſteams of a green ſerum, that he was preſently ſeized with a peſtilential fever, and narrowly eſcaped with his life.

In regard to the ſediment which the ſerum dropped, on becoming putrid, and which reſembled well digeſted matter, the doctor thinks it a terreſtrial ſubſtance, intended for the nouriſhment or reparation of the ſolids; in which opinion he was the more confirmed by obſerving a like ſediment, in the urine of men in perfect health: and therefore concludes that the pus, or digeſted matter of ſores, is nothing but this ſubſtance ſeparated from the ſerum of blood. And hence it is that all large ulcers are extremely weakening, from the great loſs of blood in furniſhing this ſubſtance. Hence alſo it is, that iſſues are of more conſequence for making drains than one would expect from the viſible evacuation: as near as the doctor could gueſs, an ounce of ſerum, after ſtanding ſome days, not furniſhing more of this matter than what might be produced in the daily diſcharge of a large pea-iſſue, or from a ſeton.

There are frequent inſtances of the tawny colour of the ſerum, the reſolution of the craſſamentum, and even of the offenſive ſmell of blood recently drawn. And, indeed, if we reflect how putreſcent blood is in a heat equal to that of the human body, we may be convinced, that no ſooner is the perſpiration of the lungs impeded, than a corruption begins in the whole maſs; which if not timely prevented, brings on ſome putrid diſeaſe. If the acrimony is great and ſudden, a fever or flux will enſue; but if the accumulation is ſo ſlow that the body grows habituated to the putrefaction, a ſcurvy prevails. This is the caſe in long voyages, on board unventilated ſhips; in marſhy countries; and, in a leſſer degree, in all northerly climates, in moiſt ſituations.

Thickneſs of the BLOOD, is alſo a preternatural concretion, following on a plethora, or diminution of its motion, from which ſtagnations and other diſorders draw their riſe. This is either general throughout the whole body; or ſpecial, confined to ſome particular part; as in hypochondriac and hyſteric caſes, where the blood, by reaſon of the ſlowneſs of its progreſſion, acquires a lentor in the region of the abdomen. To the ſame cauſe are alſo owing polypuſes, apoplexies, pleuriſies, infarctions of the viſcera, palpitations of the heart, ſuppreſſions of the menſes, &c.

Solubility of the BLOOD, is that tendency in the ſerum and craſſamentum, by which they are diſpoſed to ſeparate and diſengage from each other, when the blood comes to cool, and ſtand in a baſon. When blood is taken off, it muſt frequently ſtand a long time at reſt, and in a cold place, before its principles can diſunite, ſo as to effect a perfect ſeparation of the ſerum from the craſſamentum; and yet at laſt, when the ſeparation is made, there may be a ſufficient quantity of ſerum, and perhaps a greater proportion than ordinary; whereas, at other times, this ſeparation ſhall be quickly made, and the ſolution affected after a ſhort time of ſtanding in a warmer air. Phil. Tranſ. N° 44. p. 89.

The red part of the blood is readily ſoluble in water, but not in ſerum, nor in a ſaturated ſolution of neutral ſalts. See an account of ſome experiments on the blood by Dr. Lewis, in Neumann's Works. Page 551, n.

Sweetening, purifying, or cleanſing the BLOOD, are terms that ſeem to have ariſen from a miſtake, as if the blood were an impure fluid, or capable of receiving impurities with the chyle; which ſeems to be overturned by the extreme fineneſs of the orifices of the lacteals, which will hardly allow any thing impure to paſs.

Excretions or Evacuations of the BLOOD, are either ſpontaneous, as in the hæmorrhoids, hæmoptoe, hæmorrhages at the noſe, the lochia, and menſtrual flux; or artificially produced by medicines, emmenagogues, venæſections, ſcarifications, leeches, &c.

The want of due evacuations of the blood produces plethoras. In hypochondriacal caſes, the natural excretions by the anus, menſtrual flux, &c. are by all means to be promoted, as the ſureſt means of cure.

Spitting of BLOOD, ſpirit of plantain-juice, comfrey-roots, and fine ſugar, are recommended by Mr. Boyle as an approved remedy againſt ſpitting and vomiting of blood. Tar water is ſaid to be a very good remedy in this caſe.

Orgaſm of the BLOOD, denotes an extraordinary efflatus, or ebullition, obſerved in fevers, phrenzies, hæmoptoes, palpitations of the heart, and even by ſome ſuppoſed in cephalalgias, ſcurvies, arthritic pains, &c. It is to be compoſed or allayed by calmers, nitroſe preparations, &c. rather than by opiates.

Flux of the BLOOD, is called an hæmorrhage. The periodical ones of women, menſes. Thoſe after child-birth, lochia. That ordinarily happening on the firſt coition is by ſome called and conſidered as the teſt of virginity.

About the matter of nutrition, or the ſource whence the nouriſhment is derived, great conteſts have ariſen among phyſicians and anatomiſts; ſome contending for a nutritious juice conveyed through the lungs; ſome ſetting up the lymph, others the chyle, ſome the ſerum of the blood, ſome the cruor, as the univerſal ſuccus alibilis, &c. However, all theſe, except they who bring the nutriment through the nerves, make the blood the vehicle, that conveys the alimentary parts through the body, whatever they be, and whenceſoever derived: but perhaps it was on the ſcore of its heterogenity, or compoſition of different elements, that they did not make itſelf the nutritious fluid; without reſtraining that faculty to ſome particular parts of it. But Dr. Drake makes no ſcruple to ſay, that the blood, in its largeſt acceptation, as conſiſting of all the parts before deſcribed, is ſimple and homogeneous enough for the purpoſes of nutrition; and that every part thereof contributes ſomething, either materially or inſtrumentally, to the augmentation, or reparation of the parts through which it paſſes.

The Quantity of BLOOD, in a human body, has been variouſly eſtimated by various authors: Dr. Lower computes it in an ordinary man, at about twenty pounds; Dr. Moulin by obſerving the proportion of the weight of ſeveral animals to their blood, eſtimates it at about $\frac{1}{20}$ of the weight of the whole man, which may amount to eight or ten pounds. Dr. Keil, from a calculation founded on the proportion of the coats to the diameters of the veſſels, ſhews, that in a body weighing 160 pounds, 100 pounds thereof are blood; but then under blood he includes the juices of the lympheducts, nerves, and other veſſels which are ſecreted from it.

In reality, it is very difficult to determine the quantity of blood in the body. Bleeding to death, the method uſed by Dr. Moulin and others, can never give the eſtimate of its true quantity; becauſe no animal can bleed longer than while the great artery is full, the continuance of which will be longer or ſhorter as the wounded artery is ſmaller or greater; and the aorta muſt always be the firſt veſſel that empties. The moſt certain way, in Dr. Keil's opinion is, by finding what proportion the cavities of the veſſels of which the whole body is compoſed, bear to the thickneſs of the coat. This, in the veins and arteries, may be exactly found; but, in other veſſels, we only know the quantity of fluid they contain, by carefully evaporating as much as poſſible.

Some think it probable, that at leaſt two thirds of the quantity of blood contained in an animal body, is continually paſſing the capillaries and ſmall veſſels in the glandular and muſcular parts, which can never be drawn off by any thick diſcharge from cutting the large veſſels; ſince, in that caſe, the larger veſſels being emptied much faſter than they can be ſupplied again from the capillaries, a defect of blood will ſoon enſue at the heart, upon which the animal falls into convulſions, and the circulation ſtops, while far the greater part of the blood muſt be ſuppoſed ſtagnating in the ſmaller and remoter veſſels.

Circulation of the BLOOD, denotes a natural motion of the blood in every living animal; whereby that fluid is alternately conveyed from the heart to every part of the body, by the arteries, and returned from the ſame parts to the heart by the veins.

The circulation of the blood has been generally allowed to have been firſt diſcovered in England, in the year 1628, by Harvey a phyſician of our own country; though there are ſeveral authors who diſpute it with him.

Circulation of the blood through the lungs, but the major circuitus was undoubtedly the diſcovery of Harvey. Many of the ancients had ſome knowledge of the motion of the blood; but they were ignorant of its regular circulation.

The circulation of the blood is evinced, from the following conſiderations. 1. All the blood of a living animal, upon wounding any one of the larger arteries, is in a little time, evacuated, and that with a conſiderable force: as appears from the operation of butchers, &c.

Hence, it follows, that the blood has a paſſage from every part of the animal body into every artery: and if the whole maſs of blood be found to move on this occaſion, it is evident it muſt have moved before.

2. The great quantity of blood driven out of the heart into the arteries of every pulſe, makes a circulation neceſſary; ſince, without it, an infinitely greater ſtock of blood muſt be ſuppoſed in the body of a man, than any obſervation or experiment will allow of.

For though the ancients, who knew not this circulation, imagined that only a drop or two was expelled at each ſyſtole; which they were neceſſitated to ſuppoſe, to avoid the too great diſtenſion of the arteries, from a more conſiderable influx: yet it is certain, and even demonſtrable, that there muſt needs be an ounce, or more driven into them at each time; and yet ſome compute that there are five or ſix thouſand pulſations in an hour.

3. Any of the arteries, being tied with a thread, ſwell, and beat, between the bandage and the heart; but they grow flaccid between the bandage and the extremities of the body. If now the artery be cut between the bandage and the heart, blood ſtreams out, even to death; if it be cut between the bandage and the extremity of the body, the quantity of blood it yields is very ſmall.

The vital blood, therefore, flows through the arteries; and its courſe is from the heart towards the extremes of the body: and this it does in every part of the body, internal and external; ſtill out of a wider part into a narrower; out of the trunk into the branches. And it is on this principle alone, that all the blood may be derived into any artery, and evacuated at it.

4. Any one of the larger veins being bound up with a thread, ſwells between the extremes of the body and the bandage, but without beating; and between the bandage and the heart it becomes flaccid.

If opened in the former part, it bleeds largely; if in the latter it ſcarce bleeds at all. The blood, therefore, flows briſkly from every part of the body into this vein; and its courſe is from the extremes of the body towards the heart; from the narrower parts of the vein towards the wider parts; from the branches to the trunk.

From the whole it is evident, that all the arteries of the body are continually bringing the blood from the left part of the heart, through the trunks of the arteries, into the branches; and from thoſe to all parts of the body, internal and external; and on the contrary, that all the veins, excepting the porta, are perpetually bringing back the blood from the extreme parts into the ſmaller branches; from thoſe it paſſes into the larger, at length into the trunks, and thence into the cava; and through the ſinus venoſus, or trunk of that vein (which ends in the cavity of the right auricle) into the heart.

The blood being arrived here, its motion, or circulation is, continued as follows:

The auricles of the heart being large hollow muſcles, are furniſhed with a double ſeries of ſtrong fibres proceeding with a contrary direction to two oppoſite tendons, the one adhering to the right ventricle, the other to the ſinus venoſus; as alſo with innumerable veins and arteries; by the contractile force of theſe auricles, the blood will be vigorouſly expreſſed, and drove into the right ventricle; which, upon this contraction, is rendered flaccid, empty, and diſpoſed to admit it.

If the right ventricle, thus full of blood, by the contraction of its fibres preſs the blood towards the aperture again, venous blood at the ſame time pouring in, will drive it back again into the cavity and mix it more intimately; till riſing up againſt the parietes, it raiſes the valvulæ tricuſpides, which are ſo connected to the fleſhy columns extended on the oppoſite ſide, as that when laid quite down they cannot cloſe the parietes of the right ventricle; theſe it thruſts towards the right auricle, till being there joined, they ſtop the paſſage very cloſely, and prevent any return.

By the ſame means, the ſame blood riſes up into the three ſemilunar valves, placed in the extremity of the other mouth, and lying open to the pulmonary artery: theſe it ſhuts cloſe againſt the ſides of the artery, and leaves a paſſage into the artery alone. The venous blood, therefore, that is, the blood of the body, continually moves out of the ſinus, or trunk of the vena cava, through the right auricle, and right ventricle, into the pulmonary artery, in a continued and forcible ſtream.

The blood carried by this artery into the lungs, and diſtributed by its branches through the whole ſubſtance thereof, is firſt admitted into the extremities of the pulmonary vein, called arteria venoſa; whence paſſing into four large veſſels, which unite together, it is brought to the left ſinus venoſus, or trunk of the pulmonary vein; by the force of whoſe muſculous ſtructure it is driven into the left ventricle, which, on this occaſion, is relaxed, and by that means prepared to receive it.

Hence, as before, it is driven into the left ventricle, which is relaxed by the ſame means; and the valvulæ mitrales opening, admit it into the left ventricle, and hinder its reflux into the pulmonary vein.

From hence it is forced into the aorta; at whoſe orifice there are three ſemilunar valves, which alſo prevent a reflux by cloſing the ſame.

And thus is circulation effected; all the blood ſent into the lungs, and received in the arteria venoſa, ſinus venoſus, left auricle and ventricle, being here continually propelled into the aorta, whoſe ramifications are ſpread throughout all the reſt of the body, with a violent motion.

This motion, in living animals, is attended with the following phenomena.

1. Both the venous ſinuſes are filled, and grow turgid at the ſame time. 2. Both auricles grow flaccid at the ſame time, and both are filled at the ſame time, with blood impelled by the contractile force of its correſpondent muſcular venous ſinus. 3. Each ventricle contracts, and empties itſelf of blood at the ſame time; and the two great arteries are filled and dilated at the ſame time. 4. As ſoon as the blood, by this contraction, is expelled, both ventricles being emptied, the heart grows longer and broader; and conſequently more flaccid and capacious. 5. Upon which, the muſcular fibres of both venous ſinuſes contract, and expreſs the blood contained in them into the ventricles of the heart. 6. In the mean time, the venous ſinuſes are again filled, as before; and the auricles, &c. return into their former habitude. 7. And this alteration continues till the animal begins to languiſh, under the approach of death; at which time the auricles and venous ſinuſes make ſeveral palpitations, for one contraction of the ventricle.

Thus is all the blood, in its return from every part of the body, internal and external, and from every part of the heart and its auricles, impelled into the right ventricle; out of that into the lungs; thence into the left ventricle; and thence through the whole extent of the body; and thence again brought back to the heart.

The tail of a newt, or water lizard, affords alſo a very entertaining proſpect of the circulation of the blood through almoſt numberleſs ſmall veſſels; but no object ſhews it ſo agreeably as one of theſe animals while ſo young as not to be above an inch long; for then the whole body is ſo very tranſparent, that the circulation may be ſeen in every part of it, as well as in the tail; and, in theſe objects, nothing is more beautiful than the courſe of the blood into the toes, and back again, where it may be traced all the way with great eaſe. Near the head there are alſo found three ſmall fins, which afford a very delightful proſpect: theſe are all divided like the leaves of polypody, and, in every one of the branches of theſe, the blood may be very accurately traced, running to the end through the artery, and there returning back again by a vein of the ſame ſize, and laid in the ſame direction; and as the veſſels are very numerous and large in this part, and the third or fourth magniſyer may be uſed, there are ſometimes ſeen thirty or forty channels of the running blood at once; and this the more as the globules of blood in the newt are large, and are fewer in number, in proportion to the quantity of ſerum, than in any other animal, and their figure, as they are protruded through the veſſels, changes in a very ſurpriſing manner.

In a fœtus, the apparatus for the circulation is ſomewhat different from that above deſcribed. The ſeptum, which ſeparates the two auricles of the heart, is pierced through with an aperture, called the foramen ovale: and the trunk of the pulmonary artery, a little after it has left the heart, ſends out a tube in the deſcending aorta, called the communicating canal.

The fœtus being born, the foramen ovale cloſes, by degrees, and the canal of communication dries up, and becomes a ſimple ligament. Though in ſome inſtances it has been known to remain open.

This mechaniſm once known, it was eaſy to perceive its uſe. For while the fœtus is incloſed in the uterus, it receives no air, but that little furniſhed it by the umbilical vein: its lungs, therefore, cannot ſwell and ſubſide as they do after the birth, and after the free admiſſion of the air. They continue almoſt at reſt, and without any motion; their veſſels are, as it were, full of themſelves, and do not allow the blood to circulate, either in abundance, or with eaſe.

Nature, therefore, has excuſed the lungs from the paſſage of the greateſt part of the blood; and has contrived the foramen ovale, by which part of the blood of the vena cava, received into the right auricle, paſſes into the left auricle, as the mouth of the pulmonary veins; and by this means it is found as far in its journey as if it had paſſed the lungs.

But this is not all: for the blood of the cava, which, miſſing the foramen ovale, paſſes from the right auricle into the right ventricle; being ſtill in too great quantity to paſs by the lungs, whither it is driven through the pulmonary artery; is, partly, intercepted in the way by the communicant canal, and poured immediately into the deſcending aorta.

Upon the whole, the blood in the lungs of the fœtus has none of the advantages of air, or reſpiration; which yet being neceſſary, nature, it is ſuppoſed, takes care that it receives a portion of air, mixed together with its mother's blood, and tranſmitted to it by the umbilical veſſels, to be diffuſed through the body.

This is confirmed hence; that, by conſtringing the navel ſtring very tight, the child dies like a man ſtrangled: which appears to be owing to nothing but the want of air. Add to this, that as ſoon as the mother ceaſes to reſpire, the fœtus expires.

Vitality and Aſcenſion of the BLOOD. Dr. Willis endeavours to ſhew that the blood being animate, this animation or life depends on its being kindled; inaſmuch as the common affections of fire and flame belong to the blood, though this vital flame doth not appear to ſight, becauſe its form is ſubordinate to another ſuperior form, viz. the ſoul of the animal. Phil. Tranſ. N° 57. p. 1178. See BIOLYCHNIUM.

Inflammability of the BLOOD. Mr. Boyle having held a piece of human blood, dried till it was almoſt pulverable, in the flame of a candle, found it would take fire, and afford a flame much like that which excited it, burning with a crackling noiſe, and here and there melting. But this inflammability much better appeared, when putting together four or five thoroughly kindled coals, he laid on them a piece of dried blood of the bigneſs of a ſmall nutmeg; for this yielded a large and very yellow flame, and if it were ſeaſonably and warily blown from time to time, as the effluvia degenerated into ſmoak, it would long continue to yield clear and yellow flames. The ſame author having cauſed ſome blood to be dried till it was reducible to fine powder, took part of the powder, which had paſſed a fine ſearce, and caſting it on the flame of a good candle, the grains, in their quick paſſage through it, took fire; and the powder flaſhed not without noiſe, as if it had been roſin.

Uſes of the BLOOD, in the animal œconomy, the blood ſerves as the ſource or fund from which all the humours of the body are ſecreted, whether neceſſary for nutrition, digeſtion, muſcular motion, ſenſation, or the like. Some alſo make it the principle of life and heat. And others hold it to do the office of a pondus in the alternate motion of the heart. Phil. Tranſ. N° 281.

Dr. Prieſtley has ſhewn, that one great uſe of the blood muſt be to diſcharge the phlogiſton with which the animal ſyſtem abounds; imbibing it in the courſe of its circulation, and imparting it to the air, with which it is nearly brought into contact, in the lungs; the air thus acting as the great menſtruum for this purpoſe. Exp. and Obſ. on Air, vol. iii. p. 71.

Other Uſes of BLOOD, are chiefly in agriculture, where it is found an excellent manure for fruit trees; blood is the baſis of that noble colour, called by painters Pruſſian blue; and it is to vitriol, that is, to iron diſſolved, and formed into a ſalt, that it owes its change into that colour; it is alſo uſed by ſugar bakers.

On this principle Mr. Brown, an excellent chemiſt, tried the effect of ſolutions of other metals mixed with blood, the reſult of which may be a baſis for many valuable diſcoveries. The blood in all theſe experiments, was prepared into a lixivium, in the ſame manner as in making the Pruſſian blue, that is, by calcining it with an equal weight of ſalt of tartar, and then diſſolving it in boiling water. See BLUE.

BLOOD, in farriery, a diſtemper incident to cattle which generally proves fatal. See Syſtem of FARRIERY.

BLOOD *Flower*, hæmanthus, in botany, a genus of the hexandria monogynia claſs: its characters are theſe; the flower has a permanent empalement of ſix leaves, ſhaped like an umbel. It hath one erect petal, cut into ſix parts; and ſix awl ſhaped ſtamina, which are inſerted in the petal. The germen is ſituated under the flower, and afterward becomes a roundiſh berry with three cells, each containing one triangular ſeed. There are four ſpecies.

The ſeaſon for tranſplanting the bulbs of this plant is in May or June, when the leaves are decayed; they may be kept out of the earth at this ſeaſon three or four months, but it is more adviſeable to plant them ſooner, as they always flower the ſtronger for it. They require rich ſoil and artificial heat in winter, when they bloſſom.

BLOOD *Shotten*, a diſtemper of the eyes, wherein the blood veſſels are greatly diſtended, ſo as to make the eyes appear red.

BLOOD *Royal*, is applied to the regular deſcendants of the royal family.

BLOOM, in the iron works, a term uſed by the miners for a four ſquare maſs of hammered iron, of about two foot long, and three quarters of a hundred weight, made from part of a ſow of caſt iron. The bloom, however, is not yet become iron fit for the ſmith's uſe, but muſt undergo many hammerings, and be firſt made what they call the ancony.

Half BLOOM, a round maſs of metal, which comes out of the finery of an iron work.

BLOSSOM, in a general ſenſe, denotes the flower of any plant.

In a more proper ſenſe, the word is reſtrained to the flowers of trees, which they put forth in the ſpring, as the forerunners of their fruit, otherwiſe called their bloom.

The office of the bloſſom is partly to protect, and partly to draw nouriſhment to the embryo fruit, or ſeed. Phil. Tranſ. N° 399. p. 329.

In ſome plants the male and female parts of generation are remote from each other; e. gr. in the gourd, pumkin, melon, cucumber, and all that race; to which may be added the nut bearing, and perhaps moſt bearing trees, which have all bloſſoms diſtinctly, male and female, on the ſame plant.

The male bloſſoms, called alſo catkins, may be diſtinguiſhed from the others, in that they have not any piſtil or rudiment of fruit about them, but have only a large thrum, covered with duſt in their middle.

The female bloſſom has a piſtil within the petala, or flower leaves, and the rudiment of their fruit is always apparent at the bottom of the flower before it opens.

Some ſorts of willows appear to change their ſex every year; and produce only male bloſſoms, or catkins, one year; and the year following ſtrings of female bloſſoms, which, if they happen to be near enough ſome flowering male, will produce ſeed, not much unlike thoſe of an apocinum.

BLOTTING *Paper*, a ſpecies of paper made without ſize or ſtiffening, ſerving to imbibe the wet ink in books of account, and prevent its ſetting off, or blotting the oppoſite page.

BLOW, in a general ſenſe, denotes a ſtroke given either with the hand, a weapon or inſtrument.

Blow *Pipe*, among jewellers and other artificers, is a glaſs tube, of a length and thickneſs at diſcretion, wherewith they quicken the flame of their lamp, by blowing through it with their mouth. It is uſed in works of quicker diſpatch, which do not need the bellows, for concentrating flame and various uſes.

Though the wind blown out at a ſmall bent tube of glaſs, called a blow pipe, ſeems not to have any great celerity in compariſon of the parts of flame, and is itſelf of little force; yet, when the flame of a lamp, or candle, is directed by it, ſo as to beat upon a body at a convenient diſtance, it may be made to melt ſilver, or even copper itſelf, which yet may be kept, for many hours, unmelted in a red hot crucible, or the flame of the lamp or candle unaſſiſted by the blaſt.

The enamellers have alſo tubes of divers ſizes, wherewith to blow their enamel, anſwering to the ſame purpoſe as the ponteglio, or blow pipe, of glaſſmen.

BLOWING *of Glaſs*, one of the methods of forming the divers kinds of works in the glaſs manufacture. It is performed by dipping the end of an iron ponteglo, or blowing pipe, in the melted glaſs, and blowing through it with the mouth, according to the circumſtances of the glaſs to be blown.

Blowing, *Exſufflatio*, was alſo a ceremony in the ancient adminiſtration of baptiſm. Something like this is ſtill retained in the Ruſſian church. In the ſacramentary of St. Gregory, the prieſt who adminiſters baptiſm, is enjoined to blow thrice on the child's face, making the ſign of the croſs with his head, and pronouncing the words *exi ab eo ſatan*.

Blowing *of Tin*, the running or melting of ore, after firſt burning it in a kiln, to deſtroy the mundic. Phil. Tranſ. N° 69. p. 2111, ſeq. See Tin.

Blowing is alſo uſed in ſpeaking of the natural motion or courſe of the wind.

Blowing, among gardeners, denotes the action of flowers, whereby they open and diſplay their leaves.

In which ſenſe, blowing amounts to much the ſame with flowing and bloſſoming.

It is among floriſts, an artificial proceſs, in order to bring a flower to diſplay itſelf with greater perfection and beauty than it would arrive to in the natural way.

The uſual method is thus: about April, when the flower ſtems begin to put forth, or ſpindle, as the gardeners call it, they place by each flower a ſtrait ſtick of proper length, and tie the ſpindles to it as they ſhoot. As ſoon as the flower buds appear, they leave only one of the largeſt on each flower ſtem to bloſſom. About ten days before the flowers open themſelves, the round podded kinds will begin to crack their huſks on one ſide, when the careful gardener, with a fine needle, ſplits or opens the huſk on the oppoſite ſide to the natural fracture; and about three or four days before the complete opening of the flower, cuts off with a pair of ſciſſars the points on the top of the flower pod, and ſupplies the vacancies or openings on each ſide the huſk with two ſmall pieces of vellum, or oil cloth, ſlipped in between the flower leaves and the inſide of the huſk; by ſuch means, the bloſſom will diſplay its parts equally on all ſides, and be of a regular figure: and as the floriſts term it, truſſes well. Beſides this care, when the bloſſom begins to ſhew its colours, they ſhade it from the extreme heat of the ſun with a trencher-like-board, or other device of the like nature, faſtened to the ſtick which ſupports it; for the flowers, as well as fruits, grow larger in the ſhade, and ripen and decay ſooneſt in the ſun.

Blowing *Snake*, in amphibiology, a name given by the people of Virginia to a ſpecies of ſerpent much reſembling the European viper, but conſiderably larger, and very remarkable for its inflating and extending the ſurface of its head before it bites. Its wound is very fatal.

BLUBBER, in phyſiology and trade, the fat which inveſts the bodies of all large cetaceous fiſh, ſerving to furniſh an oil.

The blubber is properly the adeps of the animal: it lies immediately under the ſkin, and over the muſcular fleſh. In the porpoiſe, it is firm and full of fibres, and inveſts the body about an inch thick. In the whale, its thickneſs is ordinary ſix inches; but about the under lip, it is found two or three feet thick. The whole quantity yielded by one of theſe animals ordinarily amounts to forty or fifty, ſometimes to eighty or more, hundred weight. Phil. Tranſ. N° 77. p. 2275.

The uſe of blubber to the animal ſeems to be partly to poiſe the body, and render it equiponderant to the water; partly to keep off the water at ſome diſtance from the blood, the immediate contact whereof would be apt to chill it; and partly alſo for the ſame uſe that cloaths ſerve us, to keep the fiſh warm, by reflecting or reverberating the hot ſteams of the body, and ſo redoubling the heat; ſince all fat bodies are, by experience, found leſs ſenſible of the impreſſions of cold than lean ones.

Its uſe in trade and manufactures is to furniſh train-oil, which it does by boiling down. Formerly this was performed aſhore in the countries where the whales were caught; but of late the fiſhers do not go aſhore, they bring the blubber home, ſtowed in caſks, and boil it down there. This branch of traffic is lately become of great importance in Britiſh commerce.

BLUE, one of the primitive colours of the rays of light.

Mr. Boyle has given us the following method of making tranſparent blue, nearly equal to ultramarine. The principal ingredient of this beautiful colour is the cyanus, or blue corn-bottle-flower, which abounds almoſt in every corn field, and may eaſily be had during four of the ſummer months.

This flower has two blues in it, one of a pale colour in the large outer leaves; and the other of a deeper blue, that lies in the middle of the flower. Both theſe will do, being ſeparated from the buttons or caſes in which they grow; but the deep blue leaves in the middle produce much the beſt colour: this may be obſerved by rubbing the leaves while they are freſh upon a piece of writing paper, ſo hard as to expreſs the juice, which will yield an excellent colour, that by the experience of two or three years has not been found to fade.

A ſufficient quantity of theſe middle leaves being procured, let the juice be preſſed from them; to which a little alum being added, will give a laſting tranſparent blue, ſcarcely inferior in brightneſs to ultramarine.

It is very probable, that if the chives of theſe flowers were cured in the ſame manner with ſaffron, they would produce a much greater body of colour, from which a tincture might be drawn with more eaſe than when preſſed freſh from the field.

Mr. Boyle alſo recommends another fine blue, produced from the blue leaves of rue beaten in a ſtone mortar with a wooden peſtle, and then put in water for fourteen days or more, waſhing them every day until they are rotten. Theſe beaten up at laſt, water and all, until they become a pulp, and then dried in the ſun, will make a fine blue for ſhading.

Blue *Aſhes*, cendre bleu, and by corruption from the French Sanders blue. Theſe are very much uſed in water-colours, and ſome are very lively; but in oil they grow dull and greeniſh, being ſomewhat of the nature of verdigriſe; and the more oil is put to them, the weaker they become. They are found in the form of a ſoft ſtone, in places where there are copper mines, and water only is made uſe of in levigating them, to reduce them to a fine powder. This kind of blue ought to be uſed in works to be ſeen by candle light, as in ſcene painting; for though a great deal of white is mixed with it, it appears very beautiful, notwithſtanding it has a greeniſh caſt; quite contrary to enamel, which looks bright by day, and dull by candle light.

Some of theſe blue aſhes look as beautiful as ultramarine, but by mixing them with a little oil, the difference is eaſily diſcovered: for whereas ultramarine becomes much higher on being mixed with oil, theſe acquire no body of colour from the mixture.

There is nothing to be found in the ſhops under this name but common verditer, or ſome ſpecies of it.

Blue *Bice*, is a colour of good brightneſs, next to Pruſſian blue; it is alſo a colour of a body, and flows well from the pencil.

Azure Blue, in chemiſtry. This colour may be drawn from ſilver: but Boyle juſtly obſerves, that this happens only according to the proportion of copper found mixed in this metal. The following is the ſhorteſt proceſs for making it. Diſſolve ſal gem, ſalt of tartar. and roche alum, in the ſtrongeſt double diſtilled vinegar; ſuſpend over the vinegar ſo prepared, thin plates of ſilver; and bury the veſſel in the huſks of grapes. Every three days remove the plates, and wipe off the blue which will be formed on them: otherwiſe, put laminæ of ſilver as thin as paper, into a pint of the ſtrongeſt vinegar, add to it two ounces of ſal ammoniac well pulveriſed; put this into a glazed earthen pot carefully ſtopped; bury this in horſe-dung for fifteen or twenty days, at the end of which time you will find the plates covered with a fine azure blue.

Blue, with dyers, is one of their ſimple or mother colours, uſed in the compoſition of others: it is given chiefly with woad, and indigo. Some dyers heighten their blue, by adding madder, Braſil, and other woods. The way of brightening blues is by paſſing the ſtuff, when dyed and well waſhed, through luke-warm water; or, which is much better, by working and fulling the dyed ſtuff with melted ſoap, and then ſcouring it well. Blues are dyed immediately from the whites, without any other preparation than ſcouring. See Treatiſe on the Art of Dying.

Blue and yellow compoſe green when blended together. Yellow lake or patent yellow, and Pruſſian blue, make beautiful green uſed with oil; the mixture, according to the teint required: to render it paler, add white lead at the artiſts pleaſure.

Hellot ſuſpects that ſuch a blue fecula, as is procured from indigo and woad, is procurable from many other vegetables. He ſuppoſes the natural greens of vegetables to be compounded in like manner of thoſe two colours, blue and yellow; and that the blue is oftentimes the moſt permanent, ſo as to remain entire after the putrefaction or deſtruction of the yellow. The theory is ſpecious, and perhaps juſt.

Indigo BLUE. See INDIGO.

BLUE, by painters, is made differently, according to the different kinds of paintings. In limning, freſco, and miniature, they uſe indifferently ultramarine, blue aſhes, and ſmalt; theſe are the natural blues.

In oil they uſe indigo, blue bice, blue verditer, lapis armenus, ſmalt, and litmus; alſo a counterfeit ultramarine.

Enamellers and painters on glaſs have blues peculiar to themſelves; each preparing them after his own manner. See the Arts of Enamelling and Painting on GLASS.

Pruſſian BLUE, or *Berlin* BLUE, is a modern invention, conſiderably in uſe among painters, though inferior to the ultramarine blue. It was diſcovered by accident, about the beginning of this century. A chemiſt of Berlin, having ſucceſſively thrown upon the ground ſeveral liquors from his laboratory, was ſurpriſed to ſee it ſuddenly ſtained with a moſt beautiful colour. Recollecting the liquors he had thrown on each other, he made a ſimilar mixture in a veſſel, and produced the ſame colour. He did not publiſh his proceſs, but prepared and ſold his blue, which was ſubſtituted for ultramarine. The account of it was firſt publiſhed in the Berlin Memoirs, 1710; but without the deſcription of its proceſs.

In a paper of Dr. Woodward's, communicated to the Royal Society in the year 1724, there is given a ſhort way of making the Pruſſian blue, which when tried over again by Mr. Brown the chemiſt, was found to anſwer perfectly well; and gave hints and occaſions to ſeveral experiments, which gave great light into the true nature of the bodies uſed in that praparation.

The method was this. Four ounces of bullock's blood dried, and four ounces of ſalt of tartar prepared from four ounces of crude tartar and as much nitre, were calcined together; two hours after which, a black ſpungy ſubſtance remained in the crucible, weighing four ounces; a ſolution of which being made in boiling water, and afterwards filtered, left a remainder which when dried weighed nine drams. An ounce of Engliſh vitriol was diſſolved in ſix ounces of rain water, and eight ounces of crude alum in two quarts of water. Theſe being mixed hot with the blood, became green; and on adding two or three ounces of ſpirit of ſalt, they become of a fine blue, which will ſubſide, and leave the water clear at top. Mr. Brown found the proceſs exactly anſwer, and the product was an ounce of a very fine colour, and perfectly fit for the painter's uſe.

It is curious to know what gave the firſt hint for the production of ſo fine a colour from a combination of ſuch materials, eſpecially when we come to conſider, that the blood has the principal ſhare in this ſurpriſing change. Blood of any kind, or fleſh of any kind, would produce the ſame effects; but it is probable that fleſh would not yield ſo ſtrong or fine a colour. Beef has been tried, and found to yield a blue, but not ſo fine as the blood. Phil. Tranſ. abr. vol. vii. p. 747, &c.

In all the recipes which have been given for making the Pruſſian blue, the liquors are ordered to be mixed together boiling hot, except the ſpirit of ſalt; and experience ſhews, that the colour is moſt readily and beautifully made that way: but in experiments made with all the liquors cold, the colours have been very well produced, only in leſs beauty; they have required waſhing ſeveral times in freſh water, to bring them to their beauty.

Mr. Brown thinks, that this blue is the phlogiſtic part of iron, diſengaged by the lixivium of bullock's blood, and applied to the earth of alum: M. Macquer concludes, from many experiments, that it is nothing but iron impregnated with a ſuperabundant quantity of phlogiſton, which it receives from the phlogiſticated alkaline precipitant. He has likewiſe applied the preparation of this pigment to the dying of wool and ſilk, and found means of fixing the colour. The cloth muſt firſt be dipped in a diluted ſolution of vitriol and alum, then in the ley diluted, and afterwards in water acidulated with ſpirit of vitriol; it acquires hereby a light blue colour, which becomes deeper and deeper by repeating the dippings as before, and adding to the liquors each time a little more of the reſpective ſaline matters. M. Macquer obſerves, that this blue dye exceeds in beauty and luſtre that of indigo and woad; that it penetrates the whole ſubſtance of fulled cloth, without weakening it; that it is durable in the air, and bears boiling in alum water, but is diſcharged by ſoap. Phil. Tranſ. abr. vol. vii. p. 747, &c. Mem. Acad. Scienc. for the years 1725, 1749, 1752.

The method of making this Pruſſian blue in perfection, has been purchaſed as a very valuable ſecret. Its proceſs is very extraordinary, and could ſcarce be derived *a priori* from any reaſoning about the nature of colours. It is allowed to be an excellent blue pigment, and is by ſome preferred to ultramarine, though its durability might have been ſuſpected, from the vegetable and animal matters uſed in its preparation, if the colour did not ſeem extraordinarily fixed by the operation.

The goodneſs of Pruſſian blue muſt be diſtinguiſhed by its brightneſs, deepneſs, and coolneſs.

There are four different proceſſes given for making the fineſt ſort of Pruſſian blue with quick-lime.

Proceſs I. Take 3lb. of ox's blood, dried and reduced into a kind of ſmall ſcales; an equal quantity of quick-lime baked; 2lb. of red tartar; and 1lb. 8 oz. of ſalt-petre; pulveriſe the whole groſsly, and put it into a crucible, placed in the midſt of a great furnace, and give it a gradual fire. After four hours, when the matter is reduced into a kind of paſte which emits no more ſmoke, and is equally red, throw it by ſpoonfuls into two pails of boiling water; and, having filtrated the lixivium, mix it with a ſolution of 6lb. of alum, and 1lb. 8 oz. of green vitriol. This operation will yield but 7 oz. of fecula; but its beauty will make ſufficient amends for the ſmall quantity, as it will ſurpaſs in this reſpect all the blues of Pruſſia, which are prepared by other methods.

Proceſs II. Take 3lb. of dried ox's blood, an equal quantity of quick lime, 2lb. of red tartar, and 2lb. of nitre; let them be calcined and lixiviated, as in the former proceſs: pour the ſolution into a lixivium of 4lb. of alum, and 1lb. of green vitriol. This operation will yield more of the blue fecula than the other, but the colour will be leſs beautiful.

Proceſs III. Take 3lb. of dried ox's blood, 4lb. 8 oz. of quick lime, 2lb. of red tartar, 1lb. 8 oz. of ſalt petre. Proceed as before. This operation will produce the moſt beautiful blue; but the quantity will be only about 8 oz. and 4 drams.

Proceſs IV. Take 3lb. of dried ox's blood, 6 lb. of quick lime, 2lb. of red tartar. and 1lb. 8 oz of nitre. Calcine and lixiviate as before; pour the warm lixivium into a ſolution of 4lb. of alum, and 1lb. of green vitrol; the fecula precipitated in this way will be as beautiful as thoſe of the firſt proceſs, and the quantity 26 ounces.

Saxon BLUE. This die has been known for ſome time, and is made by diſſolving indigo in oil of vitriol, by which the indigo becomes of a much more lively colour, and is extended to ſuch a degree, that it will go very far in dying. The following receipt for making it, produces a very fine colour, and never fails of ſucceſs.

Mix 1 oz. of the beſt powdered indigo with 4 oz. of oil of vitriol, in a glaſs body or mattraſs; digeſt it an hour with the heat of boiling water, ſhaking the mixture at different times. Add 12 oz. of the water to it, ſtir the whole well, and when cold filter it; a very rich deep colour will be produced; and if a paler blue be required, it may be had by the addition of water. The heat of boiling water is ſufficient for this operation, and can never ſpoil the colour. A ſand heat, not uncommonly uſed for this purpoſe, is often found to damage the colour.

Indigo digeſted with a large quantity of ſpirit of wine, and dried, will produce a finer colour than the former, if treated in the ſame manner with oil of vitriol.

Ultramarine BLUE, a beautiful blue colour, uſed by the painters, prepared from lapis lazuli.

Some derive its name ultramarine, q. d. beyond ſea, from its being firſt brought into Europe out of India, and Perſia. Others ſay, it is becauſe its colour is deeper than that of the ſea.

This blue is one of the richeſt and moſt valuable colours, uſed in painting. The preparation conſiſts in firſt calcining the ſtone in an iron pot or crucible, then grinding it very fine on a porphyry; then mixing it up with a paſte made of wax, pitch, maſtich, turpentine, and oil; and at laſt waſhing the paſte well in clear water, to ſeparate the colouring part from the reſt, which precipitates to the bottom, in form of a ſubtile, beautiful, blue powder. The water is then poured off, and the powder at bottom is dried in the ſun; and it is the true ultramarine.

Thoſe who prepare this colour, make uſually four kinds, which they procure by ſo many different lotions: the firſt is always the beſt; and the reſt worſe and worſe to the laſt. There is ultramarine of the firſt kind, ſold for 11l. ſterling per ounce; and of the laſt, for about 12 or 15s.

The common opinion concerning its origin is, that the method of making it was firſt diſcovered in England; and that a member of the Eaſt India company, having a quarrel with his aſſociates, to be revenged of them, made the ſecret public.

Ultramarine muſt be choſen of a high colour, and well ground, which is known by putting it between the teeth, where, if it feel gritty, it is a ſign the triture is not ſufficient.

To know whether it be pure and unmixed, put a little of it in a crucible, and heating it red hot, if the powder has not changed its colour after this trial, it is certainly pure: on the contrary, if you perceive any change, or any black ſpecks in it, it is falſified.

Many ſpecimens of blue earth have been diſcovered in England and Ireland, and ſeveral parts of the continent.

BLUE *Bottle*, in botany, is the Engliſh name of the cyanus. It is a ſmall plant, with beautiful blue flowers, common in our corn fields, and of which many beautiful ſpecies are kept in gardens; as centaury, &c.

The common wild blue bottle of our corn-fields, is eſteemed efficacious in diſeaſes of the heart, and malignant fevers.

BLUE *Mantle*, in heraldry, the title of a purſuivant at arms.

BLUENESS, that quality which denominates a body blue;

or ſuch a ſize and texture of the parts that compoſe the ſurface of a body, as diſpoſes them to reflect the blue or azure rays of light, and thoſe only, to the eye.

With reſpect to the blueneſs of the ſky, M. de la Hire, after Leonardo da Vinci, obſerves, that any black body or dark body viewed through a thin white one, gives the ſenſation of blue. From the ſame principle he accounts for the blueneſs of the veins on the ſurface of the ſkin, though the blood they are filed with be a deep red; this, viewed through the membrane of the vein, and the white ſkin, will produce the perception of blueneſs.

BLUFF *Head*, or BLUFF *Headed*, in the ſea language, is when a ſhip has but a ſmall rake forward on, being built with her ſtem too ſtraight up.

BLUING *of Iron*, a method of beautifying that metal ſometimes practiſed; as for mourning buckles, ſwords, or the like. The manner is thus: take a piece of grindſtone, and whet ſtone, and rub hard on the work to take off the black ſcurf from it; then heat it in the fire, and as it grows hot, the colour changes by degrees, coming firſt to a light, then to a dark gold colour, and laſtly to a blue. Sometimes they grind alſo indigo and ſallad-oil together, and rub the mixture on the work with a woollen rag, while it is heating, leaving it to cool of itſelf.

Among ſculptors we alſo find mention of bluing a figure of bronze, by which is meant the heating of it, to prepare it for the application of gold leaf, becauſe of the bluiſh caſt it acquires in the operation.

BLUNDERBUSS, is a ſhort ſort of fire arm, with a large bore, contrived to carry a number of muſket or piſtol bullets at once.

BLUSHING, a ſuffuſion or redneſs of the cheeks, excited by a ſenſe of ſhame, on account of conſciouſneſs of ſome failing or imperfection.

BLUSHING is ſuppoſed to be produced from a kind of conſent or ſympathy, between ſeveral parts of the body, occaſioned by the ſame nerve being extended to them all. Thus the fifth pair of nerves being branched from the brain to the eye, ear, muſcles of the lips, cheeks, palate, tongue, and noſe; a thing ſeen or heard, that is ſhameful, affects the cheeks with bluſhes, driving the blood into the minute veſſels thereof; at the ſame time that it affects the eye, and ear. For the ſame reaſon it is, as Dr. Derham obſerves, that a ſavoury thing ſeen or ſmelt affects the glands and parts of the mouth: if a thing heard be pleaſing, it affects the muſcles of the face with laughter; if melancholy, it exerts itſelf on the glands of the eyes, and occaſions weeping, &c. And to the ſame cauſe Dr. Willis aſcribes the pleaſure of kiſſing.

BOA is a genus of ſerpents in the Linnæan ſyſtem, with abdominal and ſubcaudal ſcuta, and without a rattle.

BOADODA, *Baſhaw*, in the Turkiſh military orders, is an officer of the janizaries, whoſe buſineſs it is to walk every day about the principal parts of the city, with a number of janizaries, to attend him, to keep order.

BOAR, in tetrapotology, ſus agreſtis, the wild boar. This creature differs from the common domeſtic hog, in that the grown animal is not different in colour in the different individuals of the ſame ſpecies, but is always of a ruſty iron-grey. His ſnout is much longer alſo than that of the other; his ears ſhorter and rounder; and both theſe, and his tail and feet, are always black. It differs alſo, being covered with two ſorts of hairs, the one kind long, the other ſhort: theſe laſt ſerve the creature to the ſame purpoſes, as the downy fur which the beaver and otter have under their long hair. It is very commonly wild in Italy, and its fleſh frequently brought to market.

The boar generally lives to twenty five or thirty years, if he eſcapes accidents. The time of going to rut is in December, and laſts about three weeks. They feed on all ſorts of fruits, and on the ruits of many plants: the root of fern in particular ſeems a great favourite with them: and when they frequent places near the ſea coaſts, they will deſcend to the ſhores, and demoliſh the tenderer ſhell fiſh in very great numbers. Their general places of reſt are among the thickeſt buſhes that can be found, and they are not eaſily put up out of them, but will ſtand the bay a long time. In April and May they ſleep more ſound than at any other time of the year, and this is therefore the ſucceſsful time for taking them in the toils. When a boar is rouſed out of the thicket, he always goes from it, if poſſible, the ſame way by which he came to it; and when he is once up, he will never ſtop till he comes to ſome place of greater ſecurity. If it happens that a number of them are found together, when any one breaks away, the reſt all follow the ſame way. He makes no doubles or croſſings when chaſed; and when killing makes no noiſe, if an old boar; but the ſows and young ones will ſqueak, when wounded.

The modern way of boar hunting is generally to diſpatch the creature by all the huntſmen ſtriking him at once: but the ancient Roman way was, for a perſon on foot, armed with a ſpear, to keep the creature at bay, and in this caſe the boar will run of himſelf upon the ſpear to come at the huntſman, and puſh forward till the ſpear pierced him through.

The wild boar was formerly a native of Britain, as appears from the laws of Hoel Dda, Leges Welicæ, 41. William the conqueror puniſhed with the loſs of their eyes, any that were convicted of killing him: Charles I. turned out wild boars in the New Foreſt, but they were deſtroyed in the civil wars.

In the corn he is ſaid to feed; in the meadows or fallow fields, to rout worm, or fern: in a cloſe to graze.

The boar is farrowed with as many teeth as he will ever have, his teeth increaſing only in bigneſs, not in number; among theſe there are four called tuſhes or tuſks, the two biggeſt of which do not hurt when he ſtrikes, but ſerve only to whet the other two loweſt, with which the beaſt defends himſelf, and frequently kills, as being greater and longer than the reſt.

It is very remarkable, the boars in the Weſt Indies are ſubject to the ſtone: few of them are abſolutely free from it, yet ſcarce any have the ſtones of any conſiderable ſize. It is common to find a great number in the ſame bladder, and they are uſually of about a ſcruple weight, and are angular, and that with great regularity, each having five angles. Phil. Tranſ. N° 36. Among the ancient Romans, boar's fleſh was a delicacy; a boar ſerved up whole was a diſh of ſtate.

BOARD, a piece of timber ſawed thin, for the purpoſes of building.

BOARD, is alſo uſed for a kind of table or bench, whereon ſeveral artificers perform their work.

In this ſenſe, we ſay a work board, a ſhop board, a taylor's board, &c.

BOARD is alſo uſed for a flat machine, or frame, uſed in certain games, and the like.

In this ſenſe, we ſay a draught board, a cheſs board, a ſhovel board, and the like.

BOARD is alſo uſed for an office where accounts are taken, payments ordered, and the like.

In this ſenſe, we ſay the board of works, boar of ordnance, board of treaſury, and the like.

BOARD *of Trade and Plantation*, this was aboliſhed in 1780, and in lieu thereof, there has ſince been eſtabliſhed a Committee of Trade. See TRADE.

BOARD *of Trade, Bureau de commerce*, an office in the French polity, eſtabliſhed in 1723, compoſed of eight perſons of experience in commerce and navigation, where all papers and propoſals relating to the improvement of trade are examined, and all difficulties which occur in affairs of navigation and commerce, either within or without the realm, are diſcuſſed.

BOARD *Wages*, denotes a certain annual ſum allowed to houſhold ſervants for maintenance. Board wages, granted to the menial officers and ſervants of the crown, commenced in 1629, when the neceſſities of king Charles obliged him to retrench the expence of his houſhold, by aboliſhing the greateſt part of the daily tables in his palace, which were eighty in number, and ſubſtituting his annual allowance in their room. This method is now prevalent in many private families to the diſgrace of hoſpitality and domeſtic enjoyment.

BOARD, or ABOARD, in ſea-language, is uſed in ſpeaking of things within a ſhip or other veſſel.

Hence, to go aboard, ſignifies to go into the ſhip; to heave over board, is to throw a thing out of the veſſel into the ſea: to ſlip by the board, is to ſlip down by the ſhip's ſide; board and board, is when two ſhips, come ſo near as to touch one another; or when they lie ſide by ſide.

Weather board, is that ſide of a ſhip which is to windward.

To board a ſhip, is to enter an enemy's ſhip in a fight.

BOARDING *of a Ship*, an attack made to take her, by entering her decks with a detachment of armed men. No ſpecific rules can be laid down for conducting ſo hazardous an enterprize; Britiſh courage has effected wonders by thus attacking the enemy; and on thoſe occaſions Britiſh humanity is not leſs meritorious than national valour.

BOAT, a ſmall, open, floating veſſel, commonly wrought or moved only by rowing; intended chiefly for the navigation of rivers, lakes, and the like.

The boat acquires various names, according to its various ſtructure, and the various uſes it is appointed for, and the places where it is to be uſed. The ſeveral boats, and their names are,

A jolly boat, a long boat, a ſkiffe, a pinnace, a cutter, a lanch, a water boat, a yawl, which are boats for ſhips; a gondola, a Greenland boat, a Bermudas boat, a balloon of Siam, a horſe boat, a periagua, a pleaſure boat, a ponton, a canoe, a cruckle, a currycurry, a deal hooker, a felucca, a ferry boat, a pram, a punt, a ſhallop, a Moſes, a tilt boat, a tod boat, a well boat, a wherry, a flat bottomed boat, &c.

The boats or wherries allowed to ply about London, are called Scullers, viz. thoſe wrought by a ſingle perſon with two oars; or Oars, wrought by two perſons, with each an oar. De Chales propoſes the conſtruction of a boat, which, what burden ſoever it bear, ſhall not only move againſt the current, without either ſails or oars, but alſo advance ſo much the faſter, as the rapidity of the water is greater. Its make is the ſame with that of the others, excepting only a wheel added to its ſide, with a cord, which winds round a roller as faſt as the wheel turns.

Something of the like kind has alſo been ſince done by M. Pitot. Vide Mem. Acad. R. Scienc. an. 1729. p. 359, and p. 540.

A new attempt, and with great ſucceſs, has alſo been lately made at Vienna.

M. de la Hire has given us an examination of the force neceſſary to move boats, both in ſtagnant and running water, either with ropes faſtened to them, or with oars, or with any other machine; wherein, he ſhews, that the larger the ſurface of the oars plunged in the water, and the ſmaller that of the boat preſented to the water, is; and again, the longer that part of the oar between the hand and the places where the oar reſts on the boat, and the ſhorter that between this laſt point and the water, the freer will the boat move, and the greater effect will the oar have.

Hence it is eaſy to calculate the force of any machine that ſhall be applied to rowing; if we know the abſolute force of all the men who row, it muſt be changed into a relative force, according to the proportion of the two parts of the oar; i. e. if the part out of the veſſel be double the other, and all the men together can act with the force of 900 pounds, we compute firſt, that they will exert 300; which 300, multiplied by the ſurface which the veſſel preſents to the water, gives a ſolid water of a certain weight; which weight may be found, and of conſequence the velocity impreſſed on the veſſel by the oars. Or, the velocity of the oars may be found in the ſame manner, by multiplying the 300 pounds by the ſurface of all the parts of the oars plunged in the water. Nor would there be any difficulty in finding firſt the relative forces, then the abſolute ones; the velocities either of the oars, or of the veſſel, being given, or the proportion of the two parts of the oar.

Boats ſail more ſlowly and heavily over ſhallow, than over deep waters. See an account of experiments for explaining this, in Dr. Franklin's letter, to Sir John Pringle. Experiments, &c. 4to. 5th ed. p. 510.

Long Boat, called alſo the ſhip's boat, is the largeſt and ſtrongeſt boat belonging to a ſhip that can be hoiſted aboard of her. It has a maſt, ſail, and oars, as other boats; alſo a tiller to the rudder, which anſwers to the helm of a ſhip.

Her thaughts are the ſeats where the rowers ſit; and her thowls the ſmall pins between which the oars are put when they row.

Inſtead of a long boat, merchant's ſhips in the Mediterranean uſe a lanch.

A ſhip's boat is the very model of a ſhip, and is built in every reſpect anſwerable to thoſe which a ſhip requires, both for ſailing and bearing a ſail: and they bear the ſame names as to all the parts of a ſhip under water. See the Syſtem of Naval *Architecture.*

Its uſe is to weigh the anchor, convey goods, proviſions, &c. to or from the ſhip.

The terms uſed in navigating a boat, are, to trim the boat, that is to keep her even; to wind the boat, i. e. to bring her head the other way; free, or bale the boat, i. e. to fling out the water; man the boat, i. e. let ſome men go to row the boat; to moor the boat, i. e. to faſten it with two ropes, ſo that one ſhall counteract the other; fend the boat, i. e. ſave her from beating againſt the ſhip's ſides. The boat's gang include thoſe who uſe to row in the boat, which are the cockſwain and his gang, to whom the charge of the boat immediately belongs.

Boat *Fly*, a water inſect, whoſe back is ſhaped much like the bottom of a boat; the hind legs, which are thrice as long as the fore, aptly enough reſembling a pair of oars. Accordingly, contrary to all other creatures, he ſwims, ſays Moufet, on his back.

Boat *Hook*, an iron hook, with a ſharp point on the hinder, part, fixed on a long pole, uſed in bringing it to, or puſhing it from any other boat, ſhip, &c.

BOATSWAIN, an officer on board a ſhip, who has charge of her rigging, ropes, cables, anchors, ſails, flags, colours, and pendants; and is alſo to take care of the long boat, and its furniture, and to ſteer her, either by himſelf or his mate.

He calls out the ſeveral gangs aboard, to the due execution of their watches, works, &c. He is likewiſe a kind of a provoſt martial, who ſees and puniſhes all offenders ſentenced by the captain, or a court martial of the fleet.

Boatswain's *Mate*, is an aſſiſtant of that officer, who has the peculiar command of the long boat, for the ſetting forth of anchors, weighing or fetching home an anchor, warping, towing or mooring. He is alſo to give an account of his ſtore.

BOB, in rigging, denotes a peal conſiſting of ſeveral courſes, or ſets of changes.

Bob *Stay*, in ſea language, a rope uſed to confine the bow-ſprit of a ſhip downward to the ſtem.

BOBARTIA, in botany, a genus of the triandria digynia claſs of plants, the calyx of which is imbricated, and contains only a ſingle flower; the corolla is a glume, bivalve, and placed on the germen; the ſeed is ſingle, of an oval figure, and contained in the cup. There is one ſpecies.

BOBBING, or Bobbin, a little piece of wood turned into a cylindric form, whereon thread is wound, to be uſed in the weaving of bone lace.

The French alſo give the denomination bobine to what among us is more properly called a ſpool or quill. In which they are alſo followed by ſeveral Engliſh,

Bobbing, among fiſhermen, a particular manner of fiſhing for eels, different from ſniggling.

Bobbing for eels is thus performed: they ſcour well ſome large lobs, or worms, and with a needle run a twiſted ſilk through them from end to end, taking ſo many that they may wrap them about a board a dozen times at leaſt: then they tie them faſt with the two ends of the ſilk, that they may hang in ſo many hanks; which done, they faſten all to a ſtrong cord, and, about an hand breadth and half above the worms, fix a plummet three quarters of a pound weight, and make the cord faſt to a ſtrong pole. With this apparatus fiſhing in muddy water, they feel the eels tug at the bait; when they think they have ſwallowed it ſufficiently, gently draw up the rope to the top and bring them aſhore,

BOCAMOLLE, in ichthyology, a name given by ſome to a very large and long Braſilian fiſh, more uſually called by its Braſilian name, pira jurumenbeca.

BOCCA, in ichthyology, a name by which ſome authors have called the fiſh, more commonly known by the name of the uranoſcopus, or ſtar gazar.

It is a ſpecies of the trachinus, diſtinguiſhed from the other kinds by having beards on the lower jaw.

Bocca, in glaſs making, the round hole in the working furnace, by which the metal is taken out of the great pots, and by which the pots are put into the furnace. This is to be ſtopped with a cover made of earth and brick, and removeable at pleaſure, to preſerve the eyes of the workmen from the violence of the heat.

BOCCARELLA, in the ſame manufacture, a ſmall hole or aperture of the furnace, one of which is placed on each ſide of the bocca, almoſt horizontal with it. Out of them the ſervitors take coloured or finer meal from the piling pot.

BOCCONIA, in botany, ſo called after Paul Boccone, a conſiderable botanical writer in Sicily; the name of a genus of the dodecandria monogynia claſs of plants; the characters of which are theſe: the flower hath four narrow petals, with a very great number of very ſhort ſtamina; in the centre is ſituated a roundiſh germen, contracted at both ends, having one cell, full of pulp, including a ſingle round ſeed. There is but one ſpecies of this genus known at preſent, which is the branching bocconia, with a woolly cow parſnip leaf; or as it is called by Sir Hans Sloane, the greater tree celandine, with oak leaves.

It is very common in Jamaica, and ſeveral other parts of America, where it grows to the height of ten or twelve feet; having a ſtraight trunk, as large as a man's arm, which is covered with a white ſmooth bark. The whole plant abounds with a yellow juice, like the greater celandine, which is of an acrid nature; ſo that it is uſed by the Americans to take off warts, and ſpots from the eyes. The ſingular beauty of this plant renders it worthy a place in every curious collection; and the Indians are very fond of it, for Hernandez tells us, their kings planted it in their gardens.

BODIANO, in ichthyology, the name of an American fiſh, of the ſize of a perch, with a purple back, and yellow ſides and belly. It is more uſually known among authors by the name of Pudiano.

BODTY, in amphibiology, the name of a ſpecies of American ſnake of the amphiſbæna kind, called alſo Ibijara.

BODY, in phyſics, a ſolid, extended, palpable ſubſtance; of itſelf merely paſſive, and indifferent either to motion or reſt; but capable of any ſort of motion, and of all figures and forms.

The word alludes to the Saxon bodige, ſtature; and to the Belgic boode, a cover, q. d. the tabernacle of the ſoul.

Body is compoſed, according to the Peripatetics, of matter, form, and privation; according to the Epicureans and Corpuſcularians, of an aſſemblage of hooked, heavy atoms; according to the Carteſians, of a certain quantity of extention; according to the Newtonians, of a ſyſtem or aſſociation of ſolid, maſſy, hard, impenetrable, moveable particles, ranged or diſpoſed in this or that manner; whence reſult bodies of this or that manner; whence reſult bodies of this or that form; diſtinguiſhed by this or that name.

Theſe elementary or component particles of bodies muſt be infinitely hard; vaſtly harder than the bodies compounded of them; nay, ſo hard as never to wear, or break in pieces. "This, Sir "Iſaac Newton obſerves, is neceſſary in order to the world's per"ſiſting in the ſame ſtate, and bodies continuing of the ſame na"ture and texture in ſeveral ages."

The Exiſtence of Bodies, is a thing incapable of being demonſtrated: the order in which we arrive at the knowledge of their exiſtence ſeems to be this. We firſt have ſenſations; we then obſerve we have not thoſe ſenſations when we pleaſe: and thence conclude, we are not the abſolute cauſe thereof, but that there is required ſome other cauſe for their production. Thus we begin to know, that we do not exiſt alone, but that there are ſeveral other things in the world together with us.

Body generally ſtands contradiſtinguiſhed from ſpirit: though in Spinoſa's and the Chineſe ſyſtem, this difference is ſet aſide, and body and ſpirit ſuppoſed to be the ſame ſubſtance under different modifications. Mr. Hobbes likewiſe affirms ſpirits to be bodies, the exiſtence of any ſubſtance not corporeal being rejected by him. See alſo Dr. Prieſtley on Matter and Spirit.

The Chineſe philoſophers reaſon thus: among an infinite number of properties, all equally contained in the nature of being, we are ſometimes affected with its extenſion, mobility, ſolidity, figure and colour; in which caſe we call it ſimply body, or matter.

The true notion of body is hard to frame, and philoſophers are not yet agreed on it; ſome place the eſſence of body in ſolidity, or impenetrability; others in weight or gravity; others in extenſion; others in mobility. According to the firſt of theſe, body is defined as ſomewhat that perfectly fills a determinate quantity of ſpace or extenſion, ſo as neceſſarily to exclude all other bodies from being comprehended within the ſame dimenſions. According to the ſecond, body is defined as a thing which is receptive and communicative of motion or progreſſion. Sir W. Petty repreſents body as matter under ſome figure.

The firſt or internal principles of bodies, which are not reſolvable in others, are called elements.

Light or fire is found an ingredient in all bodies; which ſome, eſpecially among the chemiſts, make to be the ſame with the principle ſulphur.

The motion of bodies is either local or inteſtine. The latter is not ſenſible; but may be inferred from a great number of operations. Dr. Hooke does not deſpair, but that, under farther helps and improvements of the organ of hearing, we may come at length to diſcern the inteſtine motions of bodies by the ear.

As to the colours of bodies, ſir Iſaac Newton ſhews, that bodies appear of this or that colour, as they are diſpoſed to reflect moſt copiouſly the rays of light originally endued with ſuch colours. But the particular conſtitutions, whereby they reflect ſome rays more copiouſly than others, remain yet to be diſcovered. See Colour.

The mutual action of bodies on each other, is, by Sir F. Bacon, reſolved into a principle of aſſimulation; by Hooke, into congruity and incongruity; by Newton, into attraction and repulſion; and by others, into affinity, ſimiliarity and diſſimilarity, &c.

Bodies are curiouſly denominated as ſolid, fluid, rough, ductile, flexible, hard, mixed, animate, &c. all of which are explained by the adjective to which the noun is annexed.

Bodies are divided into animate and inanimate; i. e. into thoſe informed by a ſoul, and thoſe which are not; or thoſe that have life and thoſe that have none.

Some conſider bodies, either as natural and ſenſible; viz. as formed by phyſical cauſes, and clothed by phyſical qualities (in which ſenſe, body makes the object of Phyſics): or, as intellectual or quantitative, in the general or abſtract; and according to three dimenſions: in which ſenſe, body makes the ſubject of geometry.

Body, with regard to animals, is uſed in oppoſition to ſoul; viz. for that part of an animal, compoſed of bones, muſcles, canals, juices, nerves, &c.

In which ſenſe, body makes the ſubject of comparative anatomy.

The Human **Body**, conſidered with regard to the various voluntary motions it is capable of performing, is an aſſemblage of an infinite number of levers, drawn by cords: if conſidered with regard to the motions of the fluids it contains, it is another aſſemblage of an infinity of tubes, and hydraulic machines. Laſtly, if conſidered with regard to the generation of thoſe ſame fluids, it is another infinite aſſemblage of chemical inſtruments and veſſels: as, philtres, alembics, recipients, ſerpentines, &c. and the whole is a compound which we can only admire, and whereof the greateſt part eſcapes our admiration itſelf. The principal chemical apparatus in the whole body, is that wonderful laboratory the brain: it is in this, that precious extract, called animal ſpirits, the only material mover of the whole fabric, is ſecreted from the blood.

In the machine of the animal body, the retainers to the doctrine of trituration maintain the brain to do the office of the beam of a preſs; the heart of a piſton; the lungs, of a bellows; the mouth, of a mill ſtone; and the teeth, of peſtles; the ſtomach, of a preſs; the inteſtines, of a reſervoir; the veſſels, of ſieves or ſtrainers: and the air, of a pondus, or ſpring, that ſets the machine a going.

BOG, a moiſt, rotten ſpot of earth, which ſinks and gives way to the weight of the body, formed of graſs and plants putrefied by ſome ſpring; frequent eſpecially in Ireland.

The word is probably derived from the Belgic *boogen*, to bend; on account of its giving way when trod upon.

In Ireland they diſtinguiſh between a turf bog, called alſo red bog, out of which turf or peat is dug; and a quaking-bog, which will ſink under a man in the place where he ſtands to a conſiderable depth, and riſe before and behind proportionably: underneath, is frequently clear water, into which a perſon often ſlips to the middle, upon breaking the ſurface. Quaking bogs frequently turn into turf bogs.

Every red bog is encompaſſed with a deep marſhy ſloughy ground, called the bounds of the bog. Horns and ſkeletons of mooſe-deer are ſometimes found in bogs fourteen feet deep.

Bog, or *Moraſſy Ground*, is not only uſeleſs, but dangerous and unwholeſome; they originate from neglect and ſloth; how vague the argument of thoſe writers who contend that the bogs in Ireland are neceſſary, as they yield a peat, which ſerves the inhabitants for the purpoſes of fuel? Only conſider one moment, and the fallacious notion will appear in its true light. The lands occupied by bogs are always of a good and rich quality, when properly drained; and the expence of ſuch draining, when judiciouſly managed, is inconſiderable, compared with the advantages which conſequently reſult. Moraſſy ground thus improved, and planted with wood intermixed with timber trees, would in the courſe of fifteen or twenty years yield a produce of uſeful poles and fire wood, equal to twenty times the expence of the improvement and planting; the adjacent air would be ſalubrious and healthful, induſtry would be promoted, and every public and private benefit accrue, which the moſt zealous friend to his country could effect or deſire. This is not ſpeculation, but an idea founded on practical experience, and in the ſecond part of our Agricultural System, under the Article Husbandry, will be copiouſly entered into in a manner far ſuperior to any thing of the kind that ever appeared in print.

BOGA, in ichthyology, a name given by many to a fiſh caught in the Mediterranean, and ſold at Naples and Meſſina, called among authors boops. It is a ſpecies of the ſparus.

BOHEA, a black tea much uſed. See Tea.

BOHEMIAN *Chatterer*, in ornithology, a bird that viſits this iſland perhaps once in twenty years. See Phil. Tranſ. vol. lxii. N° 20. p. 315. an. 1772.

It is alſo called ampelis, garrulus, and roller.

BOIGUACU, in amphibiology, is the name of a ſpecies of ſerpent called alſo liboia, and by the Portugueſe cobra de veado. This is the largeſt of all ſerpents, growing to twenty-four feet long and more, and preying on large animals. It is very thick in the middle of the body, and ſmaller both at the head and tail. It is of a very beautiful variegated colour. Down the middle of the back runs a chain of black ſpots, a hand's breadth diſtant from one another, each having a ſpot of white in its middle; and below theſe are two other rows of ſmaller black ſpots towards the belly. It has in each jaw two rows of very ſharp teeth, white as pearl. Its head is very broad, over the eyes it riſes in two protuberances; and in ſome of this ſpecies there are two claws, like thoſe of birds, behind the anus, towards the tail.

This is a very terrible creature, and will ſeize on a man, and either lies in ambuſh in thickets or on the branches of large trees, from which it throws itſelf on its prey. It has no venom in its bite; and its fleſh is eaten, and eſteemed a great delicacy.

BOIL, in medicine, is a ſmall reſiſting tumor, with inflammation, redneſs, and great pain, ariſing in the membrana adipoſa under the ſkin. As there is no part of the body free from being the ſubject of this tumor, ſo the whole body is ſometimes ſo miſerably infeſted with them, that the patient knows not how to ſtir, or on what part to lie. Young infants and adults are equally liable to this diſorder: and though in adults there is ſeldom any great danger in it, yet it ſometimes happens when they are very numerous in tender infants, that they not only excite violent pains, reſtleſſneſs and toſſings, with great weakneſs, convulſions and epilepſies, but death itſelf ſometimes follows them.

The principal cauſe of boils, is a too glutinous and inſpiſſated ſtate of the blood, and the cure of them principally depends upon the reſtoring the blood to its due conſiſtence and proper circulation. People who are very ſubject to theſe tumors ſhould bleed and take purging medicines at proper intervals, and drink plentifully of warm and weak liquors, abſtaining from wine, ſtrong ſpirituous liquors, and from the uſe of tobacco.

When the diſorder is recent or not habitual, external remedies alone are ſufficient for the cure: honey mixed to a proper ſharpneſs with ſpirit of vitriol is a very good external application. The touching the boils with ſpirit of vitriol alone, is often alſo of great ſervice; and ſometimes the diſcutient plaſters are to be applied, as the diachylon, ſpermaceti, and ſoap plaſter. If theſe applications, however, do not prove ſucceſsful in the diſperſing a boil, the only method to be taken, is that of bringing it to ſuppuration. This, however, in ſome caſes is no eaſy taſk, but the tumor remains ſometimes very hard and troubleſome, even after a proper treatment of many weeks, and ſometimes the humour that occaſions it becomes ſo acrimonious, by its long tenſion, and great inſpiſſation, that it produces ulcers, which grow gradually worſe and worſe, till at length they end in incurable fiſtulæ. To promote and quicken the ſuppuration, it is generally found of great ſervice to apply plaſters of diachylon with the gums, and of honey and flour mixed, and made to a proper conſiſtence; and where theſe prove inſufficient, maturating cataplaſms are to be applied, and very frequently repeated. When the boil is ſufficiently maturated by one or other means, which will be known from the ſoftneſs and yellowneſs of its head, it muſt be opened by inciſion, and when the matter it contained is diſcharged, the ulcer muſt be daily cleanſed, till perfectly freed from all malignity, and then healed with the vulnerary balſams.

When infants which ſuck are afflicted with boils, the proper method is to give cooling medicines and purges to the nurſe, and enjoin her a due regimen in diet; and the infant ſhould at the ſame time be got to take ſome gentle laxative, and the abſorbent powders, as thoſe of crab's eyes and the like, to allay the acrimony of its juices. Theſe tumours carry off morbed matter and promote

mote health, and to bring them to ſuppuration is certainly the wiſeſt method, as diſperſing them and afterwards neglecting a regular courſe of cleanſing medicine often proves dangerous.

BOILER, a large copper veſſel, wherein things are expoſed over the fire to be boiled.

BOILING, ebullition, in phyſics, the agitation of a fluid body, ariſing from the application of fire, &c.

The phenomenon of boiling may be thus accounted for: the minute particles of the fuel being detached from each other, and impelled in orbem, with a great velocity (i. e. being converted into fire), paſs the pores of the containing veſſel, and mix with the liquid. By the reſiſtance they here meet with, their motion is deſtroyed; i. e. they communicate it wholly to the quieſcent water: hence ariſes, at firſt a ſmall inteſtine motion in the water, and from the continued action of the firſt cauſe, the effect is increaſed, and the motion of the water continually accelerated: ſo that the water by degrees, becomes ſenſibly agitated. But now the particles of the fire ſtriking on thoſe in the lower ſurface of the water, will not only give them an impulſe upwards, contrary to the laws of æquilibrium, but will likewiſe render them ſpecifically lighter than before, ſo as to determine them to aſcend according to the laws of æquilibrium; and this, either by inflating them into little veſicles, by the attraction of the particles of water around them; or by breaking and ſeparating the little ſpherules of water, and ſo increaſing the ratio of their ſurface to their ſolid content. There will therefore be a conſtant flux of water from the bottom of the veſſel to the top, and conſequently a reciprocal flux from the top to the bottom; i. e. the upper and under water will change places; and hence we have the reaſon of that phenomenon, of the water's being hot at top ſooner than at bottom.

Again, an intenſe heat will diminiſh the ſpecific gravity of water, ſo as not only to make it mount in water, but alſo in air; whence ariſe the phenomena of vapour and ſmoak; though the air incloſed in the interſtices of the water muſt be allowed a good ſhare in this appearance: for that air being dilated, and its ſpring ſtrengthened by the action of the fire, breaks its priſon, and aſcends through the water into the air; carrying with it ſome of the contiguous ſpherules of water, ſo many as ſhall hang in its villi, or can adhere immediately to it.

The particles of air, in the ſeveral interſtices of the fluid maſs thus expanded, and moving upwards, will meet and coaleſce in their paſſage; by which means great quantities of the water will be heaved up, and let fall again alternately, as the air riſes up, and again paſſes from the water: for the air, after coalition, though it may buoy up a great heap of water, by its elaſticity while in the water; yet cannot carry it up, together with itſelf, into the atmoſphere: ſince, when once got free from the upper ſurface of the water in the veſſel, it will unbend itſelf in the atmoſphere; and ſo its ſprings and force will become juſt equal to that of the common unheated air. Add to this, that were the ſpring and motion of the air ſufficient to carry up the water with it, yet it would not have that effect; but the water would run off at the extremities of the air; all except ſo much as ſhould be either entangled in its villi, or immediately adhere to its ſurface by attraction: and hence we ſee the reaſon of the principal phenomenon of boiling, viz. the fluctuating of the ſurface of the water.

Boiling water diſpoſes it to freeze more readily.

We generally annex the idea of a certain very great degree of heat to the boiling of liquids; but this does not ſeem to be a connection of nature's making, but of our own. It is reported by many, that a veſſel of tar being ſet over the fire till it boils, a perſon may, while it is boiling, put his hand into it without any injury; and that the artificers who uſe and prepare this commodity, know this property of it ſo well, that they uſually take the ſkum from their pots off it, while boiling, with their naked hands. The hand may be put in boiling glue without injury.

Water, in the receiver of an air pump, when exhauſted, will boil without any great heat. The receiver ſhould for this experiment, be one part full of water, and three empty: in this caſe, the flame of a candle being placed under the veſſel, the water will boil violently, while the glaſs itſelf is ſcarce warm; and when the water has been thus kept boiling a quarter of an hour, the glaſs will ſcarce be any thing the hotter for it. When the candle is taken away, the water will ſtill continue a great while boiling, and when it ceaſes firſt, will renew itſelf again from time to time to a very great ebullition. All the bubbles that riſe out of the water on this occaſion, do not raiſe the mercury in a gauge to any ſenſible height.

Spirit of wine, in the ſame manner, boils much ſooner in vacuo than the water, and in this ſtate will raiſe the mercury in the gauge to an inch higher than its former ſtandard. If the receiver containing it in this boiling ſtate, be plunged into cold water, the liquor inſtead of becoming calm, boils more ſtrongly than before. It might be ſuppoſed that this phænomenon was owing to a periſtaſis; but we have more grounds to ſay it came from hence, that the vapours of the ſpirit were more cendenſed, and ſo made the receiver more empty, which is ſufficient to make the ſpirit of wine boil, though it were not hot, as liquors uſually do when put into the engine, and the air exhauſted. In all theſe, and many other caſes, boiling is induced without that heat, which is ſuppoſed a neceſſary concomitant of it. Phil. Tranſ. N° 122.

Alabaſter in boiling, will ſwell a ſixth or eighth part above the top of the pot.

Different fluids require different degrees of heat to make them boil. Dr. Friend gives a table of the different times required to make ſeveral fluids boil by the ſame heat.

Water, when once brought to boil, is not ſuſceptible of any farther degree of heat, however the fire be increaſed: but this differs according to the weight of the atmoſphere, and the purity of the water.

BOIOBA, in amphibiology, the name of a ſpecies of ſerpent found in America, and called by the Portugueſe *cobra de verd.* It is about an ell in length, of the thickneſs of a man's thumb, and is all over of a very beautiful and ſhining green. Its mouth is very large, and its tongue black. It loves to be about houſes, and never injures any creature unleſs provoked or hurt; but it will then bite, and its poiſon is very fatal. The natives take, as a remedy againſt its poiſon, the root caa-apia bruiſed, and taken in water.

BOITIAPO, in amphibiology, is a ſerpent of Braſil, called by the Portugueſe *cobra de ciſo.* It is ſeven or eight feet long, as thick as a man's arm, round, and pointed towards the tail, like a ſhoe maker's awl. It is covered with fine, and as it were, triangular ſcales; and is of an olive colour, and yellowiſh. It lives upon frogs, &c. and its bite is dangerous, like that of many other ſerpents.

Its fleſh might be as effectually uſed as that of the viper, for purifying the blood; and as an alexipharmic.

BOLE, in medicine, is applied to ſeveral kinds of earths that enter ſome of the Galenical compoſitions.

Boles are native foſſile earths, uſually ſomewhat unctuous; ſo that when mixed up with water they may be wrought into a paſte; but are not ſoluble either by water or fire: ſuch are argill, or white clay, *axungia terræ*, or *axungia lunæ*, *cimolia*, fuller's earth, boles white and Armenian, the Chian, Eretrian, Lemnian, and Malteſe earths, ruddle, Samian, Sileſian, Toccavian, Bohemian, French, and all the cealed earths. But there are others of a drier and leaner kind, as chalk, ochre, and marle.

Boles are viſcid earths, leſs coherent and more friable than clay, more readily uniting with water and more freely parting from it. They are ſoft and unctuous to the touch; and adhere to the tongue; and by degrees melt in the mouth, impreſſing a light ſenſe of aſtringency. There are a variety of theſe earths, the principal of which are,

1ſt. Armenian bole, commonly called bole armoniac; when pure, it is of a bright red colour with a tinge of yellow; it is one of the hardeſt and moſt compact bodies of this claſs, not ſmooth and gloſſy like the others, but generally of a rough and duſty ſurface. It does not efferveſce with acids, though ſome part of it diſſolves by all of them. Neuman obſerves, that four ounces of armenian bole diſtilled in a glaſs retort, in an open fire, yielded three drachms of a ſaline phlegm, which ſmelt a little urinous, and changed ſyrup of violets green. In the neck of the retort was found a little powdry ſaline matter, which had an ammoniacal taſte; but it was in too ſmall a quantity to be collected, or further examined. Like moſt other coloured earths, this kind of bole contains a portion of ferruginous matter, to which the colour is owing, and which may be ſeparated with the magnet, after the bole has been calcined with oil or other inflammable matters.

It is likewiſe impregnated with vitriolic acid, and hence, when mixed with nitre or ſea ſalt, it extricates the acids of theſe ſalts in the fire.

2d. French bole is of a pale red colour with irregular ſpecks of white and yellow: it is much ſofter than the Armenian bole, and ſlightly efferveſces with acids.

3d. Bole of blois is yellow, remarkably lighter than moſt of the other yellow earths, and effervеſces ſtrongly with acids.

4th. Bohemian bole, is of a yellow colour with a caſt of red, and generally of a flaky texture. It is not acted on by acids.

5th. Lemnian earth is of a pale red colour, and ſlightly effervеſces with acids.

6th. Sileſian bole is of a pale yellow colour; acids have no viſible effect upon it.

Theſe and other earths made into little maſſes and ſtamped with impreſſions, are called terra ſigiltatæ. In medicine, they are deemed aſtringent, and are preſcribed in fluxes and complaints of the prima via.

Bole armoniac is found plentifully in the north eaſt parts of Armenia, is ſometimes uſed in Germany, but is ſeldom ſeen in England. What is called bole armoniac in our ſhops being no other than a compoſition of common tobacco pipe clay, and an ochre known among painters by the name of Spaniſh brown.

Boles are prepared by the apothecaries by diſſolving them in water after the ſand is ſeparated; they pour the turbid ſolution into another veſſel, where it remains till the water is clear; being poured off, the ſediment is dried in little cakes, and kept for uſe.

Bole earths ſeem diviſible into two ſpecies, according as they are more or leſs tenacious; in which view loam and clay may repreſent them all. Even theſe two ſeem only to differ in reſpect of the fineneſs, or coarſeneſs of their component parts which renders them more or leſs tenacious, clinging, or adheſive. To make a true judgment of the quality of this kind of earth, the following experiment may be uſeful.

Common loam was mixed into a maſs with water, and then dried; to ſhew that, compared with clay, it would eaſily break, crumble, and fall to powder; but beating ſome loam fine in a mortar, and mixing it well with water, it clung with clay; and when dried, adhered more tenaciouſly than before.

This ſhews that not only loam and clay, but all the bolar earths, are nearly the ſame thing, when their component parts, or gravelly and ſandy matters, are reduced to the ſame degree of fineneſs; but alſo ſupplies us with a plain and ſimple rule for the improvement of the art of pottery, and the imitation of china ware; and perhaps certain curious boles may afford very delicate matters for pottery wares; and even of various colours not leſs curious than the white: nor is it altogether clear, why that colour alone ſhould be made the chief baſis of this art. The rule is, to grind or beat the earths employed, to an extreme degree of fineneſs; and accordingly procelane has been imitated in Europe.

Marles, or boles, alſo afford a fit matter for the making of crucibles, retorts, &c. They likewiſe ſerve to procure the diſcontinuation and diviſion of certain ſalts, and other materials that would otherwiſe riſe, and boil over in the operation. Theſe are, therefore, employed in the diſtillation of nitre, turpentine, wax, &c.

They contribute likewiſe more materially, more intimately, and eſſentially as to quantity, in the fixation of certain bodies in chemiſtry; as of oils, for example, of common ſulphur, and even of mercury; for which, ſee Becher's firſt Supplement to his Phyſica Subterranea.

Some have a method of recovering the luſtre of pearls, eſpecially the Scotch pearls, by warming them a little over the fire, and rubbing them with powdered white bole.

BOLETO Lichen, a name given by M. Juſſieu to a plant, which partakes of the nature of the moreille and of the liverwort, and which he has accurately deſcribed in the Memoirs of the Academy of Sciences at Paris, 1728.

The whole plant has the ſmell of the common muſhroom, and when young, has a viſcious liquid contained under the foldings of its head, which finally, when the plant is arrived at maturity, dries into the form of an extremely ſubtle yellow powder, which is the ſeed.

BOLETUS, in botany, a word uſed by Linnæus to expreſs a genus of Funguſes, belonging to the claſs of cryptogamia, uſually comprehended by authors under the name of agarics, though very different from them. The agarics and boleti are both horizontal muſhrooms; that is, they have no pedicle, but grow to trees, &c. by their ſide; but the firſt are lamellated underneath, in the manner of the common muſhrooms; the boleti are all porous underneath.

The boletus is a kind of wood muſhroom, almoſt round, of a white colour, ſpotted with yellow and brown marks; by ſome naturaliſts called fungus nemorum.

BOLLARDS, large poſts ſet in the ground on each ſide a dock. On docking or undocking ſhips, large blocks are laſhed to them; and through theſe blocks are reeved the tranſporting hawſers to be brought to the capſtans.

BOLLITO, in the glaſs works, a name which the Italians called a ſee green colour or artificial chryſtal.

To prepare this colour you muſt have in the furnace a pot filled with forty pounds of good chryſtal, firſt carefully ſkimmed, boiled, and purified, without any mangeneſe; you muſt then have twelve ounces of the powder of ſmall leaves of copper thrice calcined, half an ounce of zaffer in powder; mix them together, and put them at four times into the pot, that they may the better mix with the glaſs; ſtirring them well at each time of putting in the powder, leſt they ſhould ſwell too much and run over.

BOLSTER, a ſubſtance either laid under the head, or other part; it is alſo a common and neceſſary apendage to a bed.

Bolster is alſo uſed for a ſtuffing, intended to fill out or raiſe a flat, ſinking or hollow part.

In which ſenſe, bolſters are contrived for crooked, hunched, and other diſtorted backs, ſhoulders, &c.

By a conſtitution made under archbiſhop Burchien, the clergy are forbidden to wear bolſters about their ſhoulders, in their gowns, coats or doublets. The occaſion of the prohibition is variouſly conſtrued. Some ſay bolſters came in faſhion in the reign of King Richard the third, who being neceſſitated by his natural deformity to uſe pads; the courtiers and even the clergy did the ſame out of compliment to the prince; ſo that every body, who had the misfortune to be born ſtreight, was obliged to wear a bolſter on his ſhoulders to be in the faſhion. Others controvert this; alleging the conſtitution above mentioned was made 20 years before the uſurpation of Richard. If Mr. Walpole's account of this king deſerves credit, the cauſe abovementioned for being faſhionably crooked deſerves no credit.

BOLT, in building, an iron faſtening for a door, moved with the hand, and catching in a ſtaple or notch made to receive it.

Bolts are chiefly of three kinds: plate, round, and ſpring bolts.

Bolt *of a Lock* is the piece of iron, which entering the ſtaple, faſtens the door; being the part which is moved backwards and forwards by turning the key.

Of theſe there are two ſorts; one ſhuts of itſelf by only putting to the door, and is called a ſpring bolt; the other, which only moves when the key opens or ſhuts it, is called a dormant bolt.

Bolts, in gunnery, are of ſeveral ſorts; thoſe which go betwixt the cheeks of a carriage to ſtrengthen the tranſoms, are called tranſom bolts. The large iron bolts or knobs on the cheeks of a carriage, which keep the hand ſpike from ſliding, when it is poiſing up the breech of the piece.

Bolts, or iron pins, in a ſhip, are of ſeveral ſorts, frequently diſtinguiſhed according to the places where they are uſed; as, chain bolts, bolts for carriages, rings bolts, &c. See Naval Architecture.

Bolt is alſo uſed for a meaſure or certain quantity of canvas, amounting to twenty eight ells; of ſilk or ſtuff, it denotes a long narrow piece, of indefinite meaſure.

BOLTERS, or **Boulters**, a kind of ſieves for meal, having the bottoms made of woollen, or hair.

Sieves are now generally exploded; alſo mills turned by hand are little uſed, as they have given place to a more expeditious mode by bolting mills being attached to the grinding mill, which not only facilitates the operation, but ſeparates the bran or huſks from the meal in a more exact and profitable manner. Bolting cloths made of wire have been lately improved; that probably in a few years all other kinds will be deemed unworthy of notice, as an exact conſtruction and durability are the deſiderata requiſite in bolters or bolting cloths.

BOLUS, in medicine, an extemporaneous form of remedy, of a ſoft conſiſtence, ſomewhat more ſo than that of an electuary, and of the quantity of one doſe, or morſel, to be ſwallowed down; contrived principally for the ſake of ſuch as have an averſion to potable medicines; as alſo for the better conveyance of certain preparations of mercury, antimony, &c. which by their weight would ſink to the bottom of the glaſs, were they given in draughts.

There are boluſes of various kinds, made with electuaries, confections, conſerves, pulps, powders, ſalts, oils, eſſences, extracts, ſyrups, &c. ſome of which ingredients muſt always have ſolidity or drineſs enough to give a conſiſtence to thoſe that are liquid.

Boluſes are of different kinds and ſuited to various purpoſes, i.e. emetic, purgative, anodyne, aſtringent, diuretic, &c.

Acrid ſubſtances, and ſuch as are offenſive either to the ſmell or taſte, or are of a very viſcid nature, are much more properly exhibited in form of boluſes than of powders; ſince their offenſive qualities are by this means concealed. The draſtic purges and mercurial preparations are therefore very properly given in boluſes.

Such ſubſtances as ferment when brought together are very improper for boluſes unleſs they are to be ſwallowed as ſoon as made up. To this may be added, that the number of ingredients in a bolus ſhould never exceed three, or at the moſt four.

BOM, in amphibiology, the name of an American ſerpent, remarkable for its noiſe, which is like the ſound of the word uſed as its name. It grows to a vaſt ſize, and is perfectly harmleſs, never hurting any one.

BOMARIN, in tetrapodology, a name uſed by ſome for the hippopotamous, or river horſe.

BOMB, in the military art, a hollow iron ball, or ſhell, filled with gun-powder, and furniſhed with a vent for a fuſee, or wooden tube filled with combuſtible matter, to be thrown out from a mortar.

The word bomb comes from the Latin bombus, crepitus, or ſibilus ani; by reaſon of the noiſe it makes.

The method of preparing a bomb is as follows: a hollow iron globe is caſt pretty thick, having a round aperture by which it may be filled and lighted; and circular anſæ of hammered iron fixed in the mould when they are caſt, for the commodious putting it into the mortar.

To prove whether it be ſtaunch, after heating it red hot on the coals, it is expoſed to the air, ſo that it may cool gently: for ſince fire dilates iron, if there be any hidden chinks or perforations, they will be thus opened and enlarged; and the rather, becauſe of the ſpring of the included air, continually acting from within. This done, the cavity of the globe is filled with hot water, and the aperture well ſtopped, and the outer ſurface waſhed with cold water and ſoap; ſo that if there be the ſmalleſt leak, the air, rarefied by the heat, will now perſpire, and form bubbles on the ſurface.

If no defect be thus found on the globe, its cavity is filled with whole gunpowder; the moſt proper quantity of powder is probably two thirds of the weight which would fill the cavity. A little ſpace or liberty is left, that when a fuſee or wooden tube of the figure of a truncated cone, is driven through the aperture, and faſtened with a cement made of quick lime, aſhes, brick duſt, and ſteel filings, worked together in a glutinous water; or of four parts of pitch, two of colophony, one of turpentine, and one of wax; the powder may not be bruiſed. This tube is filled with a combuſtible matter, made of two ounces of nitre, one of ſulphur, and three of gunpowder duſt well rammed.

This fuſee is ſet on fire, burns ſlowly till it reach the gunpowder which goes off at once, burſting the ſhell to pieces with incredible violence: whence the uſe of bombs in beſieging towns.

Special care, however, muſt be taken, that the fuſee be ſo proportioned, as that the gunpowder do not take fire before the ſhell arrives at the deſtined place; to prevent which, the fuſee is frequently wound round with a wet clammy thread.

The fuſees are driven into the ſhell ſo as that only about an inch and a half comes out beyond the fuſee hole; and then the ſhell is ſaid to be fixed. They are charged long before there is occaſion to uſe them; and in order to ſecure the compoſition with which they are filled, the two ends are covered with a compoſition of tallow, mixed either with pitch or bees wax. When the fuſee is to be put into the ſhell, the little end is opened or cut off; but the great end is never opened till the mortar is to be fired.

BOMBARDIER, in entomology, a name given to a ſpecies of the inſect called bupreſtis; the wings of which are incloſed in a kind of caſe to cover and wrap them up. It keeps itſelf concealed among the ſtones, and ſeems to make little uſe of its wings; it moves by a ſort of jump, and when touched makes a noiſe reſembling the diſcharge of a muſket in miniature, during which, a blue ſmoke may be ſeen to proceed from its anus. It may be made at any time to play off its little artillery, by ſcratching its back with a needle.

BOMBASINE, in commerce, a kind of ſilk ſtuff manufactured at Milan, and thence ſent into France and other countries.

BOMBAST, in compoſition, is an endeavour by ſtrained deſcription to raiſe a ſubject beyond probability; which, inſtead of ſublimity, never fails to be ridiculous. The mind in ſome animating paſſions, is apt to magnify its object beyond natural bounds; and when carried beyond theſe, degenerate into burleſque; as in the following example, from the Sejanus of Ben Johnſon, Act V.

Sejanus ——— Great and high,
The world knows only two, that's Rome and I!
My roof receives me not; 'tis air I tread,
And at each ſtep I feel my advanced head
Knock out a ſtar in heaven.

A writer who has no natural elevation of genius and ſentiment, is certain to ſtretch elevated ideas into bombaſt.

BOMBAX, in botany, the ſilk cotton tree, a genus of the polyandria monogynia claſs of plants. The characters are, that the flower is quinquefid and ſpreading; that it hath many ſtamina which are the length of the petal; that a round germen is ſituated in the centre; and that the empalement afterward becomes a large, oblong, turbinated capſule, having five cells which are ligneous, containing many roundiſh ſeeds, wrapped in a ſoft down. There are three ſpecies, which grow naturally in both the Indies.

They are a very large ſpreading tree and generally, grow with a ſtreight ſtem; the top branches are compoſed of five, ſeven, or nine ſmoth, ſpear ſhaped little leaves, which join at the baſe to one ſtalk; the flower buds appear at the end of the branches; when they fall off they are ſucceeded by oval fruit, large as a ſwan's egg, which when ripe opens in five parts, and is full of cotton and ſeeds.

Theſe plants require a large ſtove, where they may have room to grow; but as they are ſeveral years old before they flower in the countries where they grow naturally, there is little hope of their producing any in England.

The ſeed is the only part uſed in medicine, which is of a balſamic nature, uſed in coughs, ſhortneſs of breath, and ſoreneſs of the lungs, cauſing expectoration, and freeing them from tough phlegm.

BOMBINA, in amphibiology, a ſpecies of the rana belonging to the order of reptiles.

BOMBYLIUS, in natural hiſtory, the name of the common humble bee, of which we have a great variety of ſpecies, many of them very beautiful.

Mr. Ray, in his hiſtory of Inſects, mentions no leſs than nineteen ſpecies, all wholly different from one another.

In the Linnæan ſyſtem, it is a genus of the order of diptera.

BON, the name of a yearly feaſt celebrated by the Japoneſe in honour of the dead.

BONA *Fide*, is uſed in ſpeaking of things done with an honeſt intention; in law, when a perſon performs any action which he believes at the time to be juſt and lawful, he is ſaid to have acted bona fide.

Bonæ *Fidei*, actions, thoſe wherein, for farther light, the judge might take cognizance of things not mentioned between the parties.

Bona *Fida*, judgment, that wherein the parties are obliged to pay each other what is due bona fida, i. e. juſtly and equitably.

Bona *Notabilia*, in law. Where a perſon dying has goods, or good debts, in another dioceſe, but within the ſame province, beſides his goods in the dioceſe where he dies, amounting to the value of five pounds, at leaſt; he is ſaid have bona notabilia: in which caſe, the probate of his will, &c. belongs not to the biſhop of the dioceſe where he dies, whoſe juriſdiction cannot extend beyond the bounds of his own dioceſe, but to the archbiſhop of the province; conſequently the laſt will of ſuch perſon muſt be regiſtered and proved in the Prerogative court.

Though if a perſon happens to die in another dioceſe, than that wherein he lives, on a journey; what he hath about him above the value of five pounds, &c. ſhall not be bona notabilia.

Bona *Peritura*, periſhable goods. By ſtat. 13 Ed. I. cap. 4. the cargo of a ſhip that has been caſt away ſhall be kept for a year and a day, and reſtored to the rightful owner; but if the goods be ſuch as will not endure ſo long, they are bona peritura, which the ſheriff is allowed to ſell, and to account in money for the value.

Bona *Vacantia*, goods; ſuch as royal fiſh, ſhipwrecks, treaſure-trove, waifs, and eſtrays, in which no one can claim a property. Theſe goods by the law of nature, and by the imperial law, belonging to the firſt occupant or finder; but in the modern conſtitutions of European governments, they are annexed to the ſupreme power by the poſitive laws of the ſtate. In England by cuſtom to the lord of the manor.

Bonis, *Non Amovendis*, a writ directed to the ſheriffs of London, &c. where a writ of error is brought to charge them that the perſon againſt whom judgment is obtained be not ſuffered to remove his goods, till the error is tried and determined.

BONASIA, in ornithology, a ſpecies of the tetrao.

BONASUS, in tetrapodology, the name of a ſpecies of wild ox, of the ſize of the tame kind common with us, but of a thicker body, and having on its neck a mane like that of a horſe, and horns very ſhort and crooked, ſo as to be of no uſe to him in fighting. When he is urged, he is able throw out his dung a great way, and it is then of a hot and corroſive nature, though not ſo at other times; and this is the method of defending himſelf; a thing hardly credible, as Mr. Ray juſtly obſerved, if we had not inſtances of other animals, which poſſeſs the like faculty.

BOND, a written obligation entered into between parties.

Bond *Tenants*, are the ſame in reſpect to the nature of their tenure, with copy holders and cuſtomary tenants. Blackſtone's Comm. vol. ii. p. 148.

Bond, in maſonry and brick laying, is when bricks or ſtones are laid over the joint in the courſe below.

BONDAGE properly denotes a ſtate of ſervitude or ſlavery. in Engliſh law writers, the ſame with villenage.

BONDUCH, in the materia medica, a name by which many authors have called the molucca, marſao, or bezoar nuts.

BONE, in anatomy, a white, hard, brittle, part of the body, framed for the defence of the ſoft parts, and the ſupport of the whole fabric.

The general uſe of the bones is to ſtrengthen the body, like beams and pillars in a building; to defend ſome of the more eſſential parts, as the brain, &c. to give ſhape to the body and to aſſiſt in motion.

It is demonſtrable, that of whatever figure bones are, and in whatever manner their fibres are diſpoſed, their ſtrength muſt always be in a ratio compounded of their quantity of bony matter, and of the diſtance of their center of gravity from the center of motion.

Hence on a double account, the part of a bone, formerly fractured, muſt be ſtronger than any other part of that ſame bone, becauſe the diameter is enlarged, and the quantity of matter is increaſed.

The human bones have been ſometimes known to grow ſoft and flexible, ſo as to bend any way with leſs difficulty than the muſcular parts of a healthy perſon's leg. Phil. Tranſ. N° 470. ſect. 3.

Bartholin gives an inſtance of an anoſteus, or boneleſs child, ſhewn at Briſtol, whoſe arms and legs were flexible like a glove.

The bones are uſually capped at the ends with cartilages, and to them are alſo annexed ligaments.

The doctrine of the bones makes a particular branch of anatomy, under the denomination of oſteology, for a deſcription of which ſee Section II. in the Syſtem of Anatomy.

Animals without bones, are ſaid to be anoſtei; ſuch are all the ſpecies of reptiles, inſects, &c. The injuries bones are ſubject to, are fractures, rickets, tophi, exoſtonſes, or excreſcences, &c. the operations practiſed in diſeaſes of the bones are exciſion, amputation, perforation, trepanation, ſetting, exfoliation, ſhaving, filling, &c.

Bones have ſometimes been found incruſted with ſtone, which has given rice to accounts of ſkeletons petrefied. Phil. Tranſ. N° 477. p. 55, &c.

Bones are totally ſoluble in concentrated acids of vitriol, nitre, and ſea-ſalt, and may be ſoftened by theſe or acetous acids diluted. Gradual heat renders them opake, white, and friable; but if they are firſt urged with a ſtrong fire, ſuch as is ſufficient to melt iron or copper, they become hard, ſemi-tranſparent, and ſonorous.

By diſtillation in a retort, the bones reſolve into phlegm, ſpirit, volatile ſalt, fetid oil, and *caput mortuum*, which, calcined in an open fire, leaves a white earth, without any fixed ſalt. This laſt appears to be the proper conſtituent part of the bones, ſince after the other principles are ſeparated, the earth ſtill retains the former ſhape of the bone, though it be ſo brittle, that, on the leaſt touch, it moulders into duſt. When moiſtened with a little water or oil, it recovers ſome degree of tenacity again; but cannot be reſtored to its former firmneſs.

The origin and formation of bones is generally traced from cartilages, which all bones are ſuppoſed once to have been; or, according

cording to others, membranous tendons. Some deduce theſe farther from gellies; and others from mere fluids; which ſucceſſively arriving at greater and greater conſiſtency, become firſt gelatinous, then tendinous, then cartilaginous, and laſtly bony. Phil. Tranſ. N° 54. N° 71. and N° 81.

Hence the different ſtates of the bones in different ages, ſexes, and the like; which, in children, are found ſoft, moiſt, and cartilaginous; in aged people, hard, dry, and inflexible; the very cartilages in theſe frequently becoming bony.

Wounds of the Bones. As blunt inſtruments uſually make fractures of the bones, ſo ſharp ones, ſuch as ſwords, ſpears, &c. do, properly ſpeaking, ſometimes wound them; and theſe wounds cannot be ſuffered, without a great variety of ſymptoms, which are often very dangerous, according to the ſize and depth of the wound, and the nature of the wounded part. Such ſlight wounds as do not penetrate deep into the bone, are often attended with no great danger, eſpecially if proper care be taken in the dreſſing of them, and the injured bone be as much as poſſible kept covered with its integuments, from the injuries of the external air. All fat and oily medicines muſt be wholly rejected in wounds of this kind, as great enemies to the bones. But when wounds of this kind penetrate deep, and wholly divide the bone and its adjacent parts, or violently affect any of the organs neceſſary to life, in the head, neck, back bone, or breaſt, with a puncture or diviſion of the longer veins, arteries, nerves, and tendons of the upper and lower limbs, the danger is always great, the cure difficult, and death too often the conſequence. Petit has adviſed, that, in wounds of the bones, if the ſolution be inflicted lengthwiſe, the lips of the wound are to be cloſed and united by the uniting bandage; but if the wounds are very oblique, or wholly tranſverſe, then they are to be joined together by ſuture, and the eighteen headed bandage; but this is certainly a wrong method in many caſes of this kind. Indeed, in the firſt kind of theſe wounds, and when they are very ſlight, as when the ſkull is not wholly, nor indeed very deeply penetrated, and that without contuſion, nor the brain much hurt, this method may do very well; but when the contrary of theſe mild ſymptoms are the caſe, a very different method of cure is to be attempted; the wound is to be kept open by lint, and not healed up till thoroughly cleanſed; for, by a too ſpeedy cloſure of ſuch wounds, the very worſt ſymptoms, and even death very often, are brought on.

So alſo, in ſlight, oblique, or tranſverſe wounds of the bones, the ſuture, or the eighteen headed bandage, may be uſed with ſafety and ſucceſs; but theſe are ſeldom neceſſary; and in oblique wounds of the head, forehead, and cranium, if not violent ones, the parts may be much eaſier cloſed and retained by a common bandage and plaſter, than by ſutures with the needle, or the eighteen headed bandage; but when the divided part hangs down, the ſuture may indeed be neceſſary.

If the bones of the fingers are thus wounded, or wholly divided by a ſword, they may be happily cured without the ſuture, by the following method. Firſt, accurately replace the divided bone, then ſecure it in its place, by winding round a ſlip of plaſter, and, over this, applying a compreſs dipped in ſpirit of wine, and laying over all little ſlips of paſteboard, by way of ſplints; then binding up the whole with a proper narrow bandage, and hanging the arm in a ſling from the neck. Once, in about three days, the dreſſing is to be removed, and the wound treated with a vulnerary eſſence; and in a month the cure will be perfected

If either of the bones of the cubitus be divided, it uſually is the ulna, as that is moſt expoſed to the ſword in fighting. This caſe requires neither the ſuture nor eighteen-headed bandage; but the wound being cleanſed, is to be treated with ſome vulnerary eſſence or balſam, and with lint dipped in the ſame eſſence; after which are to be laid on, in order, the plaſter, compreſs, and paſteboard ſplints, wetted with ſpirit of wine, which are to be bound round the thick part of the cubitus near the wound, with a long bandage, that, as they dry, they may accommodate themſelves the better to the figure of the part; and, laſtly, the arm is to be ſuſpended in a ſling hung round the neck; after this, the wound is to be dreſſed every day, or every other day, in proportion to the diſcharge, and a cure without the help of the ſuture will be eaſily effected; the ſuture, in ſuch caſes, being not only unneceſſary but pernicious. But if both bones are divided, then indeed the eighteen-headed bandage may be neceſſary, and uſeful with advantage; but, even in this caſe, the ſuture is much better let alone; for it is always to be avoided, except when perfectly neceſſary, from the dangers of inflammation, convulſions, and other bad ſymptoms that too naturally attend it.

If the thigh bone, however, ſhould be cut with a ſword, in that caſe the bloody ſuture will be of ſervice, and is even neceſſary to cloſe and retain thoſe very ſtrong muſcles: the wound is in this caſe to be carefully treated, and the limb laid up in a caſe of ſtraw, as in other fractures. So alſo, if the bone of the humerus, or arm, ſhould be penetrated with a ſword, that wound alſo ſhould, for the ſame reaſon, be treated by the ſuture; but then it is not to be dreſſed with the eighteen-headed bandage, but with the common long and narrow bandage uſed in other fractures of the arm; the limb is afterwards to be ſupported by a ſhort napkin, faſtened about the neck, by which means the muſcles will be brought to a more ready union, and the cure ſooner perfected.

If it ſhould happen that both bones of the cubitus or leg ſhould be divided by a ſword, ſo as to leave the limb hanging only by the fleſh, ſkin, and blood veſſels, which is a caſe that very rarely happens, without wholly amputating the limb, then alſo the ſuture, with the eighteen-headed bandage, are the neceſſary applications; the ſuture, however, can be of no ſervice in a caſe of this kind, when the fleſh and blood veſſels are divided, and the limb ſo far cut off, as to hang only by a ſkin, eſpecially when the part is ſo conſiderable as the leg or arm; for, in theſe caſes, the limb muſt be taken off, and the ſtump dreſſed as in other amputations.

When the lower jaw is ſo cut by a ſword, that the piece ſeparates, and cannot be otherways retained, then alſo the ſuture may be uſed, adding a proper compreſs, plaſters, and the ſuitable bandage. If the clavicle, or acromion ſcapulæ, ſhould in like manner be wounded by a ſword, the treatment and bandage are to be of the ſame kind, gently unbending, cleanſing, and dreſſing the part either every day, or every other day, as the diſcharge ſhall require, till the cure is perfected.

No medicines ſo effectually prevent the corruption of bones laid bare, and aſſiſt to cover them ſo ſoon with fleſh, as ointments, balſams, and dreſſing ſeldom, in order to have the aſſiſtance of the moſt effectual balſam of all, pus. With theſe we ſee the extremities of amputated bones covered over with fleſh, part of the ſkull, tibia, and other ſolid bones, covered in a little time with granulated fleſh after they had been laid quite bare by wounds made even with bruiſing inſtruments; and likewiſe after their carious ſurface had been cut off, and a complete cure made, without the leaſt exfoliation. Monro, Med. Eſſ. Edin. vol. V. Art. 24.

Bone *Setting*, the art or act of replacing diſlocated bones, and the parts of fractured ones.

Bone *Setting*, by ſome called ſynthetiſmus, includes the four operations of extenſion, coaptation, deligation, and reduction or repoſition.

Fractures and diſlocations of bones are ſo frequent, that it ſeems ſurpriſing the ſetting them ſhould ſo long have been left to quacks and ignorant perſons. It is about 150 years ſince the methodical ſurgeons have applied themſelves to this art; which they have carried to a degree of perfection beyond what it ever arrived at among the Greeks.

A bone ſetter ſhould poſſeſs a perfect knowledge of anatomy, and mechanics; the former, to inform him of the ſtate and ſituation of the fractured or diſlocated bones; the latter, to furniſh machines, whereby to reinſtate them. The famous bench of Hippocrates was once held the moſt perfect engine of this kind.

M. Petit has contrived another, which not only ſeems more handy and portable, but more powerful, as well as leſs painful to the patient. By means of it, the operator is fully maſter of the powers that pull it, and may proportion them to the ſtrength and weakneſs of the ſubject, and that of the muſcles or tendons which are to be replaced. Add, that as it is neceſſary, the power which retains the body be equal to that which pulls the diſlocated member: in this machine, the ſame rope which pulls the limb, repels the body; and that the machines hitherto contrived, have only ſerved for luxations of the ſhoulder, and that of the hip, which are made upwards, and where the members are ſhortened; whereas this ſerves for fractures as well as luxations, and not only where the members are ſhortened, but where they are longer. For further information, ſee Syſtem of SURGERY.

The replacing a diſlocated bone of a horſe, is a work of much difficulty, and requires great force; they uſually caſt the beaſt on a ſoft place, put four ſtrong paſterns on his feet, and draw him from the ground, that his whole weight may, in a manner, reſt on the disjointed member. Some tie a leathern thong about the paſtern, faſtening the other end of it to a yielding ſhrub, and thus whip the creature to make him ſtrain with all his force, till the bone fly into its place.

Bones, *Boiling and Whitening them*, are neceſſary operations in making ſkeletons: the method of doing which is thus deſcribed by Simon Pauli. They muſt firſt be well boiled, and afterwards expoſed day and night in the open air for a conſiderable time. The beſt ſeaſon for this operation is in wet ſtormy weather, eſpecially in the months of January, February, March, &c. the air being then impregnated with a nitrous ſalt, which contributes much to give them a bright white colour. If it does not rain, they muſt be ſprinkled with a bruſh dipt in rain water; and even rubbing them gently with the bruſh may be of uſe.

In expoſing them, care muſt be taken to place them on a fir board, by no means an oak one, which ſhould be covered with a ſtratum of ſlate-ſtone, firſt well ſoaked in water; next, fine ſea-ſand is to be ſprinkled on, an inch or two deep. The uſe of the ſand is to imbibe what marrow or fat remains in the bones after boiling.

On viewing the bones with the aſſiſtance of good glaſſes, their ſuperficial part is found to conſiſt of a great many ſmall veſſels, and ſome few of a larger ſize; which laſt, when they come to the ſurface of the bone, appear inveſted with either a membrane or a bony ſubſtance, perfectly tranſparent. The inſide of the bone is a ſpongy or cellular ſubſtance, conſiſting of long particles, cloſely united; and theſe are compoſed of numberleſs ſmall veſſels, cloſely united, and ſome running lengthways, others taking their courſe toward the ſide of the bony fibres; which, notwithſtanding their great number of apertures, are extremely hard, and lie ſome parallel, and others perpendicular to the length of the bone. Mr. Leewenhoeck diſcovered once, in a ſmall bit of ſhin bone, four or five veſſels, with apertures large enough for a ſilk to paſs through, each whereof ſeemed furniſhed with a valve, diſpoſed in ſuch a manner as to let out what was contained in the veſſel, but ſuffer nothing to return into it.

The way to examine the bones, is to ſhave off, with a very ſharp pen knife, extremely thin pieces, lengthwiſe, croſſwiſe, and obliquely, and theſe from the outſide, inſide, and middle of the bone, and apply theſe, ſome dry, others moiſtened with water, to the focus of the double microſcope; and thus the veſſels will be ſeen in all directions: but the beſt way of ſeeing the bony ſtructure, is by putting the bones in a very clear fire till they are red hot, and then taking them out carefully, you will find the bony cells, though tender, perfect and entire; and, being now quite empty, they may be viewed with eaſe and pleaſure. Baker's Microſc. p. 143.

BONES, in commerce, are very uſeful articles for making different kinds of toys, and alſo in ſeveral of the chemical arts; viz. for making iron malleable, for abſorbing the ſulphur of ſulphureous ores, for forming teſts and coppells, or veſſels for refining gold or ſilver with lead; as burnt bones compoſe a maſs of a porous texture, which abſorbs vitrified lead and other metals, while the unvitriſcible gold and ſilver remains entirely behind. They are uſed for the preparation of milky glaſſes and porcelains, for the rectification of volatile ſalts, and of empy rhumatic oils; alſo for making glue. The bones of the cuttle fiſh are uſed by thegoldſmiths for making moulds; thoſe of the cow kind, for painters black, alſo in lieu of ivory for toys and cutlers work.

Foſſile, or *Petrified* BONES, are thoſe found in the earth, frequently at great depths, in all the ſtrata, even in the bodies of ſtones and rocks.

There are divers ſorts of foſſile bones; ſome of a huge ſize, uſually ſuppoſed to be the bones of giants, but more truly of elephants, or hippopotami; other ſmaller, as vertebræ, teeth, and the like.

It has been diſputed whether theſe be really animal ſubſtances, or mineral; that is, ſtones thus figured. Modern naturaliſts generally allow them to be animal, not merely on account of their figure and reſemblance, but of their chemical principles, which are found to be wholly of the animal kind.

BONITO, in ichthiology, the name of a fiſh, of the tunny or trachurus kind, and called by ſome curvata pinima. It is a large ſea fiſh, with a long, broad, and thick body: its eyes are large, as are alſo its gills, and the greater part of its body is free from ſcales. It is a fiſh of very great beauty. It is an extremely common fiſh in ſome ſeas; our Eaſt India ſhips uſually fall in with immenſe ſhoals of them.

BONNET, in a general ſenſe, an external covering for the head, more particularly for females.

BONNET, in fortification, a kind of ravelin, without a ditch. See Syſtem of FORTIFICATION.

BONNETS, in ſea language, ſmall ſails, ſet on the courſes, on the mizen, main-ſail, and fore ſail of a ſhip, when theſe are too narrow, or ſhallow to cloathe the maſt; or in order to make more way in calm weather.

BONONIAN *Stone*, a ſmall, grey, ſoft, gloſſy ſtone, about the bigneſs of a large walnut: when broken, having a kind of cryſtal, or ſparry tail within; found in the neighbourhood of Bologna, or Bolnonia in Italy; and when duly prepared, making a ſpecies of phoſphorus.

This ſtone is found in divers parts of that country, particularly in a river at the foot of Mount Peterno. This diſcovery was made about the year 1630.

This property of affording a phoſphorus by calcination, is common to the other gypſums, when pure from metallic, or other heterogeneous mixtures; the artificial gypſums ſucceed equally with the natural, and it is found to belong to a variety of other ſubſtances. M. Margraaf obſerves, that all ſubſtances which have this property, contain a vitriolic acid, united to an alkaline or calcareous earth. See Art of making PHOSPHORUS.

BONZES, or BONZUS, a name given to the prieſts and religious of China, Japan, and Tonquin.

The bonzes are the great adverſaries of the miſſionaries; and to their influence are attributed the perſecutions which have been raiſed in thoſe countries againſt the Chriſtians.

They generally live in a ſort of community, in places a part, or conſigned wholly to them. The iſland Pou-to near Chuſan, is a famous ſeat of bonzes, being wholly inhabited by them, to the number of 3000, all of the ſect of Hoſhang, or unmarried bonzes.

They live a kind of Pythagorean life, and have not leſs than four hundred pagods, or temples, in this little iſland. They have alſo female bonzes, a ſort of nuns. Phil. Tranſ. N° 280.

In order to diſtinguiſh themſelves from the laity, they wear a chaplet round their necks, conſiſting of a hundred beads, and carry a ſtaff, at the end of which is a wooden bird: they live upon the alms of the people, and yet are very charitably diſpoſed, maintaining ſeveral orphans and widows out of their own collections.

The bonzes of China are the prieſts of the fohiſts, or ſects of Fohi; and it is one of their eſtabliſhed tenets, that there are rewards allotted for the righteous, and puniſhments for the wicked, in the other world; and that there are various manſions, in which the ſouls of men will reſide, according to the different degrees of merit. The bonzes of Pegu are generally gentlemen of the higheſt extraction.

BOOBY, in natural hiſtory, the name of a bird common about Jamaica, and in ſeveral other parts of the world. It is deſcribed by Sir Hans Sloane, in his hiſtory of Jamaica, under the name of avis fuſca anſeri baſſano affinis. It feeds upon fiſh, and dives under water after them, but is often robbed of its prey by another voracious bird, called the albatroſſe, or the man of war bird. Captain Cooke frequently met with this bird in his voyage to the South Seas.

BOOK, a writing compoſed on ſome point of knowledge for the inſtruction or amuſement of the reader.

The word is formed from the Saxon boc, which comes from the Northern buech, of buechaus, a beech or ſervice tree, on the bark of which our anceſtors uſed to write. Book may be defined more preciſely, a compoſition deſigned to communicate, to prove, or illuſtrate ſome ſcience, art, truth, or invention.

Searching the voluminous dictionaries, recently publiſhed, for information as uſual, we were ſurpriſed at finding between two and three ſheets occupied in informing their readers what a book was: in peruſing this unintereſting prolixity, it appears obvious that the intention of thoſe compilers of literature was ſolely to manufacture a large book; this brings to mind a Greek motto Mr. Addiſon has adopted in the Spectator "*That a great book is a great evil*;" being convinced modern compilations verify the idea. Is there a child who poſſeſſes the faculties of utterance and common intelligence, but knows what a book is? And is there a perſon poſſeſſed of the ſlighteſt knowledge of letters, that wants to be informed that books are of various denominations, according to the ſubject they are meant to elucidate as books of prayer, hiſtory, poetry, &c. &c.

That books are good and bad, uſeful and uſeleſs, is a well known truth; to diſcriminate and ſelect them muſt be the readers care; a Dictionary of Arts and Sciences cannot convey this information any further, than by the judicious or futile materials of which it is compoſed.

We are told the materials books were originally made of were ſtones: that events were anciently recorded on ſtones is certain; and, as a proof of the cuſtom ſtill prevails, we have only to caſt our eyes on the neighbouring church yard; where the warrior, the philoſopher, the author, and the peaſant, lie with no other diſtinction than the monumental inſcription: whether libraries were ever compoſed of ſtone volumes we leave to the inveſtigation of the poring antiquarian.

The bark of trees and ſkins of animals, properly prepared, ſeems very probable the materials firſt uſed for books.

Manuſcript books are thoſe written with the hand. Printed books are thoſe worked off by means of a preſs; ſee Treatiſe on the Art of PRINTING.

The different ſizes of books are a folio, or the ſheet folded but once, making two leaves; quarto, four leaves; octavo, eight leaves; duodecimo, or twelves, twelve leaves; ſixteenths, ſixteen leaves; twenty-fourths, twenty-four leaves, and ſometimes ſo ſmall as thirty-ſeconds. The ſize of thoſe different kinds of books, is altered materially by the ſort of paper uſed; for inſtance, a large demy quarto is ſcarcely to be diſtinguiſhed from a crown, folio, &c. &c.

Books with regard to their authors are deemed *Anonimous*, i. e. thoſe without any authors name; *Cryptonymous*, thoſe whoſe names are concealed in ſome anagram or other myſterious deception; *Pſeudonymous*, thoſe which bear a fictitious name of authors; *Poſthumous*, thoſe publiſhed after the author's death; *Genuine*, thoſe really written by the author whoſe name appears in the title page.

The uſes of books are numerous: they make one of the chief inſtruments, or means of acquiring knowledge: they are the repoſitories of law, and religion the vehicles of learning.

As the refuge of truth, which is baniſhed out of converſation, they are ſtanding counſellors, and preachers, always at hand, and always diſintereſted; having this advantage over oral inſtructors, that they are ready to repeat their leſſon, as oft as we pleaſe. Books alſo ſupply the want of maſters, and even, in ſome meaſure, the want of genius and invention; and can raiſe the dulleſt perſons, who have memory, above the level of the brighteſt, without them.

There was a clauſe in the ſtatute of the 8th of Q. Anne, ch. 19. impowering the chancellor, and ſome other great officers of ſtate, to ſet the price of books; but this is now repealed by 12 Geo. II. ch. 36. ſect. 2.

ART OF BOOK BINDING.

Book Binding, the art of ſewing together the ſheets of a book, and ſecuring them with a back, and ſtrong paſte board ſides, covered with leather, &c.

Binding is diſtinguiſhed from ſtitching, as in the latter, the leaves are only ſewed, without bands, or backs.

There are various ſorts of binding, French binding, law binding, marble binding, binding in parchment, in ſheep, in calves leather, &c. alſo half binding, wherein the leaves are generally left uncut, and only the back covered with leather, the paſteboard ſides being covered with marbled, or blue paper. Dutch binding is where the backs are of vellum. The Italians are ſtill contented to bind in a coarſe, thick paper, called binding alla ruſtica, the inconvenience of which is its being liable to wear out without careful uſe.

The firſt operation in book binding is to fold the ſheets according to the form, viz. into two for folios, four for quartos, eight for octavos, &c. &c. which the workmen do with a ſlip of ivory or box, called a folding ſtick: in this they are directed by the ſignatures at the bottom of the pages. The leaves thus folded, and laid over each other in the order of the ſignatures, are beaten on a ſtone with a heavy hammer, to make them ſolid and ſmooth, and then preſſed. Being thus prepared, they are ſewed in a ſewing preſs, upon pack-threads or cords, which are called bands, at a proper diſtance from each other, and in a convenient number; which is done by drawing a thread through the middle of each ſheet, and giving it a turn round each band, beginning with the firſt, and proceeding to the laſt. The common number of bands is ſix in folios, and five in quartos, octavos, &c. Sometimes they uſe a ſaw to make places for the bands, which are ſunk into the paper, ſo that the back of the book when bound is ſmooth, without any appearance of bands. After this the backs are glued, the ends of the bands being opened, and ſcraped with a knife, for the more convenient fixing of the paſte boards; then the back is turned with a hammer, the book being fixed in a preſs between boards, called backing boards, in order to make a groove for admitting the paſte boards. The boards being then applied, holes are made for drawing the bands through, the ſuperfluous ends being cut off, and the parts hammered ſmooth. Then the book is preſſed, in order for cutting; which is performed by a particular machine called a plough, to which is fixed a knife. After this the book is put into a preſs called a cutting preſs, betwixt two boards, the one lying even with the preſs, for the knife to rnn upon; the other above it, for the knife to cut againſt.

The book being cut, the paſte boards are ſquared with a proper pair of iron ſhears; and it is then ready for ſprinkling, gilding, blacking, or marbling the leaves. The colours, with which it is ſprinkled, are uſually vermillion, or ſap green; which is done with a bruſh made with hog's briſtles, holding the bruſh in one and, and moving the hair with the other.

In the French binding, a book is put in parchment, i. e. a ſlip of parchment is applied over the back, between each band, and the ends paſted on the inſide of each paſte board. This preparation, called indorſing, ſeems peculiar to the French binders; who are enjoined by ordonnance to back their books with parchment on the penalty of 30 livres, and the re-binding of the book: it is done in the preſs, where the back being grated to make the paſte take hold, the parchment is applied; and they afterwards add glue to fortify it.

Gilding Books on the Edges. The book, being put tight into the preſs, between two boards, is ſcraped with a knife called a ſcraper; and after that with another called a ſmoother, in order to take out all ſcratches. Being thus made ſmooth, they ſcrape a little yellow ochre upon the book, wet it with a little ſize water, and rub it off with ſome clean ſhavings. The gilding ſize is made with the white of an egg, mixed with water, and beat well together. The leaves being wetted with the ſize water, with a bruſh, the gold is then laid upon it, and afterwards dried before the fire. When dried, it is burniſhed off with a dog's tooth ſet in a handle. Blacking the leaves is done with fine antimony, the leaves being wet, and the antimony rubbed upon them until quite dry, when it is burniſhed like the gold.

The head band is now added; which is an ornament of thread or ſilk of two or three colours, placed at each extreme of the back, acroſs the leaves; and woven or twiſted, ſometimes about a ſingle, and ſometimes a double piece of rolled paper, or, what is more laſting, of glued pack thread.

For the Covers. The ſkins uſed undergo ſeveral preparations, which we ſhall explain in calf, as being the leather moſt uſed; and as being that to which all the reſt, with a little variation, may be referred. The calf ſkin, being moiſtened in water, is cut to the ſize of the book, and the thickneſs of the edges pared off on a marble ſtone kept for that purpoſe. The cover is next ſmeared over with paſte made of wheat flour; then ſtretched over the paſte board on the outſide, and doubled over the edges withinſide. They then cord the book, or bind it firmly between two boards, to make the cover ſtick the ſtronger to the paſte boards, and the back; on the exact performance of which depends a great part of the truth and neatneſs of the book. The back is then warmed at the fire to ſoften the glue, and the leather of the back is rubbed down, with a folding ſtick or bodkin, to ſet and fix it cloſe to the back. It is then ſet to dry, and when dry, uncorded: the book is afterwards waſhed over with a little paſte and water, the edges and ſquares blacked with ink, and then ſprinkled fine with a bruſh, by ſtriking it either againſt the hand, or a ſtick; or with larger ſpots mixed with vitriol, which is called marbling. Two blank leaves, on each ſide, are then to be paſted down to the cover; and when dry, the leaves are burniſhed in the preſs and the cover rolled on the edges.

The cover is glazed twice with the white of an egg; it is then filleted plain, or with gold; and at laſt poliſhed with a poliſhing iron, paſſed hot over the glazed colour. If the book be required to be lettered, they paſte a piece of red morocco on the back, between the firſt and ſecond band, to receive the title in gold letters; and ſometimes a ſecond between the next bands underneath, to receive the number of the volume.

Gilding Books on the Back and Covers. In ordinary bindings they gild little elſe but the backs, and the outward edges of the cover. On the backs are gilt the title of the book, &c. with flowers, roſes, knots, ſtars, &c. between the bands: on the covers are ſometimes added compartments, arms, &c. All theſe ornaments are made with each its ſeveral gilding tool, engraved; either on the points of puncheons, as thoſe of letters, roſes, ſtars, &c. or around little cylinders of braſs, as the lines, embroideries, &c. The puncheons make their impreſſion by being preſſed flat down; and the cylinders by being rolled along by a handle, to which they are fitted on an iron ſtay, or axis.

To apply the gold, they glaze thoſe parts of the leather, whereon the tools are to be applied, three or four times with a liquor made of the whites of eggs diluted with water by means of a ſponge; and, when near dry, they ſlightly oil them, and then lay on pieces of leaf gold, and on theſe apply the tools, with a careful even preſſure of the hand, or roll the cylinders, both the one and the other, reaſonably hot. If the figures be large, and require a great relievo, as arms, &c. they are beat or preſſed down. The gilding thus finiſhed, they rub off the ſuperfluous gold, and poliſh the whole; the gloſs of which is greatly aſſiſted by a final preſſing between horns peculiar for the purpoſe.

Our book binders, for gilding or rough leather, make uſe of reſin dried and powdered, inſtead of whites of eggs; and the gold leaf, firſt cut to a proper ſize, is laid on a hot ſomewhat oiled ſtamp, and preſſed down: and thus the reſin melts only in thoſe parts where the hot ſtamp is applied, and the gold fixes on it, whilſt the other parts of the leather remain rough as at firſt.

Book-seller, a profeſſed trader in books; whether he prints them himſelf, or procures them to be printed by others, for ſale.

Book-ſellers are a kind of agents, or curators, in the republic of letters: in many places, they are ranked among the members of univerſities, and entitled to the privileges of ſtudents: as at Tubingen, Saltzburg, and Paris, where they have always been diſtinguiſhed from the vulgar and mechanical traders, and exempted from divers taxes and impoſitions laid on other companies.

Formerly, the offices of book-ſellers and printers were united in the ſame perſons. Labbe gives a liſt of learned book-ſellers; moſt of whom were alſo authors. Of late days, book ſellers have drawn their buſineſs into leſs compaſs, and leaving the labour of compoſing books to one ſet of perſons, and that of printing them to another, content themſelves, with the gainful part.

In this view, they have been very important and uſeful agents between authors and the public; and have contributed, in no ſmall degree, to the encouragement of genius and literary induſtry, and the ſpreading of ſcience. There are few authors, who have undertaken the printing and publiſhing of any work likely to be tranſmitted to poſterity, without being connected with ſome book-ſeller or book-ſellers, eminent in their profeſſion.

The chief ſcience of book-ſellers, is the knowledge of the titles, different editions, prices, and ſcarcity of books, without regard to their contents, or qualities, otherwiſe than as theſe affect the ſale of them.

Book ***Worm***, is an inſect of the mite kind, which afterwards becomes a fly, bred from eggs depoſited in the month of Auguſt in books, eſpecially in the leaves neareſt the covers. It is not unlike the mite or blatta found in the corn. When the time of its transformation approaches, the inſect ſeeks to get into the air, and eats every thing which it finds in its way, till it gets to the extremity of the book. The mixture of juice or wormwood and other bitter ingredients in their paſte, which is an expedient uſed by book binders for this purpoſe, is no ſecurity to books againſt book worms. The beſt and the only ſecurity is from mineral ſalts, which all inſects hate. For this purpoſe book binders, ought to mix with the paſte employed in binding, the ſalt which is known under the name of arcanum duplicatum, alum, and vitriol: figuratively, book-worm denotes a perſon who ſpends his time in peruſing books.

The following concise Syſtem of Book-keeping, *is the Selection and Arrangement of Mr.* William Barton, *No.* 8, Broad-Way, Blackfriars, *Teacher of Writing, Arithmetic, and Book-keeping.*

A NEW SYSTEM OF BOOK-KEEPING.

INTRODUCTION.

THE following Syſtem on this very uſeful and intereſting ſubject has been arranged with the utmoſt care and attention, being the reſult of practice and obſervation, and I hope will be found uſeful and inſtructive. Various authors have endeavoured to point out the moſt proper method of keeping accounts, but in general cloathed with that ambiguity as to bid defiance to the reſearches of a common capacity; thus one of the moſt eſſential accompliſhments a man of buſineſs can poſſeſs, has been rendered obſcure by the pedantic labours of ignorant and aſſuming authors. The inſtructions given in ſchools have laboured under the ſame difficulties; as few preceptors acquired their knowledge in a counting-houſe, they could only refer to books as precedents for their pupils; and the *Editor of this Syſtem* appeals to the moſt adept clerk, if a great majority of the treatiſes written on Book-keeping have been any thing more than obſtacles in the way of learners, who wiſhed to qualify themſelves by books. From this almoſt general cenſure, candour obliges me to except a few; from thoſe and my own obſervations, I have endeavoured to introduce a method eaſy and familiar.

Simplicity being the only criterion of real and uſeful merit in every department of Art and Science, to depart from it in regiſtering the receipts, expenditures and dealings, from which we derive the immediate ſupport and future proſperity of ourſelves and our poſterity, is an idea too ridiculous to be followed by any perſon of liberal and candid opinions.

To render the ſubject familiar and eaſily learned, is the great object of this Syſtem; and as a multiplicity of tedious examples would only tend to embarraſs the ſtudent, brevity will be particularly kept in view, in ſuch a manner as the whole may be acquired in a very ſhort time, without the irkſome and laborious attention neceſſary to comprehend and retain the theory generally inculcated.

Such has been the manner and order in which writers have generally expreſſed themſelves, that they deface ſmooth *plains*, with uſeleſs unſlightly labyrinths. And what muſt teachers do, if the works approved by ſo many, and which have ſtood the teſt for numbers of years, appears to them too abſtruſe for ſlender capacities? They cannot convey ſuch maxims with any tolerable ſucceſs, nor have they leiſure, or encouragement, to frame and model Syſtems adapted to the genius of every pupil. Certainly, every thinking gentleman deliberating what to do in that caſe, will take a comparative view of Authors, and chuſe accordingly; for it is evident, that one maxim cannot govern ſo many various diſpoſitions, where the tendency of their mental conſtruction, and ſtate of thought, are ſo different.

Theſe Rudiments do not attempt any copious diſplay, by playing with the *art* beyond the level of common capacities; the aim is to convey inſtruction by a conciſe explanation of the ſtyle and manner in which this important ſebject ſhould appear; if the field is leſs, I hope the ſuperior value of the produce will make ample amends.

I appeal to any judicious Teacher, how far writers have copied each other on this ſubject; and differed not in any thing ſo much, as the obſcure mode of diſplaying their learning through a long ſeries of ſheets: my only claim is, that of not giving much trouble to others in underſtanding what little I have written.

Thoſe *gentlemen* who have gone through ſuch bulky and tedious varieties, can boaſt of their toils and induſtry, in ſtudying frequent repetitions of the ſame thing, differing occaſionally in the form of expreſſion, to cauſe a variation in the very ſame article, to the great embarraſſment of thoſe who wiſh to acquire knowledge; for the memory muſt fail, when ideas foreign and complex are blended with the object of our purſuit.

Book-keeping, is either kept by *Double* or *Single Entry*: the firſt mentioned is the method uſed by Merchants, and other extenſive Negotiators; and that of *Single Entry*, by retail Dealers: not that theſe laſt are confined to that confined manner; but want of knowledge at firſt introduced it, and it has been confirmed by cuſtom. If the purpoſe for which it was intended, is anſwered, I can ſee no reaſon why the practitioner ſhould deviate.

There are alſo, according to this Treatiſe, two ways of keeping accounts, but both are on the principles of *Double Entry*. The technical names uſed by other Authors in keeping accounts are avoided, from a belief that ſuch as I object againſt are vague and nugatory. Nor can I conceive that reaſon will admit of more than two plain names to compriſe the whole, (namely, REAL and PERSONAL) and bear real ſignification to all ſuch perſons as are not over-fond of winding compoſitions.

REAL ACCOUNTS, are my real properties, either in my actual poſſeſſion or out of it, intruſted to others.

PERSONAL ACCOUNTS, are the mutual tranſactions ariſing between *me* and any *other Perſon*; and are to be expreſſed in ſuch order, as occaſionally to ſhew the real and fair ſtate of our dealings.

There is a *third* kind of *account* in general *uſe*, which, however, I cannot admit, till better warranted by its *advocates*;—this is called *Imaginary*.

Under this *imaginary title*, the imagination ſtill creates more, to embarraſs *realities*, and opens an account called *Profit and Loſs*; though ſo very inconſiſtent, and incapable of pointing out any real meaning under *one head:* For it is evident, that if I *gain* by any negotiation, my profit is *real*, and not *imaginary*; and, by a ſimilar obſervation, *loſs* muſt be acknowledged to be no *profit*, but the very oppoſite; how, then, can terms ſo different in ſignification give a title to expreſs the ſame thing!

The SIX PLAIN EXAMPLES I mean to conſtruct this Syſtem upon, are briefly theſe.

1ſt. An *Inventory* or exact Account of my whole Stock to begin Trade with, and *another* of what I owe;
2d. *Buying*;
3d. *Selling*;
4th. *Receiving*;
5th. *Paying*; and
6th. *Balancing*.

In which all tranſactions are and muſt be included, though ſo many other names are given to accounts. I therefore do not mean to confuſe the real deſign and nature of the tranſaction with ideal titles, to impede the *learner* in obtaining the plain ſenſe of the buſineſs in hand.

SECT. I.

SUPPOSE I write to Mr. Lemaitre at Paris, deſiring he would purchaſe for me a pipe of Burgundy; which I order to be ſhipped from thence to Dublin, to be delivered according to my appointment to Mr. O'Kelly, Factor, who receives it and exchanges it for Iriſh linens, which he ſhips for London conſigned to me. What are theſe expences of purchaſing, commiſſions, freight, &c. but actually buying and ſelling? Yet the variety of it would occaſion ſad apprehenſions in a Learner, how to give technical terms to the ſeveral negociations, agreeable to the ſpirit of the preſent taught art of Book-keeping; and how to ſtate and balance this ſeemingly awkward chain of account, though in reality, the tranſaction is far from being myſterious or intricate.

FOR INSTANCE.

Admitting the pipe of Burgundy coſt at Paris	- £. 53
Commiſſion, freightage, and every other charge attending the whole, for which I am accountable is	21
The Wine coſt me	£. 74
Having ſold the Linens in London for	£. 93
My gain is juſt — —	£. 19

The queſtion is under, what title muſt I place this real gain, how can I with propriety annex the word loſs to it, I think conſiſtency forbids me; therefore, why ſhould I in conformity to cuſtom place what I am convinced is real profit, under the unmeaning title of PROFIT and Loss? On the other hand, ſhould I have the misfortune to have my houſe and goods deſtroyed by fire, ſurely no caſuiſt or logician would ever attempt to perſuade me my loſs is not real but imaginary; yet, a learned Book-keeper will immediately inſiſt upon its being ſet down as profit and loſs.

In accounts, it were to be wiſhed, that thoſe who do not take an abſolute pleaſure in obſtinacy, would avoid as much as poſſible, abſtruſe Phraſes, technical Terms, ambiguous Expreſſions, and unmeaning Titles; and, in conveying inſtructions, conſider what ſort of ſtyle will moſt conveniently deſcribe the leſſon meant for explanation, inſtead of ſuffering Cuſtom ſo ſhamefully to triumph over Reaſon.

When I come to record my *gain* and *loſs*, as they occur in this Syſtem, I hope to ſatisfy thoſe who may now doubt it, that accounts are to be ſtated in a more eligible manner than has hitherto been practiſed.

Partnerſhip is another degree of *imaginary accounts*; and the perſon capable of conducting it, is conceived to be no inconſiderable adept in Book-keeping; becauſe people do not reflect, that when *two* or *more* are jointly concerned in Trade, the tranſactions ought to be ſtated in the ſame manner as when a perſon carries on buſineſs *ſingly*; and the only difference is, the *diviſion* of the *Profits*, and *accounting* for the *Loſs*, when *accounts* are balanced in proportion to the reſpective *Shares* which the Partners had in the *joint Stock*.

The method firſt conſidered is founded on the Italian principle of *Double Entry*, and calculated for the uſe of the Merchant and extenſive branches of Trade; but ſo ſimplified, that perſons in different ſpheres of life may manage their inferior tranſactions on the ſame plan, and be ſatisfied of the ſtate of their domeſtic or trading concerns daily on immediate inſpection.

For the regular order of keeping accounts, in *mercantile* or other extended tranſactions, it is abſolutely neceſſary to have the following three Books.

Waſte Book, Journal, and Ledger.

Theſe *books* are kept in the ſame manner, in effect, in moſt trading cities in Europe; but not as to coin: each being regulated by that ſort of coin which has currency in the ſtate where they are, viz.

In England, *books* are kept in *pounds*, *ſhillings*, *pence*, and *farthings:* in France, in *livres*, *ſols*, and *deniers:*—in Holland, Flanders, Zealand, and Brabrant, in *ponden*, pounds, *ſchellingen*, ſhillings, and *groſs*, *groot*; they alſo keep them in *guilders*, *ſtivers* and *penningen*:—at Dantzick, and in all Poland, in *rix-dollars*, *groſs*, and *deniers*:—they are likewiſe kept in *florins*, *groſs*, and *deniers*:—through moſt parts of Germany, in *florins*, *cruitzers*, and *pennings*:—at Hamburgh, in *marks*, *ſols*, and *deniers lubs*:—at Liſbon, in *rees*:—at Florence, in *gold crowns*, *ſols*, and *deniers*:—in Spain, in *maravedis*; ſometimes in *rials*, or *pieces of eight*:—at Meſſina, and through Sicily, in *ounces*, *tarins*, *grains*, and *piccolis*:—at Venice, in *ducats*:—at Muſcovy, in *rubles*, *altins*, and *grieves*:—through all the ſtates of the Grand Signior, in *piaſters*, *abouquelles*, and *aſpers*.

SECT. II.

WASTE BOOK.

THE Waſte Book contains the original ſtate and progreſſive occurrencies of all our tranſactions, recorded in a familiar manner; and as this firſt Book is the very foundation and authority of the other two, it ought particularly to be attended to, notwithſtanding it is ſo eaſy to conduct it, that any perſon capable of writing a legible hand, and adding a few ſums of money together, may make all the occaſional Entries in it, as corrrect, and as much to the purpoſe, as thoſe who have written elaborately on the ſubject.

Waſte Book is the firſt, and moſt eſſential: in this, all kinds of matters are mixed together; no order but that of time being preſerved; it being a daily regiſter of occurrences in buſineſs, to be afterwards ſeparated and transferred into the others; ſo that this may be ſaid to contain the elements of all the reſt.

In reality it conſtitutes a Journal, or Day-book; but that name being applied to another, the name Waſte-book is given to this by way of diſtinction: though what relation the word Waſte bears to the nature of this Book, is not very obvious. Some with more propriety call it the Memorial-book, or Memorandum-book.

The Waſte-book begins with the inventory of a perſon's effects and debts; the difference between theſe is what the merchant calls his neat ſtock; and contains a complete record of every tranſaction of his affairs, with all the circumſtances, in a plain narration of matter of fact, every tranſaction following another in the order of the dates.

WASTE BOOK.

LONDON, JANUARY 1, 1790.

			£.	s.	d.
	Inventory of the whole amount of my property with which I begin trade; as follows:				
—	Caſh in the hands of Meſſrs. WILLIS, PERCIVAL, & C°. Lombard ſtreet, as per banker's book	£. 500			
—	Money and notes in my own poſſeſſion	250			
—	Six puncheons of rum in my warehouſe a £. 50 per puncheon	300			
—	Mr. Richard White owes me, per his note on demand, dated 17 November laſt	450			
	Amount of Stock	1500			
—	Borrowed of Mr. Richard Davis, and gave him my note on demand, dated December 26, 1789.	375			
	My real property ——		1125		
	—— 10. ——				
—	Bought of Mr. Richard White, 2 pipes of madeira, a £. 36 per pipe		72		
	—— 20. ——				
—	Sold by Mr. Richard Davis, 4 puncheons of rum, part of my original ſtock, a £. 72 per puncheon		288		
	—— 28. ——				
—	Received of Mr. Richard White, on account		150		
	—— 29. ——				
—	Paid Mr. Richard Davis, on account		30		
	—— 31. ——				
—	Paid houſekeeping expences, including horſe-hire, this month, as per bills on the file		12		

OBSERVATIONS ON THE WASTE BOOK.

The firſt four entries which follow the title and date make the whole of the ſtock or property with which I commence buſineſs; the next item or artitle acknowleges my being indebted to Mr. Richard Davis in a ſpecified ſum.

Theſe accounts of what I have and what I owe diſcover the preſent ſtate of my affairs, and anſwers to the firſt of the ſix examples propoſed, as the balance remaining, after diſcharging Mr. Davis's debt, is my real property; although the inventory, and the ſum for which I am iudebted, makes five entries in the Waſte Book.

The Sixth Entry is buying, being the *Second Example*
The Seventh is ſelling —— *Third Example*
The Eighth receiving —— *Fourth Example*
The Ninth paying —— *Fifth Example*

And the ſixth of theſe eſſential examples ariſes when I ballance my debtors and creditors accounts in the ledger, as will be hereafter ſhewn, and is accordingly termed Balance.

The ninth entry in the Waſte Book is paying and is analogous too and comprized in the Fifth Example; and had I one thouſand entries to make, they muſt belong to or come under one of the heads alluded in the fore-mentioned examples, and in no reſpect vary ſo as to require any more examples.

N. B. The ſtrokes in the left hand margin oppoſite each article or entry denotes their being transferred into the Journal, and the date directs where.

SECT. III.

JOURNAL.

THE JOURNAL is the next book uſed in this method of keeping accounts. It is to be a copy of the ſubſtance of all the Entries written in the Waſte-book, with their reſpective dates; the language to be more conciſe, yet deſcriptive; that the minute narrations given in the Waſte-book, may become more brief and reduced to form, to prepare it for the Ledger.

The Journal is that wherein the affairs of each day are entered, as they happen, from the Waſte-book: ſo far as it differs from the Waſte-book, is only a book of aid to the Ledger, being a complete tranſcript of the Waſte-book, in the ſame order of time, but in a different ſtyle; becauſe the Waſte-book expreſſes every tranſaction in a ſimple detail of what is done; whereas the Journal diſtinguiſhes the debtors and creditors, as a preparation for the Ledger; thus when any tranſaction is to be transferred from the Waſte-book into the Journal, they examine it by the rules of the Ledger, as if it were to be entered immediately there; and, finding the debtors and creditors to which it belongs, theſe are diſtinctly marked by their denominations of Debtor and Creditor, in the ſtyle of the Journal; at leaſt, the accounts that are debtors are expreſly ſo named; and by their being directly connected debtor to ſome other accounts, theſe are ſufficiently determined to be the creditors, though the word Creditor be not written.

Every entry in the Journal is to be made Debtor to ſome *perſon* or *thing*; the proper rule for which deſcriptive and by example will be hereafter given.

JOURNAL.

LONDON, JANUARY 1, 1790.

			£.	s.	d.
	Sundries Dr. to Stock, for the amount of my whole property		1500		
	Meſſrs. WILLIS, PERCIVAL, and Co.				
1	Caſh in their hands	£. 500			
1	Caſh in my own poſſeſſion	250			
2	Rum 6 puncheons, at £. 50 per puncheon	300			
3	Mr. Richard White debt due by him	450			
		£. 1500			
4	Stock Dr. to Mr. Richard Davis Money borrowed on my note	375			
	My real property ——		1125		
	—— 10. ——				
7	Madeira Dr. to Richard White, 2 pipes bought of him at £. 36 per pipe		72		
	—— 20. ——				
3	Richard Davis Dr. to rum, 4 puncheons at £. 72 per puncheon		288		
	—— 28. ——				
1	Caſh Dr. to Richard White Received on account		150		
	—— 29. ——				
5	Richard Davis Dr. to caſh Paid him on account		30		
	—— 31. ——				
6	Houſehold expences and horſe hire Dr. to caſh as per bills and receipts		12		

N. B. The figures placed in the left hand column of the Journal, refer to the folio or page in the Ledger where the accounts are opened or poſted to.

OBSERVATIONS ON THE JOURNAL.

The manner and utility of the Journal being previouſly defined; the terms uſed and the reaſon for uſing them next require explanation, as I hope to render every thing familiar to thoſe who beſtow attention.

The firſt entry made in the Journal is ——
" *Sundries Debtor to Stock.*"

Theſe ſundries are the four ſundry things which conſtitute the ſtock with which I begin trade, namely, Caſh at my Bankers—Caſh in my own poſſeſſion—Rum—and a Debt due by Mr. R. White.

The term Stock may be conſidered as meaning myſelf, as it might be expreſſed " *Sundries Dr. to myſelf*;" but certainly, with more propriety, the alluſion is made to my property or ſtock in trade.

The fifth entry in the Journal is " *Stock Dr. to Richard Davis*," having borrowed and holding myſelf accountable to Mr. Davis; I debit my ſtock for the ſum due.

The ſixth entry is a tranſaction with Mr. Richard White, having bought Madeira of him it adds to my ſtock of that commodity, and is conſequently indebted to Mr. White for that article; for that reaſon Madeira is made Dr. to Mr. White, though it may ſeem on a ſlight conſideration that Stock, or myſelf, ſhould be the debtor in this inſtance; in fact, I am the actual debtor, but this mode of entry diſcovers more plainly how much I have gained or loſt when I balance account. For this reaſon, the ſame diſtinction muſt be obſerved in every thing bought or ſold, principally to preſerve a methodical and clear arrangement; the moſt important conſideration in accounts.

The ſeventh entry is ſelling to Mr. R. Davis, 4 *puncheons of Rum*, and is made Dr. to Rum for the value, and not to Stock, as that particular article had been diminiſhed by him.

The eighth entry is Caſh received of Mr. White, and is of courſe made Dr. to him who paid it.

The ninth entry is Caſh paid Richard Davis on account; Mr. D. being the receiver, is made Dr. in my accounts.

The tenth entry diminiſhes my caſh, and is made Dr. to caſh.

Inſtructions to diſtinguiſh the Dr. in every Tranſaction to be particularly attended to by Learners.

1ſt. Every thing I receive is debtor to the perſon from whom received.

2d. Every perſon to whom I pay money or ſell goods, is debtor to the thing he receives.

3d. If I exchange or barter one commodity for another, the article received is debtor to that given in lieu thereof.

As the whole Art of keeping the Journal in a proper Manner depend on a judicious Diſtinction of the Debtors and Creditors, I ſhall give a few more Examples for the Illuſtration of general Practice.

EXAMPLES PRACTICALLY EXPLAINING THE ABOVE THREE POSITIONS.

EXAMPLE I.

WASTE BOOK.

Received in full of Mr. Moody - - - - - -	£. 72	
Bought of Mr. Hoggard, 10 cwt. Sugar, at 45s. per cwt.	11	2

JOURNAL.

Caſh Dr. to Mr. R. Moody Received in full - - - - - - - - - - - -	72	
Sugar Dr. to Mr. J. Hoggard Bought 10 cwt. Sugar, at 45s. per cwt. - -	11	2

EXAMPLE II.

WASTE BOOK.

Paid Mr. Charles Cooke, in full - - - - - -	52	
Sold Mr. Adlard, 50 Reams of Printing Demy at 15s. per Ream - - - - - - - - - -	37	10

JOURNAL.

Mr. Charles Cooke, Dr. to Caſh Paid him in full - - - - - - - - - - - -	52	
Mr. Adlard, Dr. to Paper 50 Reams Printing Demy at 15s. per Ream - -	37	10

EXAMPLE III.

WASTE BOOK.

Bought for Ready Money 4 hhds. White Port at £. 21 per hhd. - - - - - - - - - - - -	84	
Sold for Ready Money 40 gallons of Rum at 8s. 6d. per gallon - - - - - - - - - - -	17	
Bartered 2 hhds. of Wine at £. 20 10*s*. per hhds for 100 gallons of Rum at 9s. per gallon - - -	45	

JOURNAL.

White Port Dr. to Caſh Bought 4 hhds. at £. 21 per hhd. - - - - - -	84	
Caſh Dr. to Rum Sold 40 gallons at 8s. 6d. per gallon - - - - -	17	
Rum Dr. to Wine, received 100 gallons at 9s. in exchange for 2 hhds. at £. 22 10*s*. - - - -	45	

Theſe examples diligently peruſed and compared with what precedes them, are ſufficient to qualify any perſon to manage the Journal; and the following examples and obſervations reſpecting the Ledger, will, I hope, perfect the ſtudent in the Syſtem of DOUBLE ENTRY.

SECT. IV.

LEDGER.

The Ledger is a volume, containing all the tranſactions of a man's affairs in ſuch order, as thoſe belonging to every different ſubject lie together in oppoſite leaves; making ſo many diſtinct or ſeveral accounts. The Ledger is the waſte-book and journal, farther digeſted; and brought to a point or focus. It is ruled in columns; and all the accounts diſperſed in the journal are drawn out and ſtated in debtor and creditor. To form each account, two pages are required oppoſite to each other; that on the left ſerving for debtor, the other for creditor: each article to conſiſt of five parts, or members; the date, the perſon whom we credit, or are credited by; the thing credited or indebted for; the page where it was transferred from the journal; and the ſum or amount of the article.

The management of the Ledger, correctly, being of great importance in accounts; attention to the following rules will render the theory familiar to practice.

1. That every perſon with whom you deal, on mutual truſt and credit, or who, by any means becomes your debtor, or you his, as well as for every thing you deal in, there muſt be a place in the book allowed: wherein is to be written all, and only the tranſactions relating to that ſubject, whoſe name is to be written on the head thereof; in order to form diſtinct accounts.

2. Every account to be diſtinguiſhed into two parts, on the right and left pages, of one folio or opening; the name of the perſon or thing being written on the head of the account, on the debtor ſide, diſtinguiſhed by the word debtor, and creditor on the right, or oppoſite leaf.

3. Every perſonal account to be opened in this manner, i. e. every perſon to be made debtor for what he owes you; and creditor for what you owe him.

4. Every real account ſhould contain, on the debtor ſide, the quantity and value of what was upon hand at the beginning of the account, and what was afterwards received, with all coſts and charges; and on the creditor ſide, the quantity and value of what is diſpoſed of, taken away, or gone out of it, with all the returns that you made.

5. To facilitate the uſe of the Ledger, there ſhould be an alphabet to ſerve as an index, conſiſting of twenty-ſix leaves, each cut on the edge, and marked with one of the letters; wherein the perſons names, with whom you have accounts, &c. are inſerted, with the folio of the Ledger, where the account is ſtated. It is impoſſible to arrange the alphabet annexed to the following Ledger after the manner in general uſe, as the conſtruction of a book for that purpoſe is in a peculiar form, known to every ſtationer, or clerk; I ſhall, therefore, conform to the uſage formerly in practice, a method by no means ſo convenient as the prevailing mode.

ALPHABET.

A	B Balance, fo. 8	C Caſh, fo. 1	D Davis Rd. fo. 5
E	F	G	H Houſe Ex. fo. 6
I	J	K	L
M Madeira, fo. 7	N	O	P
Q	R Rum, fo. 2	S Stock, fo. 4	T
U	V	W White Rd. fo. 3	X
Y	Z	—	—

BOOK-KEEPING.

LEDGER.

(1)

CASH, DEBTOR.

					£.	s.	d.
Jan.	2	1	To Caſh in the Banker's Hands -	4	500		
	—	1	Ditto in my own Hands - - -	4	250		
	28	1	Richard White, received on Account	3	150		
				£.	900		

(2)

RUM, Dr.

					£.	s.	d.
Jan.	1	1	To Stock, 6 puncheons, at 50l. per puncheon - - - - -	4	300		
			Gained on this Account - - -		88		
				£.	388		

(3)

RICHARD WHITE, Dr.

					£.	s.	d.
Jan.	1	1	To Stock, due by him on Note -	4	450		
				£.	450		

(4)

STOCK, Dr.

					£.	s.	d.
Jan.	1	1	To Richard Davis, due to him in my Note - - -	5	375		
	29	1	Houſe Expences and Horſe Hire -	1	12		
	31	1	Balance being what I am now worth	8	1201		
				£.	1588		

(5)

RICHARD DAVIS, Dr.

					£.	s.	d.
Jan.	20	1	To Rum 4 puncheons at 72l. -	2	288		
	29	1	Caſh paid him on Account - -	1	30		
			Balance due to him - - - -	8	57		
				£.	375		

(6)

HOUSHOLD EXPENCES Dr.

					£.	s.	d.
Jan.	31	1	To Bills this Month - - - -	4		:2	

(7)

MADEIRA, Dr.

					£.	s.	d.
Jan.	10	1	To Rd. White 2 pipes at 36l. per pipe	3	72		

(8)

BALANCE, Dr.

					£.	s.	d.
Jan.			To Caſh now in Hand - - -	1	858		
			Rum 2 puncheons remaining on Hand, valued at - - - -		100		
			Madeira 2 pipes in Hand, coſt -		72		
			Richard White due by him - -		228		
				£.	1258		

LEDGER.

(1)

CREDITOR.

					£.	s.	d.
Jan.	29	1	By Richard Davis paid on Account	5	30		
		1	Houſehold Expences and Horſe Hire	6	12		
			Balance in Hand - - - - -	8	858		
				£.	900		

(2)

Cr.

					£.	s.	d.
Jan.	20	1	By Richard Davis, 4 puncheons of Rum, at 72l. per puncheon	5	288		
			Balance 2 puncheons on Hand, valued at - - - - - -	2	100		
				£.	388		

(3)

Cr.

					£.	s.	d.
Jan.	1	1	By 2 pipes Madeira at 36l. per pipe	7	72		
	28	1	Caſh received on Account - -	1	150		
			Balance due to me - - - - -	7	228		
				£.	450		

(4)

Cr.

					£.	s.	d.
		1	By Caſh now at Bankers - - -	4	500		
		1	Ditto in my own Hand - - - -	4	250		
		1	Rum 6 puncheons on Hand - -	2	300		
		1	Richard White due to me - - -	3	450		
		1	Rum gained on account of - - -	2	88		
				£.	1588		

(5)

Cr.

					£.	s.	d.
Jan.	1	1	By Stock, per my Note to him -	4	375		
				£.	375		

(6)

Cr.

					£.	s.	d.
		1	By Stock expended in Houſe - -	4	12		

(7)

Cr.

					£.	s.	d.
Jan.	10		By 2 pipes Maderia at 36l. per pipe	8	72		

(8)

Cr.

					£.	s.	d.
			By Stock for what I am now worth		1201		
			Richard Davis due to him - - -		57		
				£.	1258		

BOOK-KEEPING.

OBSERVATIONS ON THE LEDGER, WITH DIRECTIONS FOR STATING AND BALANCING.

TO give any directions how to rule the three preceding books would be unneceſſary; as no more is required than to imitate the mechanical order before him in the different examples.

The figures in the ſmall columns of the margins, where the dates of tranſactions are, refer to the pages of the Journal from whence the oppoſite accounts were taken.

In the debtor ſides of the folios, in the ſmall columns adjoining thoſe of caſh, are the figures to ſhew what folio of the Ledger contains the creditor of the account annexed; and on the creditor ſides are the like ſmall columns, in which there are figures to direct you to the folio of the debtor.

The number of folios in the preceding Ledger are eight; having as many different titles, and all real.

Directions for opening accounts were given in the beginning of this Section.

The RULES *for knowing the* Dr. *and* Cr. *of every Account, are theſe:*

Every article I have on commencing buſineſs, is then made Debtor to Stock; and the title or account of Stock is Creditor by each article for its reſpective value. See Folio 4. of the Ledger.

Every thing I receive in a future tranſaction, is to be made Debtor to the perſon from whom it is received; and that perſon is immediately to be credited, on the creditor ſide of his account, with the ſame amount.

See the Journal for the 28th day of the month, where I received 150l. from Mr. White; Caſh being the the thing received, is made Debtor in folio 1. of the Ledger, to the perſon from whom it was received; and that being done, without delay, I give him credit, on the crdditor ſide of his account, in folio 3. of the Ledger.

By a ſtrict obſervance of this one example, you diſcover the Dr. and Cr. ariſing from all things received; for in the Ledger entries, every Dr. muſt have a Cr. immediately, to continue the uniformity of Double Entry.

And when I deliver any thing, the perſon to whom I deliver it is to be made debtor for the amount of what he receives; and the articles delivered is to be credited, in the folio bearing its name for a title, for the ſame value.

See the Journal for the 29th day of the month; having delivered to Mr. Davis 30l. he is made Debtor for the ſum, on the ſame date in folio 5. of the Ledger; and caſh bearing title in folio 1. of the Ledger, I proceed directly to give it credit for the money I paid away. So much for ſtating the Debtor and Creditor of things delivered.

PAYING and RECEIVING.

THESE, which form the general employments of mankind, are all that are required in a recourſe of book-keeping. If, then, the mark of finding the Debtors and Creditors in theſe two Caſes can be fixed to a certainty, and all the negotiations of life are comprehended in paying and receiving, what difficulty is there in opening an account according to Double Entry, but ſuch as an implicit obedience to blind cuſtom has occaſioned?

If I give one piece of goods, and receive another; will not the ſame law hold good? is not the conſideration received a pledge, a real debtor, for the thing given; and muſt not I conſider that the commodity given away in the exchange is diminiſhed by ſo much delivered out, and of courſe claims credit for ſuch under its proper title?

Or, if I give different things to one perſon, or for one certain thing; will not the rules given, at once aſcertain the Debtor for my different articles ſo given? and will not their reſpective titles direct me to a view of their reſpective decreaſe; and conſequently give each of them credit equal to the diminution they ſuffered?

Likewiſe, if I receive different articles, for one certain article of mine, or have different perſons bound in the ſame bond or contract to me: will not the ſame reaſons immediately diſcover where to place the Debtors, and the Creditors?

Leſt the foregoing arguments may be ſaid not clearly to vindicate me in the examples I have here offered in my own Ledger, I ſhall reconſider and explain the principal articles.

The firſt three accounts opened in the Ledger, are Caſh, Rum, and Richard White; and they are reſpectively charged Debtors to Stock, in the different folios 1; 2, and 3. where they are opened; and each of them is immediately entered on the creditor ſide of ſtock, in folio 4.

Stock, the 4th Entry in the Journal, is made Debtor in the Ledger, for what I owe to Mr. Davis.

The different Drs. and Crs. in theſe Entries, ariſe from the neceſſary form of ſtating my preſent circumſtances before I commence buſineſs.

The following tranſaction is ſelling Rum to Mr. Davis, for which he is made Debtor folio 5, and the account of Rum gets credit, folio 2. for its loſs.

The 9th and laſt Entry in the Journal is that of Houſhold Expences Debtor to Caſh, being the 6th title or account opened in the Ledger. It is the law of Cuſtom, to place conſumptions of this nature under the title, Profit and Loſs; and, indeed, the title has ſome ſhadow of claim here, in particular; as the manner of houſekeeping, according to the managers, may have a great ſhare of both. Yet, in the preſent caſe, I ſhall make choice of a more ſubſtantial title; I will venture to make the Account of Stock in folio 4. to anſwer for money expended in this or any ſimilar manner. It is evident that this expence diminiſhed my caſh; but it was to gratify me; and, in the name of reaſon, why ſhould I charge any part of it to loſs?

When the Journal is transferred into the Ledger, I proceed to balance all theſe accounts; and open an account of Balance in the 8th folio.

Taking a piece of paper and beginning with the Caſh account, folio 1, I find the ſeveral amounts of the Debtor and Creditor ſides, and find the difference is 858l. which is the money remaining in my banker's hands and my own; this amount I transfer to folio 8, and make balance Dr. to Caſh; then referring back to Caſh account, credit balance for the ſum, and finally cloſe the Caſh account.

In folio 2. Rum, the difference is 100l. which I carry to balance as Rum unſold, and placing the ſame to the credit of Rum, and the account balances.

In folio 3. Richard White owes me 228l. for which I make balance Dr. to him, and give him credit by balance, and this account balances alſo.

In folio 4. I make STOCK, or MYSELF, Dr. to RICHARD DAVIS: alſo to Houſhold Expences. On the oppoſite, or Creditor ſide of this account, is the ſtate of my Stock at the commencement of the year, and ſince that a gain of 88l. on Rum.

On adding up each of thoſe ſides, I find the difference 1201l. being the amount of my property. This ſum being transferred to the Creditor ſide of balance, and afterwards to the Debtor ſide of Stock, the totals of both ſides are equal to each other.

In folio 5. There appears due to Mr. Davis 57l. which being a debt I owe, it muſt of courſe be transferred to the Creditor ſide of balance, and to the Dr. ſide of Mr. Davis's account, and thus both ſides are balanced.

In folio 6. The title is Houſhold Expences, which is already diſpoſed of in the Caſh account folio 1, being the ſource from whence it came.

In folio 7. Madeira is made Dr. to Richard White, and in folio 3, is placed to the credit of Mr. White, conſequently is accounted for by leſſening the debt he owes me.

We now come to folio 8, or the Balance, and finding what I anxiouſly wiſhed for that both ſides agree, I diſcover there remains for me after paying my juſt debts, 1201l.

THE CASH BOOK,

Is certainly neceſſary in extenſive concerns; when a perſon becomes acquainted with the method of Book-keeping here laid down, he will find little difficulty in extending the number of his books at pleaſure. I ſhall preſent the reader with a brief deſcription of the Caſh book, any thing further I preſume would be unneceſſary and tedious.

This book is kept in a folio form like the Ledger, ſerving to abridge the Caſh account there. On the Dr. ſide, or left hand page, Caſh is made Dr. for all the ſums received by way of title, and on the right hand ſide Caſh is made Cr. for all the ſums paid. Every week, or what is more common, every month, this book is poſted to the Ledger in one total ſum; by this means the Caſh account in the Ledger will be ſo contracted as to conſiſt only of twelve lines, one for each month in the year.

Such other books as are uſed are book of Petty Charges, book of Houſe Expences, &c. theſe ſometimes may be deemed neceſſary auxilaries, and are chiefly intended to keep large and important concerns ſeparate from thoſe contingencies of an inferior nature. A multiplicity of Books of Accounts ſhould be avoided as much as poſſible, as they create labour, and make the buſineſs of the Counting houſe complex and tedious, where the great object ſhould be a ſimple, correct, and clear brevity.

REMARKS.

I have now conducted the Reader through one month's buſineſs, after the method called Double Entry, and all accounts being finally cloſed on this ſmall ſcale, the tranſactions of a week, a year, or any other period of time, may, with the ſame eaſe and preciſion, be brought to a concluſion; and the amount of what you are worth, and what you owe, forms an inventory of Stock to begin again with.

Too much cannot be ſaid in favor of the ſalutary method of frequently examining the true ſtate of our accounts; a neglect of this important conſideration, I dare aſſert, is the bane of many tradeſmen. From inattention in this matter, if a perſon is induſtrious in purſuit of his buſineſs, he at the ſame time is ignorant whether ſuch buſineſs repays his induſtry; conſequently, has it not been in his power to vary his plan, or conduct, with certainty in ſuch points which may probably have been to his diſadvantage. When the true ſtate of affairs is frequently exhibited to our view, it gives a perſon a fair opportunity to regulate his œconomy accordingly. If the proſpect appears fair and pleaſant, and reaſonable profits crown our labour, it acts as a chearful ſtimulus to perſevering aſſiduity; the liberal and charitable may then be generous, and call their generoſity their own. Frequent inſpections into the pecuniary concerns of life awaken ſupineneſs and negligence, and is ſure to act favourably on general manners, by removing that pervading torpor which ſloth occaſions, and which too often terminates in that deſtructive habit, an immoderate uſe of the bottle and glaſs. The ſociety of people, called Quakers, I am firmly of opinion, owe much of that prudent conduct which ſo generally characterizes them, to what we call their ſilent meetings; it preſents a ſerious opportunity to inſpect life, and improve the manners: in the face of religion, the heart muſt be baſe that can meditate evil. Other communities have not ſuch a public opportunity; and believe me a troubled mind or bad conduct will not endure examination in private.

Finally let me entreat every perſon in buſineſs, to be particularly attentive in a frequent and minute inſpection into his books of buſineſs, and never on any pretence whatever, ſuffer the management of them to be behind or neglected; for be aſſured of this truth, *one dilatory hour begets another.*

SINGLE ENTRY.

The method of Book-keeping, called Single Entry, is certainly too generally known and eaſily acquired to need a treatiſe upon it; I ſhall therefore conciſely give the outlines of a mode which may with eaſe be reduced to practice.

1ſt. Prepare a Book on the ſame plan as the Waſte Book, deſcribed in the Syſtem of Double Entry, it may be called a Waſte Book, Day Book, or what you pleaſe. In this book enter the ſundry tranſactions of the day as they occur, ruling a line between each article, or the buſineſs you do with each perſon. Let the particulars of this book conſiſt of the date, quantity, quality, value, and every other deſcriptive requiſite, to make each entry not only familiar in every reſpect to your own mind, but alſo to every other perſon who may have occaſion to inſpect your concerns at any future period, in caſe of death or other unforeſeen caſualties; in fact let every circumſtance be as full and explicit as plain language can make it.

2d. Procure another book larger, and of a different kind from the former, it ſhould conſiſt of whole ſheets of paper folded once called folio; ſuch a book as this conducted as follows is in every reſpect a Ledger.

At the beginning of this book prepare an alphabet, by cutting a ſmall piece from the edge of twelve leaves, beginning with the firſt leaf and continuing within one inch of the top, purſuing the ſame method with each leaf, finiſhing the laſt at an equal diſtance from the bottom. This method is well known among ſtationers; I therefore think it uſeleſs to give a more exact deſcription.

The next buſineſs will be to page or folio this book, obſerving that every right and left page is to bear the ſame figure.

When you poſt or transfer the accounts from the Day Book to the Ledger, firſt write the perſons name on the top of the left hand page by way of title, and on the right ſide oppoſite make a title with the word Creditor, proceeding in the ſame manner with the name of every other perſon you deal with, making ſome conſpicuous mark of diſtinction againſt every article immediately as you poſt it in the Ledger.

Obſerving this rule, ſet down every thing you pay, or are liable to pay, on the right hand page or creditor ſide; and every thing you receive or ſhould receive on the left hand page or Debtor ſide.

This Ledger is ruled on the left ſide each page, with a column for the date, and on the right for caſh.

Some use the following Ledger.

On the mode of ruling this Ledger depends its utility; if you rule it with double rows of caſh and date, it will anſwer the purpoſe of a caſh book; as explanations, however accurately and minutely given, are not eaſily comprehended; I preſent the reader with the following form of a Ledger, adapted for thoſe who keep their accounts in a familiar and conciſe ſtile.

EXAMPLE.

Mr. JEREMIAH JOHNSON, Dr. Cr.

Date.		£.	s.	d.	Date.	£.	s.	d.
1790					1790			
Jan. 1	To white Lead 2 cwt. at 32s	3	4					
	Turpentine 40 gallons at 3s 6d	7						
	Spaniſh Brown 30lb. at 3d		7	6				
10	Yellow Ochre 56lb. at 2d		9	4				
	Linſeed Oil 30 gallons at 4s	6			May 17 Receiv.	12	12	
	Ditto boiled 40 ditto at 5s	10						
17	Six Bladders yellow lake -		4	6				
Mar. 14	Red Lead 1 cwt. - - -	1	10		June 15 Receiv.	16	3	4
	£.	28	15	4	£.	28	15	4

OBSERVATIONS.

A book of this kind will undoubtedly ſave trouble and paper, and may alſo very commodiouſly anſwer the purpoſe of thoſe who receive money for the goods they ſell, which is generally the cuſtom with retail dealers; but with thoſe who mutually traffic with each other, and receive goods in return for goods, it is by no means adapted as regular Debtor and Creditor. Entries can alone prevent confuſion and errors; miſchiefs that every tradeſman ſhould ſtudiouſly avoid, as too often an honeſt heart is ſuſpected of unfair dealings, when his only guilt has been, too great a degree of confidential credulity, or perhaps ſlovenly negligence.

A ſyſtem of Single Entry is calculated for the uſe of both ſexes, whoſe rank, or occupation, exempt them from real mercantile employment, but who have a deſire of adopting ſome plain and conciſe method, laid down upon certain principles, by which to conduct their private or public negotiations, that they may have a daily view of their income and expences, and regulate their finances accordingly.

Perſons thus guided into the paths of induſtrious rectitude, may avoid the voluntary error of many, who, bewildered in folly, are loſt to Society, and to themſelves; and who, when they awake from their dream, feel all the terrors of approaching want, and all the dreadful apprehenſions of wordly ſcorn, attendant on a ſhort lived glare of ambition.

Though yeſterday cannot be recalled, yet, by yeſterday's experience, to morrow may furniſh us with wiſdom; and thus we may go on, in a ſucceſſion of improvements, till we gain a command over ourſelves, ſo neceſſary to happineſs, and ſo unattainable by thoſe whoſe inclinations lead them to dream away life, without conſidering the real purpoſes for which life was given.

Perſons in elevated life ſeldom regard that regularity in their accounts, which they have previouſly diſcarded from their moral conduct. By them ſuch exactneſs is treated with contempt; as, at beſt, but a dull, mechanical exerciſe, unworthy notice. Œconomy, Frugality, and Temperance, as well as the terms Debtor and Creditor, does not appear in the Dictionary of a man of faſhion; he cannot endure expreſſions ſo low, ideas ſo confined as theſe: though, perhaps, he derived his deſcent and conſequence from an honeſt and induſtrious trader, by whoſe means that wealth was acquired which he has made it too much his ſtudy to diſſipate.

On theſe conſiderations perſons of every deſcription, poſſeſſed of property, are certainly rendered better qualified to combat the uncertainties of life, by having learned ſome regular method of keeping their accounts; not that parſimony ſhould be recommended to thoſe bleſſed with affluence; where fortune has diſtributed her gifts, benevolence is praiſeworthy, and carries with it pleaſures to which the miſer, and carping œconomiſt, is a perfect ſtranger.

This Syſtem of Book-Keeping, *I preſent to the public as conciſe and methodical; if it has nothing elſe to recommend it, I have little to fear on a compariſon with others who have written on the ſubject. Being convinced from experience, that the only ſure way to arreſt the attention of thoſe unacquainted in this art, is by eaſy and familiar precepts. I have done my utmoſt in the preceding pages, to keep that end in view; how far I have ſucceeded, muſt be left to the candid and judicious reader.*

WILLIAM BARTON.

No. 8. Broad-Way, Black-friars.

BOOM, in the ſea language, a long pole, wherewith they ſpread out the clue of the ſpreading-ſail, ſometimes alſo that of the main-ſail and fore-ſail, to make them broader, and receive more wind.

Booming of the ſails is never uſed but in quarter winds, or before a wind. By a wind, ſtudding ſails, and booming the ſails is not proper.

When a ſhip is ſaid to come booming towards us, it imports as much as that ſhe comes with all the ſail ſhe can make.

Boom alſo denotes a pole with a buſh or baſket on the top, placed to direct ſhips how to ſteer into a channel; otherwiſe called a beacon.

Boom likewiſe is uſed, in marine fortification, to denote a cable or cables ſtretched athwart the mouth of a river, or harbour, with with yards, top-maſts, battlings, or ſpars of wood, laſhed to it, and girded with iron hoops rivetted together and nailed to the ſpars, to prevent an enemy's entering. Such a boom M. Chateau Renault had with diligence and art prepared at Vigo, for the defence of the plate fleet lying there in 1702; but how ſtrong ſoever, it was forced by Sir Thomas Hobſon. The cables of which the boom is formed, are bent to a pair of ſheet anchors on each ſide of the channel. Other cables are ſometimes faſtened to that within the boom, and bent to anchors laid down the ſtream; and theſe cables are prepared with ſpars like the other; where wood is ſcarce, the boom is prepared with old ropes, &c. and iron hoops; every part of it being well covered with pitch ſtrewed with gravel.

BOOPS, in zoology, the name of a fiſh caught in the Mediterranean, and ſold at Naples, Meſſina, and Genoa. It is a ſmall fiſh, ſeldom exceeding five inches in length, and very remarkable for the largeneſs of its eyes; and a ſpecies of the ſparus. It is of a rounded, not flat ſhape, and its ſcales are large.

Boops is alſo the name of a ſpecies of the whale.

BOOR *Worm*, in natural hiſtory, a name given by Rumphius, to the ſolen lignorum, a ſea worm, which bores the bottoms of ſhips.

BOOT, a leathern cover or defence for the leg, uſed on horſeback, both to keep the body more firm, and defend the part from the injuries of the weather.

The Chineſe had a kind of boots made of ſilk, or fine ſtuff, lined with cotton, a full inch thick, which they always wear at home and abroad.

Boot, *Bordequin*, is likewiſe a kind of torture for criminals; to extort a confeſſion, by means of a boot, ſtocking, or buſkin of parchment; which being put on the leg moiſt, and brought near the fire, in ſhrinking ſqueezes the leg violently, and occaſions intolerable pain.

Boot *Topping*, in ſea language, the act of cleaning the upper part of the ſhip's bottom, or that part which lies immediately under the ſurface of the water, and daubing it over with tallow, or with a coat or mixture of tallow, ſulphur, reſin, &c.

BOOTES, in aſtronomy, a conſtellation of the northern hemiſphere, whoſe ſtars, in Ptolemy's catalogue, are 23; in Tycho's 28; in Bayer's 34; in Hevelius's 52; and in Mr. Flamſteed's catalogue, 54.

BOOTH, *Botha*, denotes a ſtall or ſtanding in a fair or market: the term is alſo applied to any temporary ſtructure formed of boards and boughs, and deſigned for ſhade and ſhelter.

BOOTY, the moveables taken from an enemy in war.

Among the Greeks, the booty was divided in common among the army, the general only claiming a larger ſhare. By the military diſcipline of the Romans, ſpoils taken from the enemy belonging to the republic, particular perſons had no right to them. The generals who piqued themſelves on their probity, carried it wholly to the public treaſury. Sometimes, indeed, they divided it among the ſoldiery, to animate them, and ſerve in lieu of reward. But this diſtribution depended on the generals, who were to conduct themſelves herein with great equity and moderation; otherwiſe it became a crime of peculation to lay hands on the pillage. as regularly belonging only to the ſtate. The conſule Romulius and Veturius were condemned for having ſold the booty taken from the Æqui. Liv. lib. iii.

Among the Jews, the booty was divided equally between the army and the people, though under the kings a different kind of diſtribution obtained. Numb. xxxi. 27. Among the Mahometans, two thirds of the ſpoils are allowed to the army; the other third to God, to Mahomet, and his relations, and to the orphans, the poor, and the pilgrims. Calmet. Dict. Bib. tom. i. p. 321.

Among us, formerly, the booty was ſometimes divided among the ſoldiery. If the general be in the field, every body takes what he can lay hold on: if the general be abſent, the booty is diſtributed among the ſoldiers, two parts being allowed to the cavalry, and one to the infantry. A captain is allowed ten ſhares, a lieutenant ſix, and a cornet four.

BORAK, among mahometans, a fabulous animal, ſuppoſed to be of a middle kind between an aſs and a mule, whereon the prophet was carried in his nocturnal flight from Jeruſalem into the Heavens.

BORASSUS, in botany, the names of a genus of plants, deſcribed by Linnæus, but not claſſed, and called in the Hortus Malabaricus ampana, and carimpana.

BORAX, a ſaline matter, with all the properties of a neutral ſalt, chiefly uſed in ſoldering, and fuſing of metals; ſometimes alſo in medicine, as an emetic, and promoter of delivery.

Dr. Lindolff thinks it might be made in Europe without tincal, by alum, ſoap, and a ſtrong alkaline ley. D. W. Linden thinks that Dr. Lindolff is well acquainted with the nature of borax, and that it might be made after his method; but that it would be too expenſive, and not ſuperſede the importation of tincal. He therefore recommends the ſour and acid water that comes out of coal mines, train oil, or any other fiſh oil, or indeed any fat that could be had cheap; the ſtrongeſt alkali of kelp; and all theſe ingredients to be worked in a liquid ſtate, till they are well mixed, and cryſtallize like a ſalt, which he thinks would anſwer all the ends of borax. The borax uſed in Europe is prepared or refined from the tincal that is brought from the Eaſt Indies.

For the artificial, it is made by letting water run in the veins of the mine, all the winter long, till June; and letting the mine dry the reſt of the year. So that artificial borax is no more than the mineral putrified and corrupted.

In thoſe places from whence it is brought, it is ſaid that there oozes out of the ſides of the hills, containing metals and particularly copper, a thick turbid water, of a bluiſh grey colour, and of a brackiſh bitter taſte. The courſe of this water is directed into wide and ſhallow pits, lined with a ſtiff clay; here it is left expoſed, in order to evaporate; and the grey fine mud left in its paſſage is daily mixed with it, till it acquires the conſiſtence of a ſoft pap; and then a large quantity of ſome animal fat melted over the fire is thrown into it, in the middle of a hot day: is then well ſtirred, and covered with ſticks and branches of trees; and over theſe is laid a cruſt of any common clay. In this ſtate it is left, till it become quite dry: it is then ſifted, and what remains in the ſieves is ſent to us under the name of rough borax; however it is not yet certainly known whether this matter be a natural or an artificial ſubſtance, nor whence, nor how it is obtained.

Borax is of great uſe in collecting the particles of any metal over the fire, and running them into a maſs; and this, with very little diminution of their weight. Dirt or aſhes, though in ever ſo ſmall a quantity, will certainly hinder ſome ſmall particles of gold and ſilver from running together into a maſs over the fire; but if they are ſo diſpoſed by a very ſtrong fire as to meet into a regulus, a great part of the metal will always adhere to the dirt that is thrown away. The leſs perfect metals not only ſuffer the above mentioned accidents, but their ſurfaces being greatly increaſed, copper and iron turn entirely into a ſcoria, and are deſtroyed, and led and tin are ſo in great part. It is therefore very detrimental when theſe baſer metals are mixed in any, even in ever ſo ſmall a quantity, with gold or ſilver; for in the melting, there come upon the ſurfaces light ſcoriæ, in which part of the gold or ſilver is retained, as in the pores of a ſpunge, and prevented from running into a regulus.

To remedy this miſchief, borax is added, becauſe as it helps the melting of metals and of all bodies by fire, its bringing the whole maſs into a quick fuſion, gives the metals an opportunity to ſink together in a maſs to the bottom, and vitrifies the lighteſt ſcoriæ, throwing them off the ſurface; and the uſe of this ſalt is not reſtrained to gold and ſilver, but takes place as well in regard to iron as copper.

This ſalt alſo cauſes metals to melt in a much leſs fire than they otherwiſe would, and is of very ſingular uſe in preſerving the leſs perfect metals while in fuſion. It flows over them, and covers their ſurface while tortured it the fire, as if it were a kind of very thin glaſs, which defends them againſt the combined force of the fire and air, ſo deſtructive of the imperfect metals.

The aſſayers have a cuſtom of rubbing with borax the inſides of veſſels, in which the more precious metals are to be melted, which always fills up the ſmall cavities in their ſides, that might otherwiſe take in a part of the metals. When gold is melted with borax alone, it makes it pale; but this is obviated by the adding a ſmall quantity of nitre, or of ſal ammoniac. Care muſt be taken, however, not to add both theſe ſalts together, becauſe they would cauſe a detonation.

A principal uſe of borax is to facilitate the ſoldering of metals, by accelerating the fuſion of the ſurfaces of the metals to be joined, and clearing them of any calx or other matter by which they might be prevented from being perfectly united to each other.

Borax is alſo uſed by the dyers to give a gloſs to ſilks; in Italy by the ladies as a coſmetic; and in making glauber's ſalt.

BORBONIA, in botany, a genus of the diadelphia decandria claſs of plants. There are three ſpecies, which are natives of the Cape of Good Hope; and as they do not perfect ſeeds in this country, are with difficulty propagated here.

BORBOTHA, in ichthyology, a name given by ſome authors to the muſtela fluviatilis, or eel pout.

BORDAT, a ſmall narrow ſtuff, which is manufactured in ſome parts of Egypt, particularly at Cairo, Alexandria and Damieta.

BORDER, or Bordure, in heraldry, a kind of addition on the limb of a ſhield, in form of a hem, or girdle, encompaſſing it all round, and parallel to the boundary of the eſcutcheon; for a further deſcription, ſee the Syſtem of Heraldry.

Border, in gardening, denotes a narrow bed adjoining to a walk, ſerving to bound and incloſe the parterres, and prevent their being injured by the feet.

BORDERS, among floriſts, are ſuch leaves as ſtand about the middle thrum of a flower.

BORD SERVICE, called alſo Bordage, the tenure of lands on condition of furniſhing proviſion for the lord's board or table.

Some lands in the manor of Fulham, and elſewhere, are ſtill held of the biſhop of London, by the ſervice, that the tenants pay ſixpence per acre in lieu of finding proviſion for their lord's table.

BORE, the bore of a gun, or piece of ordnance, is uſed for the chaſe or barrel; though it ſeems rather to denote the diameter of the chaſe.

Square BORE, in ſmithery, denotes a ſquare ſteel point, or ſhank, well tempered, fitted in a ſquare ſocket in an iron wimble, ſerving to widen holes, and make them truly round and ſmooth within.

BOREAL *Signs*, in aſtronomy, the firſt ſix ſigns of the zodiac, or thoſe on the northern ſide of the equinoctial.

BOREAS, a Greek name now in popular uſe, for the north wind.

The Greeks erected an altar to Boreas. He is repreſented on the temple at Athens with his robe before his mouth, as if he felt the cold of the climate over which he preſides, agreeably to the deſcription of Ovid, who calls him, *gelidus, tyrannus, the ſhivering tyrant*, Met. vi. ver. 711. But he is uſually deſcribed by the Roman poets as violent and impetuous. Ibid. ver. 686—ver. 707.

BORECH, in natural hiſtory, a kind of ſalt brought from Perſia.

BORECOLE, in botany, a ſpecies of the braſſica, or cabbage. Of this there are three ſorts; the common, the green, and the Siberian or curled colewort, called by ſome Scotch kale. The two former are ſown about the middle of April, and are fit for tranſplanting about two months after. The latter kind may be ſown in the middle of July, and will be fit for uſe from Chriſtmas till April.

BORING, the act of perforating a ſolid body, or making a hole throughout its whole length or thickneſs.

BORING, in mineralogy, a method of piercing the earth by a ſet of ſcooping irons, made with joints ſo as to be lengthened at pleaſure. The ſkilful mineraliſt often pretends to gueſs where a vein of ore lies, by the external appearance of the ſoil, or what is more to be depended upon the nature of the ſprings; and in this caſe he has recourſe to boring; the ſcooping irons are drawn back at proper times, and the ſamples of earth and mineral matters they bring up, are examined; and hence it is known whether it will be worth while or not to open a mine in the place.

BOROUGH, is now particularly appropriated to ſuch towns and villages, as ſend burgeſſes or repreſentatives to parliament.

Boroughs are equally ſuch, whether they be incorporate or not; there being great numbers of our Engliſh boroughs not incorporated; and, on the contrary, ſeveral corporations that are not boroughs; i. e. Kingſton, Deal, Kendal, &c.

Boroughs are diſtinguiſhed into thoſe by charter or ſtatute; and thoſe by preſcription or cuſtom.

The number of boroughs in England and Wales, including cities and cinque ports, which elect members, is 215; ſome whereof ſend one, ſome two repreſentatives.

Royal BOROUGHS, in Scotland, are corporations made for the advantage of trade, by charters granted by ſeveral of their kings; having the privilege of ſending commiſſioners to repreſent them in parliament, beſides other peculiar privileges.

Theſe form a body of themſelves, and ſend commiſſioners, each, to an annual convention at Edinburgh, to conſult the benefit of trade, and the general intereſt of the boroughs.

The company of merchants in a royal borough make what is called a gild; the chief of which is a dean of gild, who is next magiſtrate to the bailiff.

The royal boroughs are not only ſo many diſtinct corporations, but do alſo conſtitute one entire body, governed by, and accountable to one general court, anciently called the Court of four Boroughs, held yearly to treat and determine concerning matters relating to the common advantage of all boroughs.

The four boroughs which compoſed this court were Edinburgh, Stirling, Roxburgh, and Berwick; which two laſt falling into the hands of the Engliſh, Linlithgow and Lanerk were put in their places; with a ſaving to the former, whenever they ſhould return to their allegiance.

But this court not being ſufficient to anſwer the neceſſities of the royal boroughs, they were all empowered, under James III. in 1487, to ſend commiſſioners to a yearly convention of their own, which was then appointed to be held at Inverkeithing, and is now held at Edinburgh, under the denomination of the convention of boroughs, veſted with great power.

BOROUGH *Courts* are certain courts held in boroughs, by preſcription, charter, or act of parliament: ſuch are the ſheriff's court, and court of huſtings in London.

Engliſh BOROUGH, denotes a cuſtomary deſcent of lands or tenements in certain places, whereby they come to the youngeſt, inſtead of the eldeſt ſon; or if the owner hath no iſſue, to the youngeſt, inſtead of the eldeſt brother; becauſe the youngeſt is ſuppoſed in law, the leaſt able to ſhift for himſelf. 1 Inſt. 140. b. And in ſupport of this reaſon, other uſages in favour of the youngeſt are alledged as that in Kent, where the lands being equally divided among all the ſons, the youngeſt is to have the privilege of aſtre or hearth in the manſion houſe, in his ſhare, as being ſuppoſed the tendereſt, and more in need of warming. Others, notwithſtanding, ſuſpect a different reaſon for the riſe of Borough Engliſh, viz. the places where this cuſtom now obtains, were anciently liable to that cuſtom granted the lords of manors in Scotland by king Eugenius, who had the privilege of enjoying the firſt night of their tenants brides; ſo that the eldeſt ſon being preſumed to be the lord's, they uſually ſettled their lands on the youngeſt ſon, whom they thought their own; which being practiſed a long time, grew at length into a cuſtom. The cuſtom, however, never prevailed in England, though it did in Scotland till it was aboliſhed by Malcolm III. Perhaps, ſays judge Blackſtone, the origin of this practice, may be illuſtrated by that of the Tartars, mentioned by Du Halde, among whom the ſame cuſtom of deſcent to the youngeſt ſon prevails.

Head BOROUGH, is the chief man of the decenna or hundred choſen by the reſt to ſpeak and act in their behalf.

In many pariſhes, head borough alſo ſignifies a kind of conſtables, choſen aſſiſtant to ſerve warrants, &c.

BOROW, or BERROW *Holes*, made and occupied by rabbits.

BORRAGE, Borrago, in botany, a genus of the pentandria monogynia claſs of plants. There are four ſpecies; the firſt of which is the common borrage, whoſe flowers are uſed in medicine, and the herb for cool tankards in ſummer. If the ſeeds are permitted to ſcatter, plants will come up in plenty.

The common borrage has long held its rank as a cardinal of the firſt claſs, though perhaps it would not be eaſy to ſay on what foundation. Its flowers are of the number of the four cordial ones of the ſhops, and it has been recommended as a medicine of great efficacy in malignant and peſtilential fevers, and againſt the bites of poiſonous animals. By the experimente of M. Margraaf, Mem. de Berlin, 1747, it appears that the juice affords a true nitre.

BORRALISTS, a ſect or ſort of Anabaptiſts in Holland, who allow of no uſe of ſacraments, public prayers, or other external worſhip, nor of any human gloſs or explication of Scripture; but profeſs to adhere to the faith and manners of the New Teſtament times in all their ſimplicity.

BORSELLA, in the glaſs works, an inſtrument wherewith they extend or contract the glaſſes at pleaſure; alſo ſmooth and levigate them.

BOS, the *Ox*, in tetrapodology according to the Linnæan ſyſtem, a genus of quadrupeds of the order of pecora; the characters of which are, that the horns are hollow and turned forward, bent like creſcents, and ſmooth on the ſurface; the fore teeth are eight in number, and there are no canine teeth. Of this genus, beſides the common tame one, there are four ſorts naturally wild; the biſon, bonaſus, bubalus, and urus.

Bos *Grunniens*, or *Grunting Ox*, ſo called becauſe it grunts like a hog, is a ſpecies of the ox, with a mane on the neck, and the whole body covered with long hair, a hunched back, and tail like that of a horſe; it is found in the country of the Calmucs.

Bos *Indicus*, or *Indian Ox*, is another ſpecies, with a large lump on the ſhoulders, and ſhort horns, bending cloſe to the neck in ſome of the ſpecies, and almoſt upright, bending a little forward in others. In Surat there is a ſmall kind, not bigger than a great dog, with a fierce look, which is uſed for drawing in ſmall carts.

BOSCHAS, in ornithology, the name of our common wild duck, called alſo by ſome anas torquata minor, or the ſmaller ring-duck.

BOSEA, in botany, or yerva-mora, a genus of the pentandria digynia claſs of plants; commmonly called the golden rod tree.

BOSQUETS, in gardening, a term for groves included in gardens.

The word is derived from the Italian, *boſchetto*, which is a diminutive of *boſco, a wood* or *grove*. This part of ornamental horticulture has been diſuſed in England forty years, and has given place to the more beautiful and artleſs ſyſtem which at this time prevails, of keeping grace and nature in view; a ſyſtem which foreigners not only admire but imitate.

BOSS, or BOSSE, in ſculpture, ſignifies relievo, or prominency.

BOSSAGE, a projecting ſtone in architecture, laid rough in building, to be afterwards carved into mouldings, capitals, arms, or the like.

BOTANIST, a perſon who underſtands the nature, hiſtory, and diſtinction of vegetables, on ſettled and certain principles, and can call every plant by a diſtinct, proper, and intelligible name. Linnæi Fundam, Botan. p. i. See BOTANY.

BOTANOPHILI, among the writers on the ſubject of vegetables, thoſe who have treated of them, not as botaniſts, on their natural and eſtabliſhed directions, but in regard to different operations, as gardeners, phyſicians, &c.

The following LINNEAN SYSTEM *of* BOTANY *is the Production of William Henry Hall, Eſq. No.* 3, *Millman Place, Bedford Row.*

C. COOKE.

A NEW SYSTEM OF BOTANY.

INTRODUCTION.

NATURE may be conſidered as an immenſe living power which animates the univerſe, in ſubordination to the ſupreme Being, at whoſe command it began and ſtill continues to act. Her productions are very different from human art, whoſe greateſt labours can only be ranked as dead works: on the contrary ſhe is an active and never ceaſing operator, who knows how to employ every material, and though always labouring on the ſame invariable plan, her power inſtead of being leſſened is perfectly inexhauſtible. Time, ſpace, and matter, are her means; the univerſe her object; motion and life her end.

The earth elevated above the level of the ocean, is defended againſt its irruptions. Its ſurface enamelled with flowers, and adorned with verdure, which is always renewing, is given to man for his habitation, where he is directed to embelliſh, cultivate, extend and poliſh the products of vegetation.

View thoſe melancholy deſerts where man never reſided, overrun with briars, thorns, and trees, which are deformed, broken and corrupted; the ſeeds that ought to renew and embelliſh the ſcene, are choaked and buried in the midſt of rubbiſh and ſterility. Nature, who in other ſituations, aſſumes the ſplendor of youth, has here the appearance of old age and decripitude. The earth ſurcharged with the ſpoils of its productions, inſtead of a beautiful verdure, preſents nothing but a diſordered maſs of groſs herbage. Trees encumbered with grovelling uſeleſs plants incapable of beauty or perfection.

But how beautiful is cultivated nature! how pompous and brilliant when decorated by the hand of man! He himſelf is her chief ornament; her nobleſt production:—Here what a ſource of unknown treaſures? Flowers, fruits, and grains, matured to perfection, and multiplied to infinity; the earth every where acceſſible, and rendered active and fertile; the vallies and plains converted into ſmiling meadows, rich paſtures, and cultivated fields: the hills loaded with vines and fruits, and their ſummits crowned with uſeful trees.

The Science of Botany certainly holds its moſt dignified ſtation, when ſubſervient to medicine, but its utility does not terminate in this alone, though it has too long been conſidered as having no other connexion. This, notwithſtanding, is but a partial, nay, an injurious idea of it; for nothing has more retarded its uſefulneſs than this contracted notion. It has a relation in a variety of ways to many other Arts and Sciences. Among which may be mentioned, the arts of painting and dying; but of all others agriculture certainly claims the ſtricteſt relation, ſome of its moſt important branches being greatly dependant on it, and others, from an happy application of it, being perhaps capable of further emolument.

But howſoever great the real dignity and importance of this art, yet it muſt be allowed, that it has not been cultivated ſufficiently on ſcientific principles, nor advanced in equal proportion with other branches of knowledge. It is not many years ſince Dr. Home obſerved, that Virgil and Columella, old as they are, remained almoſt the only writers worth conſulting upon this ſubject.

The writings of Gerard, Parkinſon, Evelyn, Ray, Grew, Dr. Steph. Hales, Philip Miller, Mr. Hudſon, Mr. J. Miller, Dr. Milne, Profeſſor Martin, Mr. Curtis, and various others, have done honour to themſelves and their country; and from that laudable ſpirit now diffuſing among us, throughout theſe kingdoms, for the improvement of Arts and Sciences, under the protection of our public inſtitutions, we may expect to ſee *every branch* of Botany ſtudied as it deſerves, and attended with that ſucceſs which commonly reſults from the right application of knowledge to the purpoſes of human life.

On the Continent the Swedes are making large and daily progreſs in the improvement of this branch of œconomics.

In France M. Du Hamel has rendered himſelf conſpicuous by his writings and practice; and in various parts of Europe, Societies have been formed with a profeſſed view to this end.

The firſt race of ſhepherds had daily inſtances among their flocks of the ſelection and refuſal of particular herbs, and ſubſequent obſervations muſt have multiplied and confirmed them. But they were ſtill only known in the general, and no experiments had been inſtituted to aſcertain the preciſe ſpecies thus eaten or rejected.

The utility of aſcertaining what plants are thus rejected muſt be evident, as it would neceſſarily lay the foundation of farther improvement in the œconomy of all ſorts of cattle. The intelligent huſbandman would by this means have it in his power to rid the paſtures of various uſeleſs plants, and give room for the ſalubrious ones.

In this view of the affair it will be ſeen that phyſicians are not the only perſons who may ſtudy botany to advantage; many others would find not only a fund of pleaſure from this ſtudy, but numberleſs other advantages reſulting from the knowledge of the plants of their own country.

In the inſtance before us, ſcience has opened the way, and ſurely it is not too much to ſay, that it evidently points to greater improvements in one of the moſt important branches of agriculture, as it relates to the œconomy of cattle. More than this ought not to be expected from its aid. It is to the intelligent grazier, and the gentleman well verſed in the knowledge of the indigenous plants, fraught with careful obſervation, and practiced in the œconomy of cattle, that the reſt muſt be owing.

Nothing but the want of this knowledge, in ſuch gentlemen as reſide in the country chiefly, can deprive us of the benefit which might otherwiſe accrue from reducing it into practice. To this end, it is indeed the province of the botaniſt to make plants of his own country the principal object of his attention. This has been eminently the caſe with Linnæus, and his country will continue to reap the fruit of his labours.

SECT. I.

BOTANIC HISTORY.

IT is needleſs to urge the neceſſity of *method*, in the ſtudy of nature, as it is the very ſoul of ſcience, and amidſt ſuch a multitude of objects which the vegetable kingdom affords, all attempts towards the acquiſition of knowledge without it, muſt end in uncertainty and confuſion.

We have ſufficient proofs of this, in the writers upon plants, before the invention of Syſtems, and ſee and deplore the want of them, in the loſs of many valuable articles, not only in the materia medica, but in the materia pictoria, and tinctoria of the ancients: articles, the virtues and properties of which appear to have been well aſcertained, are now loſt to us for want of a more ſcientific arrangement of the ſubjects, and accuracy in their deſcription.

Botanic writers choſe very different methods of arranging plants, not only before, but ſince the invention of ſyſtematic botany. The alphabetic has been much followed, eſpecially in local catalogues. Some have diſpoſed plants according to the time of flowering; Pauli in his Quadripartitum Botanicum, publiſhed in 1639, Beſler in the Hortus Eyſtettenſis 1640, and Dillenius in the Catalogus Giſſenſis 1719.

Others have arranged them according to the different places of their growth; as the authors of the Hiſtoria Lugdunenſis in 1587.

Another way was purſued, by obſerving that numbers of vegetables agreed with each other in their general external habit and appearance, or had a certain harmony and proportion in the form and diſpoſition of their roots, leaves, flowers, or fruits, in their particular mode of growing, flowering, or foliation; ſo that they naturally fell, as it were, into claſſes agreeably to ſuch diſtinctions. Hence their diviſions of trees into pomiferæ, pruniferæ, bacciferæ, nuciferæ, glandiferæ, &c. of herbs, into bulboſæ, ſiliquoſæ, umbelliferæ, verticillatæ, papilionaceæ, &c.

Theſe were ſo many claſſes or orders, which nature had ſo characterized, that they could not eſcape their notice; and could all the ſubjects of the vegetable kingdom be properly reduced to ſuch combinations, and the whole chain properly connected, we ſhould ſee what is meant by the NATURAL METHOD that *ultimatum et deſideratum* of Botany, of which Linnæus ſays, however, “ *Nec* “ *ſperare fas eſt quod noſtra ætas ſyſtema quoddam naturale videre* “ *queat, et vix ſeri nepotes.*” Nevertheleſs, the beſt writers of the ſixth century, ſuch were John and Caſpar Bauhine, endeavoured to preſerve the abovementioned arrangement, although it was in a rude manner. In this they were followed by our own countrymen, Gerard and Parkinſon; but as they eſtabliſhed no preciſe definition to their claſſes, ſo in their ſubdiviſions they paid little or no regard to the minuter parts of diſtinction, taken from the fructification; hence nothing like generical notes can be diſcovered in their methods, ſo that the only reſource in finding many of their plants, was to read over their long and tedious deſcriptions, which were frequently inſufficient to diſtinguiſh the plant ſought for.

The great naturaliſt Conrade Geſner who died in 1565, in his 50th year, appears to have been the firſt who thought with any preciſion, of a method of claſſing plants from the flower or fruit, but lived not to bring any regular ſyſtem to perfection. It was reſerved for Cæſalpinus, phyſician to Pope Clement VIII. to be the firſt author who arranged plants in a true ſyſtematic manner, in his Libri de Plantis, publiſhed in 1583, in which he eſtabliſhes the characters principally from the fruit, a knowledge he derived from hints originally received from Geſner.

It is ſurpriſing that after this time, though ſo many eminent botaniſts flouriſhed, yet none of them thought of purſuing the plan laid down, until Moriſon and Ray, who both publiſhed, nearly at the ſame time, their ſyſtems, were founded alſo upon the diſtinctions of fruit.

Since their time, others have laboured to bring their ſyſtems to perfection; as Knaut in Germany; Paul Herman and Boerhaave in Holland; and Dillenius, late profeſſor at Oxford, had ſtill farther perfected Mr. Ray's method, as is evident from the arrangement he has given to the Britiſh plants in the third edition of that author's Synopſis.

Several elegant ſyſtems have alſo been formed from the flower, as the baſis of the claſſical character; in conſidering which, both regularity and irregularity, as well as the number of petals, have been made the principal diſtinction. Rivinus at Leipſic in 1690, was the firſt who took the flower as the foundation of his method, as did Ruppius in 1718. But no one carried this method to ſuch perfection as Tournefort in 1694, who forms his claſſical character from the figure of the flower, and eſtabliſhes his orders or ſubdiviſions on the different ſituation of the fruit, whether above or below the empalement or receptacle.

The ſyſtem of Tournefort was generally received before that of the illuſtrious Linnæus was adopted.

Beſides theſe methods, in which the authors have conſidered one part only, either flower or fruit, as the baſis of their ſyſtems, ſeveral others have been conſtructed of late years, in which vegetables have been arranged, as far as poſſible, according to what have been called the natural claſſes; the foundations of which take in a numerous ſet of characters, ariſing from a combination and agreement in the habit of the plants, as well as their harmony in the eſſential parts of fructification. Among theſe that of Van Royen, late profeſſor at Leyden, is among the moſt elegant attempts towards this ultimatum in botany. This is exhibited in the Prodromus Floræ Leydenſis 1740. He is followed by Gmelin in the Floræ Sibirica 1747.

Theſe authors, as alſo L. Gerard in his Flora Gallo Provincialis, Paris 1761, preſerve the natural generical characters of Linnæus, almoſt entire, through their ſyſtems; and the latter writer has, with ſome variations, taken the orders of a natural method, conſtructed by B. Juſſieu, for his claſſes.

Haller alſo planned and brought to great perfection, a method of this kind, as is exhibited in his Enumeratio Stirpium Helvetiæ, 1742, and in the Hortus Gottingenſis, 1753, which he has ſince ſtill more elaborated, in a work of infinite labour and merit, the Hiſtoria Stirpium Helvetiæ, 3 tom. fol. 1768.

Linnæus very early attempted a natural method, but it is evident he thought there were too many links in the chain, to render it the readieſt guide to botanical ſcience; however he continued to improve it to the laſt; though he only reduced the genera into orders, and did not venture ſo far as to form the claſſical part of a Syſtem on that plan. Dr. Hope, of Edinburgh, the late learned profeſſor, whoſe zeal and ſucceſs in cultivating the principles of the Linnæan Syſtem are well known, has conſtructed perhaps the moſt elaborate attempt of this kind that the botaniſts have ever ſeen.

Methods have alſo been formed from the different ſpecies and arrangement of the calyx or cup of the flower in plants. Profeſſor Magnol of Montpelier, as well as Linnæus, publiſhed on this plan, but neither of them thought proper to purſue it.

Every arrangement hath its advantage in ſome reſpect or other; and it is ſurely rather to be regretted, howſoever the flower may claim the preference, that a method founded in the diſtinctions of the fruit, ſhould not alſo have as it were a ſecondary place in common uſe; for as all artificial methods are only ſuppoſed to be ſo many ſuccedanea to the natural one, a due attention to each might tend to illuſtrate the natural claſſes, to connect them, and reduce the anomalies; and ſo far pave the way to the completion of that ſcheme, which, however, will yet by many be conſidered as quite impracticable in Botany.

Linnæus was the firſt who conſtituted the ſtamina and piſtils as the baſis of an artificial method of arranging plants, and in his Claſſes Plantarum ſays, "That he was led to this, by conſidering the great importance of theſe parts in vegetation." They alone are the eſſentials neceſſary to fructification; all the other parts, except the anthera and ſtigma, being wanting in ſome flowers, and the philoſophy of Botany regards the former as the male, and the latter as the female organs of generation in plants.

As ſuch indeed they may be conſidered analogically, and in a philoſophical view; yet, perhaps, the Linnæan Syſtem, admirable as it is, would not have been leſs acceptable had the claſſical terms been expreſſive only of number and ſituation, without regard to the offices of the parts in framing the terms.

In this hiſtoric view of the Science of Botany, I have purpoſely avoided the legends, of enumerating by a Bibliotheca of ancient authors, the riſe and progreſs of it; as I conſidered the bare mention of the names of king Solomon, Anaxagoras, Pythagoras, Theophraſtus, Diſcorides, Pliny, and to add Ariſtotle and Hippocrates, who are all reputed to have ſtudied Botany, to be but trifling time with the reader, whom I wiſh to ſatisfy, as no authentic remains of their arrangements are to be found in the annals of literature.

As to the works of Antonius Muſa, Cato, Varro, and even Virgil and Columella, little can be ſaid as to their knowledge in the vegetable kingdom of nature: therefore, I have to hope, that the conciſe particulars already given as a critical hiſtory, will be well received, having given it under the ſanction, and in the very garments of a celebrated learned botaniſt of reſpectability; to whom I gratefully acknowledge the favour.

SECT. II.

BOTANIC DEFINITION.

BOTANY, in the utmoſt extent of the word, ſignifies a knowledge of plants, and of the uſes to which they may be applied in medicine, chemiſtry, agriculture, œconomics, and many other liberal and mechanic arts, as well as philoſophy.

The word comes from βοτανη, herb; and that from βοτοο, of βοὼ, I feed; becauſe moſt animals feed on herbs.

The knowledge of this ſcience is indiſputably neceſſary for thoſe who propoſe to apply plants to any uſeful purpoſe, which may be exemplified by ſuppoſing a phyſician ever ſo well acquainted with the virtues of opium, and a chemiſt ever ſo well acquainted with the method of preparing it, yet if both of them were entirely ignorant of botany, ſo as to be unable to diſtinguiſh the particular ſpecies of poppy which produce opium from others of the ſame genus, it is evident their medicinal and chemical ſkill could be of no uſe.

The prerogative of this ſcience is in its keeping together the genera, in what are called the natural claſſes or orders; and thus far approaches to the actual ſyſtem of created nature. The more ſimple and uniform the claſſical characters are, the more they are likely to interfere in this reſpect; nevertheleſs, it is pleaſing to obſerve how well many of the natural claſſes are kept together in the Linnæan ſyſtem; the characters of which enjoy the advantage of being very ſimple, and eaſy to retain in the memory, and of being founded on the parts of plants which are hardly ever ſubject to variation.

Before I proceed further in the definitive parts which conſtitute the body of this elegant ſcience, I ſhall briefly conſider its applications in two principal points of view, viz. to Food and Medicine.

Part I. Food.

Many animals are endowed with an inſtinctive faculty of diſtinguiſhing with certainty whether food preſented to them be ſalutary or noxious.

Mankind have no ſuch inſtinct. They muſt have recourſe to experience and obſervation. But theſe are not ſufficient to guide us in every caſe. The traveller is often allured by the agreeableneſs of ſmell and taſte to eat poiſonous fruits. Neither will a general caution not to eat any thing but what we know from experience to be ſalutary, anſwer in every emergency.

For example, Suppoſe a ſhip to be caſt away on a deſert iſland, and the crew eſcape to ſhore, but being totally ignorant of the nature of plants, the eating of the vegetable produce of ſuch a place may be attended with fatal conſequences; however, they can have no method of proving the experiment without hazarding ſome or one of their lives, which in fact muſt be done before any concluſion is drawn.

This is not the deſcription of danger ariſing from an imaginary ſituation; for before the vegetables that grow in America, the Weſt India Iſlands, and in the Eaſt Indies, became familiar to the ſeafaring Europeans who traded to thoſe parts; many lives were loſt by trials of this kind; neither has all the information received from experience been ſufficient to prevent individuals from ſtill falling a prey to ignorance and raſhneſs.

If the whole ſcience of botany were as complete as ſome of its branches, very little ſkill in it would be ſufficient to prevent individuals from committing ſuch fatal miſtakes.

The advantages attendant on botany when applied to food are truly great, and well worth the attention of every individual, be their rank, or degree, age or ſex, what they may; as for example; a perſon ſkilled in botany, on perceiving the flower of a plant, whoſe calix is a double valved glume, with three ſtamina, two piſtils, and one naked ſeed, he can pronounce with abſolute certainty, that the plant from which the flower was taken, bears ſeeds of a farinaceous quality, conſequently they may be ſafely uſed as food.

In like manner, ſhew him a flower with twelve or more ſtamina, all inſerted in the internal ſide of the calix, he can with certainty pronounce that the fruit of it, is wholeſome food.

On the other hand, ſhew him a plant whoſe flower has five ſtamina, one piſtil, one petal, or flower leaf, and whoſe fruit is of the berry kind, he cannot heſitate to pronounce it to be poiſonous. Facts of this kind render botany, not only a reſpectable, but a moſt intereſting ſcience.

Part II. Medicine.

When applied to medicine, the ſame law holds good; as it is found by experience, that plants which are diſtinguiſhed by the ſame characters in the flower and fruit, have the ſame qualities, though not always in an equal degree as to ſtrength or weakneſs; ſo that upon inſpection of the flower and fruit, a botaniſt can form his opinion with ſome confidence, a priori, on the effects that will reſult when taken into the ſtomach.

In order therefore to determine the medical virtues of all the plants belonging to a natural claſs, the phyſician has nothing to do but to aſcertain, by a ſet of clear and unqueſtionable experiments, the virtues of any one of them.

This greatly ſhortens the labour of inveſtigation, ſuppoſing the number of known ſpecies to amount to upwards of twenty thouſand; by aſcertaining the virtues of one genus, at a medium, may be determined the virtues of twelve ſpecies: but by aſcertaining the virtues of one genus belonging to a natural order, the virtues of perhaps three or four hundred ſpecies are aſcertained.

Under this article, I ſhall only obſerve, that the Botannic Syſtem of the juſtly celebrated Sir Charles Linnæus, knight of the order of the Polar Star, late profeſſor of phyſic and botany in the univerſity of Upſal, in Sweden, is divided into claſſes, orders, genera, ſpecies and varieties, and founded upon the fructification of plants; having thus far premiſed, I ſhall in order ſet forth the diviſions and ſubdiviſions of the ſcience.

SECT. III.

OF FRUCTIFICATION.

The ſexual ſyſtem is founded on the male and female parts of fructification, which conciſely implies the flower and fruit; and in a perfect ſtate conſiſts of the ſeven principal parts following:

I. The calyx, flower cup, or empalement; it is the termination of the cortex, or outer bark, or rind of the plant, and is preſent in the fructification, which has various appellations agreeably to the circumſtances with which it is attended.

1. Perianthium, a flower cup, is when it is contiguous or adjoining to the fructification.

Floris, if it incloſes the ſtamens, and not the germen, it is then the perianthium of the flower.

Fructus, if it incloſes the germen, but not the ſtamens, it is then the perianthium of the fruit; but if it includes both ſtamens and germen, it is then the perianthium of the fructification.

2. Involucrum, is when its ſtation is remote from the flower.

Univerſale, an univerſal involucrum, when it includes the whole umbel.

Partiale, a partial involucrum, is when it includes the ſmaller or partial umbels.

3. Amentum, a catkin, proceeds from a common receptacle.

4. Spatha, a ſheath, is when it burſts lengthways, and expoſes the included ſpadix.

5. Gluma, is the calyx, in graſſes, which are valves, having ſometimes an ariſta, or ſharp point, ſitting on the gluma or chaff.

6. Calyptra, is the calyx of moſſes, a veil or hood, like a monk's caul over the anthera or top of the ſtamens.

7. Volva, that membranaceous infolding of muſhrooms, which is rent on all ſides.

II. The corolla, is the determination of the inner bark, continued in a coloured petal.

8. Petalum a petal, is the corollaceous or inner tegument to protect the male and female parts.

Tubus, the tube or lower part of a monopetalous flower.

Limbus, the limb, the upper and ſpreading part of a monopetalous flower.

Camparulatus, bell ſhaped, bellying out in the middle, without a tube.

Infundibuliformis, funnel ſhaped, or reſembling a cone, placed on a tube.

Hipocrateriformis, ſalver ſhaped, having a plain or flat limbus ſtanding on a tube.

Rotatus, wheel ſhaped, flat and without a tube.

Ringens, gaping, irregular, with two lips, at a diſtance from each other.

Unguis, a claw, is the lower part of the petal of a polypetalous flower, by which it is fixed to the baſe.

Lamina, a thin plate, the upper ſpreading parts of a polypetalous flower.

Cruciformis, croſs ſhaped, four petals that are equal and ſpreading.

Papilionaceus, butterfly ſhaped, an irregular flower, conſiſting of four petals, the lower one reſembling the keel of a ſhip, the upper aſcending, the two lateral ſingle.

Nectarium, is that part that bears the honey, peculiar to ſome flowers.

III. The ſtamen, the male part of a flower, preparing the pollen or farina.

Filamentum, or thread, is the part that elevates the anthera, and is connected with the flower.

Anthera, the ſummit or part which contains the pollen, or farina, which, when mature, buſts, and diſcharges the farina.

Pollen, the meal or farina, contained within the anthera, which when mature, burſts, and diſcharges it with an elaſtic motion.

IV. The piſtillum, is the female part of the flower, fitted for the reception of the pollin, or farina.

Germen, is the embryo or rudiment of the fruit, yet immature in the flower.

Stylus, is the part which elevates the ſtigma from the germen.

Stigma, is the ſummit or apex of the piſtillum, covered with a menſtruous moiſture, that breaks and diſſolves the pollen, and fits it for the impregnation of the germen.

V. The pericarpium, a capſule, or ſeed veſſel, is the germen grown to maturity, big with ſeeds, which when ripe diſcharge the ſeeds.

Capſula, is a hollow pericarpium, it cleaves or parts aſunder in a determinate manner.

Valvula, or valvule, is the partition which divides into compartments or cells.

Diſſepimentum, diſſepiment, is that ſubſtance which internally paſſes through the capſule, and divides it internally into the ſeveral loculaments or partitions where the ſeeds are lodged.

Columnella, is that part in the middle of pericarpium, that connects the ſeveral loculaments or compartments with the ſeeds.

Loculamentum, one of the compartments in whoſe cells or cavity the ſeeds are lodged.

Siliqua, is a pod, or pericarpium of two valves, in which the ſeeds are faſtened alternately to each ſuture.

Logumen, is a pod, or pericarpium of two valves, in which the ſeeds are faſtened to one ſuture only.

Conceptaculum, a conceptacle, is a pericarpium of a ſingle valve, and has not the ſeeds faſtened to it.

Drupa, is a fleſhy or pulpy ſubſtance without any valve, containing a nut.

Pomum, is a fleſhy or pulpy pericarpium with valves containing a capſule.

Bacca, is a berry, and is a fleſhy or pulpy pericarpium without valves; the ſeeds contained within it have no other covering.

Strobilus, a cone, is a pericarpium formed by an amentum, into a cone grown longer.

VI. Semen, the ſeed, is a deciduous part of a vegetable, and is the rudiment of a new plant, fertilized for vegetation by the elaſticity of the pollen or farina whereby it falls on the piſtillum.

Semen, the ſeed properly is the rudiment of a new vegetable, furniſhed with the ſap, and is carved with a verſicular or bladder-like tunic or coat.

Corculum, is the firſt principle of a new plant within the body of the ſeed.

Plumula, is the ſquamous or ſcaly part of the corculum, which aſcends, and becomes the ſtem.

Roſtellum, is the plain or ſimple part of the corculum, which deſcends, and becomes the root.

Cotyledon, is the porous and periſhable ſide lobe of the ſeed, and falls off ſoon after the young plant makes its appearance above the ground.

Hilum, is the external mark or cicatrix on the ſeed where it has been faſtened within the fruit.

Arillus, the proper external coat of the ſeed, which falls off ſpontaneouſly.

Coronula, the little crown of a ſeed, and is the little calyx of a floret, adhering to the ſeed, ſerving as wings.

Pappus, the down, which is either a feathery or hairy crown, aſſiſting the ſeed to fly.

Ala, the wing or thin membrane of the ſeed, by which it is diſperſed.

Nux, a nut, is a ſeed, whoſe epidermous or oſſeous ſhell involves a ſeed or nucleus.

Propago, the ſeed of moſſes, they have neither tunic, nor cotyledon, but conſiſt of a naked corculum, where the roſtellum is inſerted with the calyx of the plant.

VII. Receptaculum, a receptacle, is the caſe which connects the foregoing parts of fructification.

Receptaculum proprium, the proper receptacle, which belongs to the parts of a ſingle fructification only, and is then called the receptacle of the fruit.

Fructificationis, of the fructification, when it is common both to flower and fruit.

Floris, of the flower, when the parts of the flower only are faſtened to it without the germen.

Fructus of the fruit, when it is the baſe of the fruit only, and is at a diſtance from the receptacle of the flower.

Seminum, of the ſeeds, when it is the baſe to which the ſeed is fixed within the pericarpium or ſeed veſſel.

Receptaculum commune, a common receptacle, is that which connects ſeveral florets together, ſo that if one of them be taken away, it would cauſe irregularity.

Palea, a chaff or huſk, is a thin ſubſtance which grows on the common receptacle and ſeparates the florets.

Umbella, an umbel, is a receptacle, when from the ſame centre ariſe a number of filiform, or thread ſhaped footſtalks, of a proportionate height, and form an even ſurface at the top.

Simplex, a ſimple umbel, when it has no ſubdiviſion.

Compoſita, a compound umbel, is when each footſtalk terminates in an umbella, or little umbel.

Univerſalis, an univerſal umbel, is when on the apex of its footſtalks it bears umbellæ, or little partial umbels.

Partialis, a partial umbel, is that which is on the apex of the footſtalk of the univerſal umbel.

Cyma, a cyme, is a receptacle when out of the ſame centre ariſe a number of long faſtigiated footſtalks, growing thinner towards the top, and from them ariſe little footſtalks, which are irregularly diſperſed; but both univerſal and partial footſtalks, riſe to an equal height.

Spadix is the receptacle of the palms, is branched, growing out from within the ſpatha, and the branches bear the fruit.

Spadix is alſo uſed to ſignify the flower ſtalk of other plants, that originally were contained within a ſpatha; but in this caſe, it is generally ſimple or undivided.

From the number, proportion, ſituation, and other circumſtances attending theſe parts of fructification, the claſſes, orders, and genera of vegetables, are characteriſed. The number and diſpoſition of the filaments of the ſtamina generally ſhew the claſs of a plant, and the ſtyles of the piſtilla conſtitute the character of the order in which it is arranged under that claſs.

Under the article ſtamina, it has been obſerved, that upon the filaments are fixed buttons called antheræ, which are conſidered as the male organs of generation in plants, and the top of the ſtyle, as has been mentioned under the article piſtillum, uſually ſwells or divides into a head, called its ſtigma, which is the female part, and which receiving the pollen or duſt from the buttons, affords it a paſſage down to impregnate the germen.

From this diſtinction of ſexes in plants, in like manner as in animals, the Linnæan Syſtem of Botany has obtained the appellation of the Sexual Syſtem.

The other parts of the fructification, viz. the calyx, corolla, pericarpium, ſemen and receptaculum, are conſulted for eſtabliſhing the genera of plants. Hence, all vegetables that agree in theſe parts ſhould be ranked under one genus, and all ſuch as differ ſhould be ſeparated.

The characteriſtic mark of each genus, is therefore to be fixed from the number, figure, proportion, and ſituation of all the parts; but as there are few genera, in which all the parts are conſtant in every one of the ſpecies, we ought, therefore, whenever it is poſſible, to fix upon ſome one circumſtance that is conſtant, and mark it as the eſſential character, which may be had in moſt genera.

The more conſtant any part of the fructification is found through the ſeveral ſpecies of any genus, the more it may be relied on with certainty as a characteriſtic mark of that genus. In ſome genera, one part of the fructification is found to be the moſt conſtant, and in others, another; but there is no part but what is ſometimes liable to variation.

SECT. IV.

OF SPECIFIC CHARACTERS.

As generic differences depend upon the form of the fructification, ſpecific diſtinctions take their riſe from any circumſtance in which plants of the ſame genus are found to diſagree, provided ſuch circumſtance be conſtant and not liable to alteration by culture or other accidents: ſo that all caſual differences are accounted as varieties of the ſame ſpecies by botaniſts.

The root often affords a real ſpecific difference, and is ſometimes the chief diſtinction; the trunk often furniſhes a ſure mark of diſtinction; the leaves exhibit the moſt natural and elegant ſpecific differences; and the flowers and other parts of the fructification have their influence likewiſe, in many caſes, in diſtinguiſhing the ſpecies.

In order to come to a critical as well as a claſſical knowledge of the ſcience of Botany, it will be neceſſary to ſubjoin an explanation of the three plates which are given, to exemplify the inveſtigation and determination of the ſpecies.

PLATE I. SIMPLE LEAVES.

Fig.

1. A round leaf (folium orbiculatum)
2. A leaf nearly round (ſubrotundum)
3. An egg ſhaped leaf (ovatum)
4. An oval leaf (ovale)
5. An oblong leaf (oblongum)
6. A ſpear ſhaped leaf (lanceolatum)
7. A linealin leaf, or which is equally broad every way (lineare)
8. An awl ſhaped leaf (ſubulatum)
9. A kidney ſhaped leaf (reniforme)
10. A heart ſhaped leaf (cordatum)
11. A creſcent ſhaped leaf (lulnuatum)
12, A triangular leaf (triangulare)
13. An arrow ſhaped leaf (ſagittatum)
14. A leaf partly arrow and partly heart ſhaped (cordato ſagittatum)
15. A halbert ſhaped leaf (haſtatum)
16. A divided or cleft leaf (fiſſum)
17. A three lobed leaf (trilobum)
18. An abruptly or bitter leaf (præmorſum)
19. A leaf divided to the midrib (lobatum)
20. A leaf with five angles (quinquangulare)
21. A grieved angled leaf (eroſum)
22. An hand ſhaped leaf (palmatum)
23. A ſimple winged leaf (pinnatifidum)
24. A jagged leaf (laciniatum)
25. An indented leaf (ſinuatum)
26. A tooth like leaf (dentato ſinuatum)
27. A leaf with indentments, hooked backwards (retrorſum ſinuatum)
28. A parted leaf (partitum)
29. A ſerpentine edged leaf (repandum)
30. A tooth cut leaf (dentatum)
31. A ſawed leaf (ſerratum)
32. A doubly ſawed leaf (duplicato ſerratum)
33. A doubly notched leaf (duplicato crenatum)
34. A griſtly bordered leaf (cartilagineum)
35. A leaf ſharply notched (acuté crenatum)
36. A leaf bluntly notched (obtuſé crenatum)
37. A plaited leaf (plicatum)
38. A notched leaf (crenatum)
39. A curled leaf (criſpum)
40. A leaf terminating bluntly (obtuſum)
41. A leaf terminating in a point (acutum)
42. A leaf tapering gradually to the point (acuminatum)
43. A blunt pointed leaf (obtuſum acumine)
44. A leaf ſharply notched at the apex (emerginatum acuté)
45. A wedge ſhaped notched leaf (cuneiforme emerginatum)
46. A blunted leaf (retuſum)
47. A hairy leaf (piloſum)
48. A downy leaf (tomentoſum)
49. A briſtly leaf (hiſpidum)
50. A fringed leaf (ciliatum)
51. A wrinckled leaf (rugoſum)
52. A veined leaf (venoſum)
53. A ribbed leaf (nervoſum)
54. A bliſtered leaf (papilloſum)
55. A tongue ſhaped leaf (linguiforme)
56. A ſcimiter ſhaped leaf (acinaciforme)
57. An hatched ſhaped leaf (dolabriforme)
58. A delta ſhaped leaf (deltoides)
59. A three ſided leaf (triquetrum)
60. A channelled leaf (canalicutum)
61. A furrowed leaf (ſulcatum)
62. A cylindrical leaf (teres)

PLATE I. COMPOUND LEAVES.

63. A finger ſhaped leaf, compounded of two (binatum).
64. A finger ſhaped leaf, compounded of three (ternatum foliolis ſeſſilibus).
65. A three'd leaf, properly ſtalk'd (tematum foliolus peticlatis).
66. A fingured leaf improperly ſtalked (digitatum)
67. A foot ſhaped leaf (pedatum)
68. A winged leaf terminated by an odd one (pinnatum cum impari)
69. A winged leaf abruptly terminated (pinnatum abrupte)
70. A winged leaf alternately (pinnatum alternatum)
71. A winged leaf interruptedly (pinnatum interrupte)
72. A winged leaf tendrilted (pinnatum cirrhoſum)
73. A winged leaf paired (dinnatum conjugatum)
74. A winged leaf decenſively (pinnatum decurſive)
75. A winged leaf jointedly (pinnatum articulaté)
76. A lyre ſhaped leaf (lyratum)
77. A leaf doubly three leaved (biternatum)
78. A doubly winged leaf (bepinnatum)
79. A leaf triply three leaved (triternatum)
80. A thrice feathered leaf, without an odd one (tripinnatum ſine imperi)
81. A thrice feathered leaf with an odd one (tripinnatum cum imperi)

PLATE II. DETERMINATE LEAVES.

82. Bent inwards or inflected (inflexum)
83. Upright or erect (erectum)
84. Spreading or expanding (patens)
85. Horizontal (horizontale)
86. Curved or reclined (reclinatum)
87. Rolled back or revolute (revolutum)
88. Seminal (ſeminale)
89. Stern leaf (caulinum)
90. Branch leaf (rameum)
91. Floral (florale)
92. A leaf furniſhed with a foot ſtalk (petiolatum)
93. A leaf which has the foot ſtalk inſerted into the centre of the lower diſk or ſurface, and not into the baſe or margin (peltum)
94. A leaf ſeated on the ſtem (ſeſſile)
95. A leaf running along the ſtem (decurrens)
96. A claſping or embracing leaf (amplexicaule)
97. A leaf perforated by the ſtem (perfoliatum)
98. Twins or conjoined (connata)
99. Sheating (vaginans) This is called alſo a glove embracing leaf, as it goes round the ſtem and ſhoots from the middle.
100. Jointed (articulatum)
101. Starry leaves (ſtellata)
102. Fourfold (quaterna)
103. Oppoſite (oppoſita)
104. Alternate (alterna)
105. Awry or chaffy (aceroſa)
106. Leaves imbricated or laid over each other, like the tiles of a houſe (imbricata)
107. Faſcicled or bundled leaves (faſciculata)
108. Frond or union of the fructification (frons)
109. Spatula ſhaped leaf (ſpathulatum)
110. Parabolic ſhaped leaf (parabolicum)

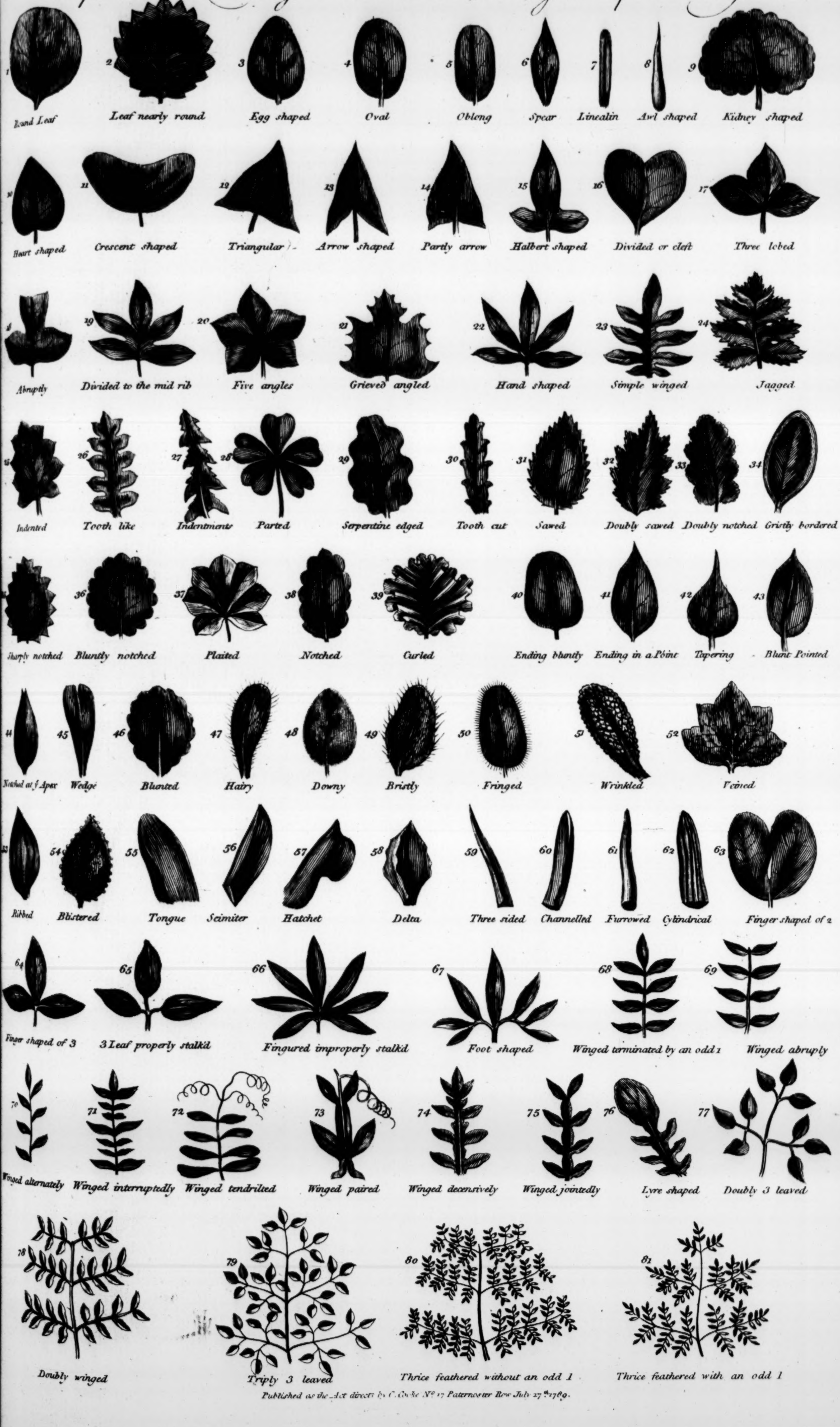
PLATE II. STEMS.

111. Scalycum or ſtraw (ſquamoſus culmus)
112. A climbing or creeping ſtem (repens caulis)
113. A naked flower ſtalk or ſcape (ſcapus)

114. Jointed

1
Round
10
Heart
Abr
Inde
Sharply
44
Notched a
Ribbe
64
Finger
70
Winged a
78

Simple Leaves (according to Linneus — See System of Botany.


1 Round Leaf
2 Leaf nearly round
3 Egg shaped
4 Oval
5 Oblong
6 Spear
7 Linealin
8 Awl shaped
9 Kidney shaped
10 Heart shaped
11 Crescent shaped
12 Triangular
13 Arrow shaped
14 Partly arrow
15 Halbert shaped
16 Divided or cleft
17 Three lobed
18 Abruptly
19 Divided to the mid rib
20 Five angles
21 Grieved angled
22 Hand shaped
23 Simple winged
24 Jagged
25 Indented
26 Tooth like
27 Indentments
28 Parted
29 Serpentine edged
30 Tooth cut
31 Sawed
32 Doubly sawed
33 Doubly notched
34 Gristly bordered
35 Sharply notched
36 Bluntly notched
37 Plaited
38 Notched
39 Curled
40 Ending bluntly
41 Ending in a Point
42 Tapering
43 Blunt Pointed
44 Notched at ỹ Apex
45 Wedge
46 Blunted
47 Hairy
48 Downy
49 Bristly
50 Fringed
51 Wrinkled
52 Veined
53 Ribbed
54 Blistered
55 Tongue
56 Scimiter
57 Hatchet
58 Delta
59 Three sided
60 Channelled
61 Furrowed
62 Cylindrical
63 Finger shaped of 2
64 Finger shaped of 3
65 3 Leaf properly stalk'd
66 Fingured improperly stalk'd
67 Foot shaped
68 Winged terminated by an odd 1
69 Winged abruply
70 Winged alternately
71 Winged interruptedly
72 Winged tendrilled
73 Winged paired
74 Winged decensively
75 Winged jointedly
76 Lyre shaped
77 Doubly 3 leaved
78 Doubly winged
79 Triply 3 leaved
80 Thrice feathered without an odd 1
81 Thrice feathered with an odd 1

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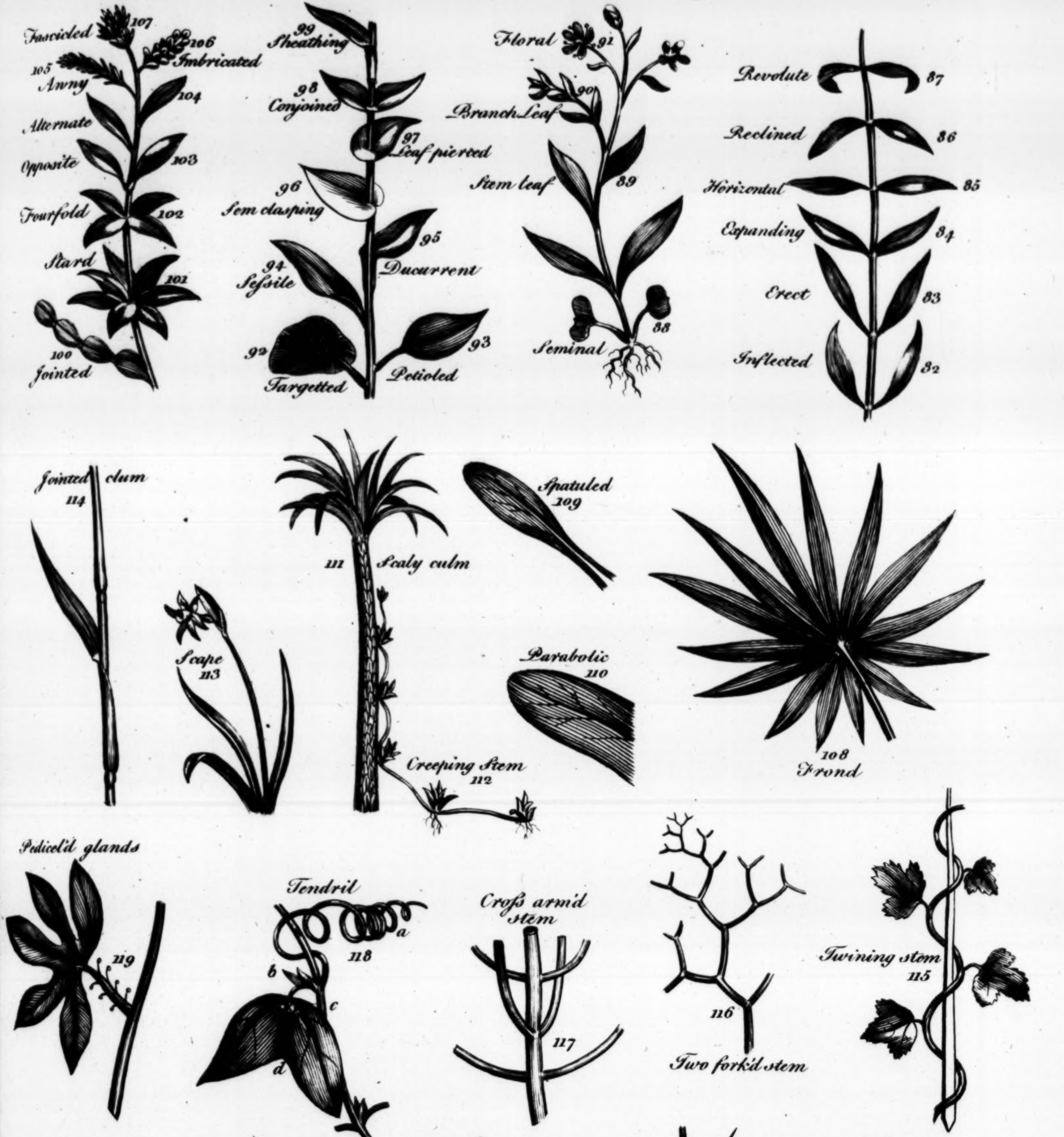
MUSEUM

Determinate Leaves, Stems, Supports, and Roots.—
See the Linnean System of Botany.

Plate 2.



Fascicled 107
106 Imbricated
105 Awny
104
Alternate
Opposite 103
Fourfold 102
Stard 101
100 Jointed
99 Sheathing
98 Conjoined
97 Leaf pierced
96 Sem clasping
95
94 Seſsile
Ducurrent
92 Targetted
93 Petioled
Floral 91
90
Branch Leaf
Stem leaf 89
88
Seminal
Revolute 87
Reclined 86
Horizontal 85
Expanding 84
Erect 83
Inflected 82
Jointed clum 114
111 Scaly culm
Scape 113
Spatuled 109
Parabolic 110
Creeping Stem 112
108 Frond
Pedicel'd glands
119
Tendril
a
118
b
c
d
Croſs arm'd stem
117
116
Two fork'd stem
Twining stem 115
Spindle form'd Root 129
Opposite leaves
a
124
Simple prickle
122
123
Triple prickle
a
Simple Thorn
b
121
Triple Thorn
a
Bacte
120
a
b
b
Branchy root 130
Tuberous root
128
127 Coated bulb
Solid bulb 126
125
Scaly bulb
Creeping root 131

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Sowerby sculp.

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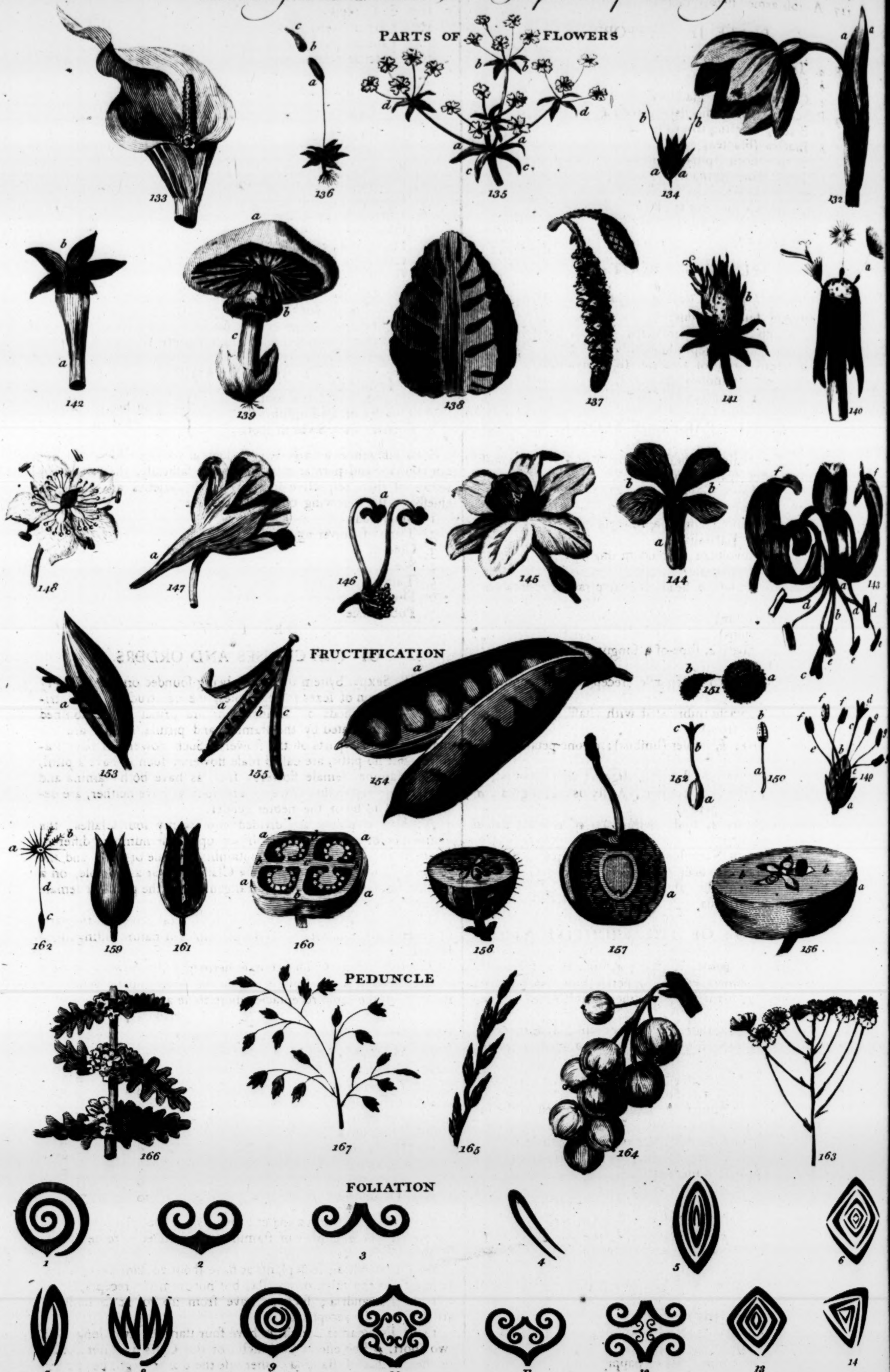
Flowers, Fructification, Peduncle and Foliation, according to Lenneus.—See System of Botany.


PARTS OF FLOWERS
133
136
135
134
132
142
139
138
137
141
140
148
147
146
145
144
143
FRUCTIFICATION
153
155
154
151
152
150
149
162
159
161
160
158
157
156
PEDUNCLE
166
167
165
164
163
FOLIATION
1
2
3
4
5
6
7
8
9
10
11
12
13
14

Sowerby delin.

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114. Jointed ſtraw or culm (articulatis culmus)
115. A twining ſtem (volubilis caulis)
116. A two forked ſtem (dichotomus caulis)
117. A croſs armed ſtem (brachiatus caulis)

PLATE II. SUPPORTS.

118. *a.* Tendril (cirrhus)
  b. Stipules (ſtipulæ)
  c. Concave glands (glandulæ concavæ)
119. Pedicled glands (pedicellatæ glandulæ)
120. *a.* Bracte, differing from the leaves.
  b. Bractea (bractea)
121. *a.* Simple thorn (ſpina ſimplex)
  b. Triple thorn (ſpina triplex)
122. Simple prickle (aculeus ſimplex)
123. Triple prickle (aculeus triplex)
124. Oppoſite leaves (oppoſita folia)
  a. Axil (axilla)

PLATE II. ROOTS.

125. Scaly bulb of the lily (bulbus ſquamoſus)
126. Solid bulb (bulbus ſolidus)
127. Coated bulb tranſverſely diſſected (bulbous tunicatus)
128. Tuberous root of filependula (tuberoſa radix)
129 Spindle formed root of a carrot (fuſiformis radix)
130 Branched root (ramoſa radix)
131 Creeping root (repens radix)

PLATE III. PARTS OF FLOWERS.

132. The ſpathe or calyx of the Narciſſus (ſpatha calyx Narciſſi)
133. Spathe ſpadix (ſpatha ſpadix)
134. *a.* A glume calyx (gluma calyx)
  b. Awn (ariſta)
135. *a.* Univerſal umbel (umbella univerſalis)
  b. Partial one (partialis)
  c. Univerſal involucre (involucum univerſale)
  d. Partial one (partiale)

136. *c.* Calyptre; *b*, lid; *a*, head; (*c*, calyptra; *b*, operculum; *a*, capitulum)

137. Ament (amentum)
138. Strobile (ſtrobilus)

139. *a*, Hat; *b*, volve; *c*, ſtipe of a fungus; (fungi; *a*, pileus; *b*, volva; *c*, ſtipes)

140. *a*, Common naked receptacle (receptaculum commune nudum)

141. Common receptacle imbricated with chaff (receptaculum commune paleis imbricatum)

142. *a*, tube (tubus); *b*, border (limbus); of one petalled corol (corollæ monopetalæ)

143. Flower; *a*, germ; *b*, ſtyle; *c*, ſtigma; *d*, filaments; *e*, anthers; *f*, petals; (flos; *a*, germen; *b*, ſtylus; *c*, ſtigma; *d*, filamenta; *e*, antheræ; *f*, petela)

144. Claws (ungues); *c*, folds (laminæ); of many petalled corol (corollæ polypetalæ)

145. Belled nectary in Narciſſus (nectarium campanulatum)
146. Horned nectaries in aconitum (nectaria cornuta)
147. Horned nectary in the calyx of tropæolum
148. Nectaries in Parnaſſia.

PLATE III. PARTS OF THE FRUCTIFICATION.

149. *a*, Perianth; *b*, germ; *c*, ſtyle; *d*, ſtigma; *e*, filaments; *f*, anthers, gaping; *g*, anthers, entire; (*a*, perianthium; *b*, germen; *c*, ſtylus; *d*, ſtigma; *e*, filamenta; *f*, antheræ dehiſcentes; *g*, antheræ integræ)

150. *a*, Filament; *b*, anther; (*a*, filamentum; *b*, antheræ)

151. *a*, duſt (pollen ſeen in the microſcope; *b*, elaſtic vapour; (halitus elaſticus)

152. *a*, germ; *b*, ſtyle; *c*, ſtigma; (*a*, germen; *b*, ſtylus; *c*, ſtigma)

153. Follicle (folliculus) a receptacle of ſeeds.

154. Legume *a*, *a*, (legumen) the ſeeds, are annexed to the ſuperior ſuture.

155. Silique (ſiliqua) *a*, *b*, each edge of the receptacle.

156. Pome, *a*, (pomum) included capſule, *b*, (capſula incluſa)

157. *a*, Drupe; *b*, with a nucleus.
  (*a*, Drupa; *b*, nucleo)

158. Berry (bacca)

159. Capſule gaping at top (capſula apice dehiſcens)

160. Of the capſule; *a*, the valvelet; *b*, the partition; (capſulæ; *a*, valvulæ; *b*, diſſepementum); *c*, column; *d*, receptacle; (*c*, columella; *d*, receptaculum)

161. *a*, Capſule longitudinally diſſected, that the receptacle of the ſeeds may appear.

162. *a.* Hairy pappus (pappus piloſus)
  b. Feathery pappus (pappus plumoſus)
  c. Seed (ſemen)
  a. Stipe of the pappus (ſtipes pappi)

PLATE III. THE PEDUNCLE.

163. Corymbe (corymbus)
164. Raceme (racemus)
165. Spike (ſpica)
166. Verticil (verticillus)
167. Panicle (panicula)
168. Faſcicle (faſciculus)

PLATE III. FOLIATION.

LEAVES TRANSVERSELY DISSECTED.

1. Convolute (convolutum)
2. Involute (involutum)
3. Revolute (revolutum)
4. Conduplicate (conduplicatum)
5. Equitant (equitans)
6. Imbricated (imbricatum)
7. Obvolute (obvolutum)
8. Plaited (plicatum)
9. Convolute (convoluta)
10. Involute oppoſite (involuta oppoſita)
11. Involute alternate (involuta alterna)
12. Revolute oppoſite (revoluta oppoſita)
13. Equitant two edged (equitantia ancipita)
14. Equitant three ſided (equitantia triquetra)

PLATE III. MEASURE.

P. Quarter of a Paris foot.
A. Quarter of an Engliſh foot.
S. Quarter of a Swediſh foot.
} 3 inches of each nation.

Such differences as are only incidental to vegetables, and are not conſtant and permanent, conſtitute claſſically, the ſeveral varieties of their reſpective ſpecies, which varieties are grounded chiefly on the following circumſtances, viz.

1. Magnitude.
2. Time of flowering.
3. Colour.
4. Scent.
5. Taſte.
6. Duration.
7. Pubeſcence.

SECT. V.

OF THE CLASSES AND ORDERS.

THE Sexual Syſtem of Botany being founded on the diſcovery of a diſtinction of ſexes in vegetables, the conſtruction and diſtribution of the mode of arrangement are principally eſtabliſhed upon, and regulated by the ſtamina and piſtilla, which are the male and female parts of the flower. Such flowers as have ſtamina, but no piſtil, are called male flowers; ſuch as have a piſtil, but no ſtamina, female flowers: ſuch as have both ſtamina and piſtilla, hermaphrodite flowers: and ſuch as have neither, are denominated to be of the neuter gender.

All known plants are divided into twenty four Claſſes; the characters of which are eſtabliſhed upon the number, different ſituation or arrangement of the ſtamina or male organs; and the Orders, or ſub-diviſions, of theſe Claſſes, as far as poſſible, on a ſimilar number, ſituation, or arrangement of the piſtils or female organs.

The Claſs ſignifies an agreement of ſeveral genera in the parts of fructification, according to the principles of nature diſtinguiſhed by art.

The firſt twenty Claſſes contain hermaphrodite flowers, or ſuch as have the ſtamina and piſtils within the ſame cup or petals, or ſtanding on the ſame receptacle where thoſe are wanting.

Of theſe twenty, the firſt ten proceed in an uninterrupted ſeries, viz.

1ſt. Monandria - - - - - - - - - - 1
2d. Diandria - - - - - - - - - - 2
3d. Triandria - - - - - - - - - - 3
4th. Tetrandria - - - - - - - - - - 4
5th. Pentandria - - - - - - - - - - 5
6th. Hexandria - - - - - - - - - - 6
7th. Heptandria - - - - - - - - - 7
8th. Oxtandria - - - - - - - - - - 8
9th. Enneandria - - - - - - - - - - 9
10th. Decandria - - - - - - - - - - 10
} Males or ſtamina, in the hermaphrodite flower.

11th. Dodecandria 12 males; but as yet no plant has been diſcovered whoſe number of ſtamina has entituled it to be ranked in this Claſs.

12th. Icoſandria; ſuch plants as have about 20 ſtamina, or more, ariſing from the calyx or corolla, but not from the receptacle.

13th. Polyandria; ſuch as have from 20 to 1000 ſtamina, ariſing from the receptacle.

14th. Didynamia; ſuch as have four ſtamina, two long, and two ſhort. The eſſential character of this Claſs does not conſiſt in the number of ſtamina, otherwiſe the plants might be referred to the 4th, or the tetrandia claſs ; but in having two of the ſtamina, ſhorter than the other, one piſtil only, and frequently, though not always, an irrregularly ſhaped corolla.

15th. Tetradynamia plants with ſix ſtamina, four long, and two ſhort.

16th. Monadelphia ; ſuch as have the ſtamina not diſtinct at the baſe, but united into one body.

17th. Diadelphia ; ſuch as have the ſtamina united at the baſe into two bodies.

18th. Polyadelphia ; ſuch as have the ſtamina united at the baſe into ſeveral bodies.

19th. Syngeneſia ; ſuch as have the antheræ, but not the filaments coaleſcing together, ſo as to form a tube or cylinder, through which the piſtil is commonly tranſmitted.

20th. Gynandria ; ſuch as have the ſtamina ſpringing from the piſtil itſelf.

21ſt. Monœcia ; ſuch as have ſeparate male and female flowers on the ſame plant.

22d. Diœcia ; ſuch as have ſeparate male and female flowers on ſeparate plants of the ſame ſpecies.

23d. Polygamia ; ſuch as have conſtantly beſide hermaphrodite flowers, others, either male or female, on the ſame plant.

24th. Cryptogamia ; containing thoſe plants, the mode and organs of whoſe fructification, are not yet ſufficiently aſcertained ; heretofore called imperfect plants.

The ſecondary part of the Syſtem, the Orders, or Sub-diviſions of the foregoing Claſſes, are eſtabliſhed on the number of the piſtils or female parts, through a conſiderable part of the Syſtem, but in other parts, from various characters, thus : The arrangement from number is purſued no farther than through the firſt 10 Claſſes ; i. e. ſo long as the claſſical character, uninterruptedly, depends on the number of ſtamina, ſo long the Orders likewiſe depend on the number of piſtils : but when ſituation or different arrangement takes place, the Orders are moſt commonly founded on other diſtinctions, which I ſhall briefly ſpecify.

The 14th Claſs is divided into two Orders. The former having four naked ſeeds ; the latter having the ſeeds incloſed in a ſeed veſſel.

The 15th Claſs has two Orders, diſtinguiſhed by the ſize of the pod ; the firſt of which is long, and the latter ſhort.

The Orders of the 16th, 17th, and 18th Claſs, are formed from the number of the ſtamina.

The 19th Claſs has ſix Orders ; in five of which the plants are polygamiæ, and in the remaining one monogamiæ ; and the differences in the Order of the former, ariſe from the different ſtructure or ſex of the floſcules, conſtituting the whole flower.

In the 20th Claſs, the arrangement of the Orders ariſes from the number of the ſtamina, as in the 16th, 17th, and 18th Claſſes.

In the 21ſt and 22d Claſſes, the claſſical characters of the foregoing parts of the Syſtem are adopted as characters of the Orders, as far down as the Monœcia Claſs itſelf. Thus the firſt Order of thoſe Claſſes contains Monandrous plants, and the laſt Gynandrous.

The 23d Claſs, is divided into three Orders, as the plants are Monœcious, Diœcious, or Triœcious.

The 24th and laſt Claſs is divided into four Orders, whoſe names, with thoſe of all the foregoing Orders are given in the following Botanic Table, which at one view gives the reader an exact ſub-diviſion of the 24 Claſſes, or grand diviſions of the vegetable kingdom.

A TABLE OF THE ORDERS, THROUGHOUT THE XXIV. CLASSES.

One Stamen in the Hermaphrodite Flower.

CLASS I.	ORDER 1. Monogynia ORDER 2. Digynia	II. ORDERS.

Two Stamens in the Hermaphrodite Flower.

CLASS II.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia	III. ORDERS.

Three Stamens in the Hermaphrodite Flower.

CLASS III.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia	III. ORDERS.

Four Stamens in the Hermaphrodite Flower.

CLASS IV.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia	III. ORDERS.

Five Stamens in the Hermaphrodite Flower.

CLASS V.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Frigynia ORDER 4. Tetragynia ORDER 5. Pentagynia ORDER 6. Polygynia	VI. ORDERS.

Six Stamens in the Hermaphrodite Flower.

CLASS VI.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Tetragynia ORDER 5. Polygynia	V. ORDERS.

Seven Stamens in the Hermaphrodite Flower.

CLASS VII.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Tetragynia ORDER 4. Heptagynia	IV. ORDERS

Eight Stamens in the Hermaphrodite Flower.

CLASS VIII.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Tetragynia	IV. ORDERS.

Nine Stamens in the Hermaphrodite Flower.

CLASS IX.	ORDER 1. Monogynia ORDER 2. Trigynia ORDER 3. Hexagynia	III. ORDERS.

Ten Stamens in the Hermaphrodite Flower.

CLASS X.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Pentagynia ORDER 5. Decagynia	V. ORDERS.

Stamens from 12 to 19, in the Hermaphrodite Flower.

CLASS XI.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Pentagynia ORDER 5. Decagynia	V. ORDERS.

The Stamens inſerted in the Inſide of the Calyx, 20 or more in Number.

CLASS XII.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Pentagynia ORDER 5. Polygynia	V. ORDERS.

The Stamens inſerted in the Receptacle, from 20 to 100, in the ſame Flower with the Piſtil.

CLASS XIII.	ORDER 1. Monogynia ORDER 2. Digynia ORDER 3. Trigynia ORDER 4. Tetragynia ORDER 5. Pentagynia ORDER 6. Hexagynia ORDER 7. Polygynia	VII. ORDERS.

Four Stamens, of which Two are longer than the others.

CLASS XIV.	ORDER 1. Gymnoſpomia ORDER 2. Angioſpurmia	II. ORDERS.

Six Stamens ; Four of which are Long, and the Two oppoſite Short.

CLASS XV.	ORDER 1. Siliculoſa ORDER 2. Siliquoſa	II. ORDERS.

The Filaments of the Stamen grow together into One Body.

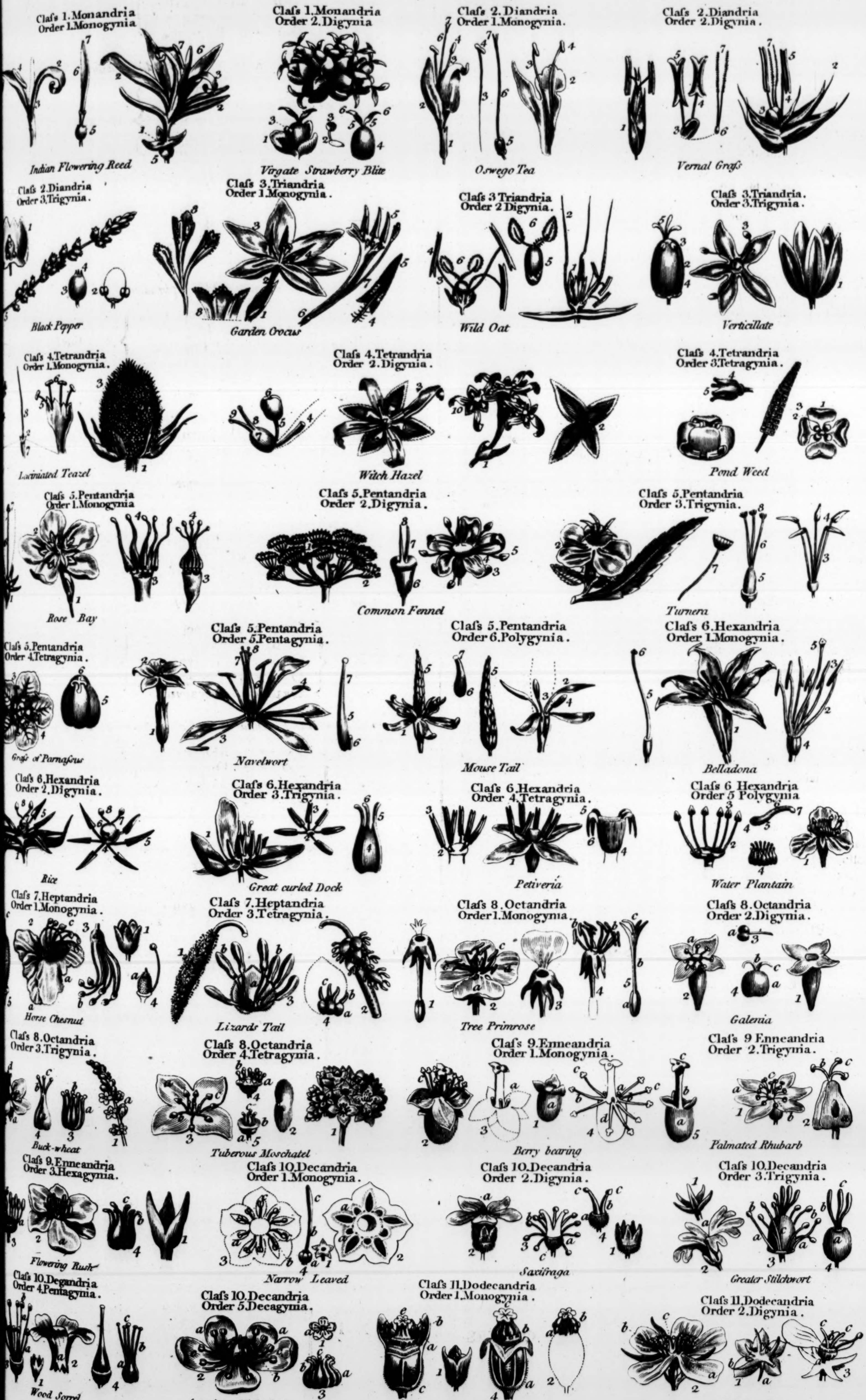
CLASS XVI.	ORDER 1. Pentandria ORDER 2. Enneandria ORDER 3. Decandria ORDER 4. Dodecandria ORDER 5. Polyandria	V. ORDERS.

The Filaments of the Stamens grow together into Two Bodies.

CLASS XVII.	ORDER 1. Pentandria ORDER 2. Hexandria ORDER 3. Octandria ORDER 4. Decandria	IV. ORDERS.

Claſses and Orders of Flowers according to Linneus.

See System of Botany.



Claſs 1.Monandria Order 1.Monogynia — Indian Flowering Reed

Claſs 1.Monandria Order 2.Digynia — Virgate Strawberry Blite

Claſs 2.Diandria Order 1.Monogynia — Oswego Tea

Claſs 2.Diandria Order 2.Digynia — Vernal Graſs

Claſs 2.Diandria Order 3.Trigynia — Black Pepper

Claſs 3.Triandria Order 1.Monogynia — Garden Crocus

Claſs 3 Triandria Order 2 Digynia — Wild Oat

Claſs 3.Triandria. Order 3.Trigynia. — Verticillate

Claſs 4.Tetrandria Order 1.Monogynia — Laciniated Teazel

Claſs 4.Tetrandria Order 2.Digynia — Witch Hazel

Claſs 4.Tetrandria Order 3.Tetragynia — Pond Weed

Claſs 5.Pentandria Order 1.Monogynia — Rose Bay

Claſs 5.Pentandria Order 2.Digynia — Common Fennel

Claſs 5.Pentandria Order 3.Trigynia — Turnera

Claſs 5.Pentandria Order 4.Tetragynia — Graſs of Parnaſsus

Claſs 5.Pentandria Order 5.Pentagynia — Navelwort

Claſs 5.Pentandria Order 6.Polygynia — Mouse Tail

Claſs 6.Hexandria Order 1.Monogynia — Belladona

Claſs 6.Hexandria Order 2.Digynia — Rice

Claſs 6.Hexandria Order 3.Trigynia — Great curled Dock

Claſs 6.Hexandria Order 4.Tetragynia — Petiveria

Claſs 6 Hexandria Order 5 Polygynia — Water Plantain

Claſs 7.Heptandria Order 1.Monogynia — Horse Chesnut

Claſs 7.Heptandria Order 3.Tetragynia — Lizards Tail

Claſs 8.Octandria Order 1.Monogynia — Tree Primrose

Claſs 8.Octandria Order 2.Digynia — Galenia

Claſs 8.Octandria Order 3.Trigynia — Buck-wheat

Claſs 8.Octandria Order 4.Tetragynia — Tuberous Moschatel

Claſs 9.Enneandria Order 1.Monogynia — Berry bearing

Claſs 9 Enneandria Order 2.Trigynia — Palmated Rhubarb

Claſs 9.Enneandria Order 3.Hexagynia — Flowering Ruſh

Claſs 10.Decandria Order 1.Monogynia — Narrow Leaved

Claſs 10.Decandria Order 2.Digynia — Saxifraga

Claſs 10.Decandria Order 3.Trigynia — Greater Stitchwort

Claſs 10.Decandria Order 4.Pentagynia — Wood Sorrel

Claſs 10.Decandria Order 5.Decagynia — American Nightshade

Claſs 11.Dodecandria Order 1.Monogynia — Asarabaca

Claſs 11.Dodecandria Order 2.Digynia — Quicken Tree

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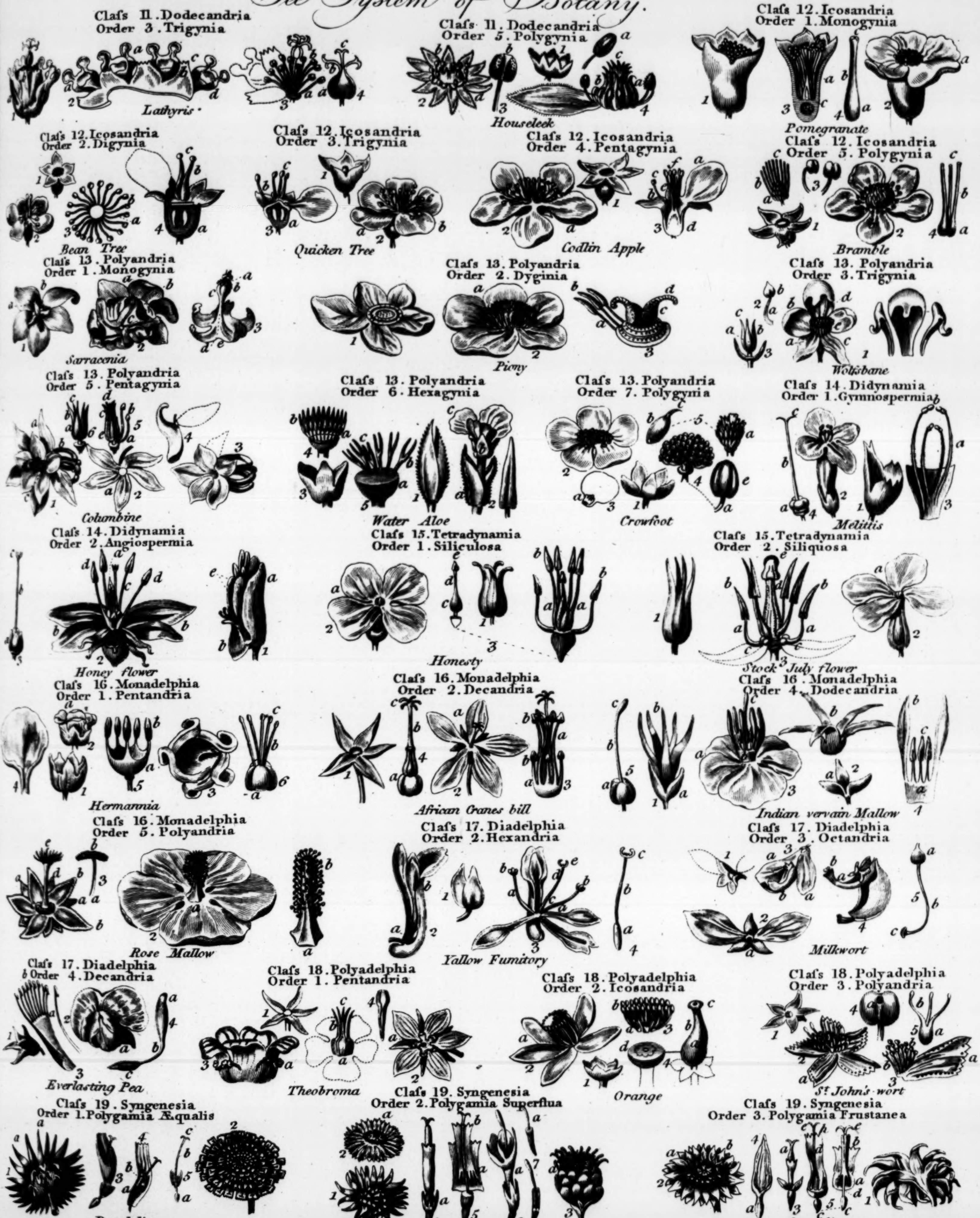
Claſses and Orders of Flowers according to Linneus.
See System of Botany.


Claſs 11. Dodecandria
Order 3. Trigynia
Lathyris
Claſs 11. Dodecandria
Order 5. Polygynia
Houseleek
Claſs 12. Icosandria
Order 1. Monogynia
Pomegranate
Claſs 12. Icosandria
Order 2. Digynia
Bean Tree
Claſs 12. Icosandria
Order 3. Trigynia
Quicken Tree
Claſs 12. Icosandria
Order 4. Pentagynia
Codlin Apple
Claſs 12. Icosandria
Order 5. Polygynia
Bramble
Claſs 13. Polyandria
Order 1. Monogynia
Sarracenia
Claſs 13. Polyandria
Order 2. Dyginia
Piony
Claſs 13. Polyandria
Order 3. Trigynia
Wolfsbane
Claſs 13. Polyandria
Order 5. Pentagynia
Columbine
Claſs 13. Polyandria
Order 6. Hexagynia
Water Aloe
Claſs 13. Polyandria
Order 7. Polygynia
Crowfoot
Claſs 14. Didynamia
Order 1. Gymnospermia
Melittis
Claſs 14. Didynamia
Order 2. Angiospermia
Honey flower
Claſs 15. Tetradynamia
Order 1. Siliculosa
Honesty
Claſs 15. Tetradynamia
Order 2. Siliquosa
Stock July flower
Claſs 16. Monadelphia
Order 1. Pentandria
Hermannia
Claſs 16. Monadelphia
Order 2. Decandria
African Cranes bill
Claſs 16. Monadelphia
Order 4. Dodecandria
Indian vervain Mallow
Claſs 16. Monadelphia
Order 5. Polyandria
Rose Mallow
Claſs 17. Diadelphia
Order 2. Hexandria
Yallow Fumitory
Claſs 17. Diadelphia
Order 3. Octandria
Milkwort
Claſs 17. Diadelphia
Order 4. Decandria
Everlasting Pea
Claſs 18. Polyadelphia
Order 1. Pentandria
Theobroma
Claſs 18. Polyadelphia
Order 2. Icosandria
Orange
Claſs 18. Polyadelphia
Order 3. Polyandria
St. John's wort
Claſs 19. Syngenesia
Order 1. Polygamia Æqualis
Dandelion
Claſs 19. Syngenesia
Order 2. Polygamia Superflua
Xeranthemum
Claſs 19. Syngenesia
Order 3. Polygamia Frustanea
Sun flower
Claſs 19. Syngenesia
Order 4. Polygamia Neceſsaria
Marygold
Claſs 19. Syngenesia
Order 5. Polygamia Segregaia
Globe Thistle
Claſs 19. Syngenesia
Order 6. Monogamia
Cardinal Flower
Claſs 20. Gynandria
Order 1. Diandria
Orchis
Claſs 20. Gynandria
Order 1. Triandria
Bermudiana
Claſs 20. Gynandria
Order 4. Pentandria
Paſsion Flower
Claſs 20. Gynandria
Order 5. Hexandria
Birthwort
Claſs 20. Gynandria
Order 7. Polyandria
Cuckow Pint

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The Filaments of the Stamens, grown together into Three or more Bodies.

CLASS XVIII.	Order 1. Pentandria	III. ORDERS.
	Order 2. Icoſandria	
	Order 3. Polyandria	

The Stamens with the Anthers of the ſaid Stamens, grown together in the Form of a Cylinder.

CLASS XIX.	Order 1. Polygamia Equalis	VI. ORDERS.
	Order 2. Polygamia Superflua	
	Order 3. Polygamia Fruſtranea	
	Order 4. Polygamia Neceſſaria	
	Order 5. Polygamia Segregata	
	Order 6. Monagamia	

The Stamens inſerted on the Piſtil.

CLASS XX.	Order 1. Diandria	VIII. ORDERS
	Order 2. Triandria	
	Order 3 Tetrandria	
	Order 4. Pentandria	
	Order 5. Hexandria	
	Order 6. Decandria	
	Order 7. Dodecandria	
	Order 8. Polyandria	

The Male and Female Flowers on the ſame Plant.

CLASS XXI.	Order 1. Monandria	XI. ORDERS
	Order 2. Diandria	
	Order 3. Triandria	
	Order 4. Tetrandria	
	Order 5. Pentandria	
	Order 6. Hexandria	
	Order 7. Heptandria	
	Order 8. Polyandria	
	Order 9. Menadelphia	
	Order 10. Syngoneſia	
	Order 11. Gynandria	

The Male and Flowers on different Plants of the ſame Species.

CLASS XXII.	Order 1. Monandria	XIV. ORDERS
	Order 2. Diandria	
	Order 3. Triandria	
	Order 4. Tetandria	
	Order 5. Pentandria	
	Order 6. Hexandria	
	Order 7. Oclandia	
	Order 8. Enneandria	
	Order 9. Decandria	
	Order 10. Dedecandria	
	Order 11. Polyandria	
	Order 12. Monadelphia	
	Order 13. Syngeneſia	
	Order 14. Gynandria	

The Hermaphrodite and Male or Female Flowers on the ſame Plant.

CLASS XXXIII.	Order 1. Moniœcia	III. ORDERS.
	Order 2. Diœcia	
	Order 3. Triœcia	

The Parts of the Fructification imperceptible to the Eye.

CLASS XXIV.	Order 1. Filices	IV. ORDERS.
	Order 2. Muſci	
	Order 3. Algæ	
	Order 4. Fungi	

It has been before obſerved, that the Orders are taken from the *Females*, or *Piſtils*, as the Classes are from the *Males* or *Stamens*; but in the Claſſes of the Syngeneſia, the Orders differ from the reſt: e. g. Monogynia, Digynia, Trigynia, &c. Γυνὴ *Fœmina*, with the prefixing of the *μόνος one, δις two, τρεῖς three, τεσσαρες four*, &c. Which ſignifies that there are 1, 2, 3, 4, &c. piſtils. Here the number of the piſtils is taken from the baſis of the ſtyles; if the baſis ſhould be deficient, then the calculation is to be made from the number of the ſtigmas.

Polygamia Equalis; that is, of many floſculi, furniſhed with ſtamens and piſtils. Flowers of this ſort are for the moſt part commonly called ſemi-floſculous.

Polygamia Spuria; that is, the hermaphrodite floſculi occupy the diſk, and the female floſculi ſurround the margin, which are deprived of the ſtamina, and that in three-fold manner.

Superfluous; that is, when the flowers of the hermaphrodite diſk are furniſhed with a ſtigma, and produce ſeeds; but the floſculi conſtituting the radius, being deprived of a ſtigma, cannot produce ſeeds.

Neceſſary; that is, when the hermaphrodite flowers, through a defect of the ſtigma or piſtil, cannot perfect their ſeeds; but the female flowers in the radius produce perfect ſeeds.

Segregated; that is, when ſeveral partial floriferous calyxs are contained in a calyx, common to all, ſo as to form only one flower.

A diſtinct and intelligible view of the ſeveral Claſſes and Orders, may be obtained by conſulting Plates, IV. V. and VI. of Botany, explained by the following references, which I have endeavoured to make as plain as poſſible.

PLATE IV.

CLASS I.

Order 1. *Canna* (Indian flowering reed). The whole flower is repreſented in the firſt figure; the perianthium is triphillous, as 1; the corolla monopetalous, but divided into ſix ſegments, 2, 2; the nectarium is ſhaped like a petal, and divided into two ſegments, the upper aſcending archwiſe, the inferior rolled back, 3; the filament is wanting, but the anthera adheres to the margin of the ſuperior ſegment of the nectarium, 4; the parts of the piſtil are a roundiſh germen, 5; ſword ſhaped ſtyle, 6, adhering to the nectarium; and a linear ſtigma, 7, growing to the margin of the

Order 2. *Blightum* (virgate ſtrawberry blite). The perianthium is tripartite, 1; no corrolla; the filament briſtly, 2; the antheræ is a twin, 3; the germen ovate, 4; the ſtyles two, 5, 5; and the ſtigmas ſimple, 6, 6.

CLASS II.

Order 1. *Monarda* (Oſwego tea). The perianthium of one leaf, 1; the corrolla monopetalous, but divided into two lips, 2; the two filaments are ſetaceous, 3; the antheræ compreſſed, 4; the germen quadrifid, 5; the ſtyle filiform, 6; and the ſtigma bifid, 7.

Order 2. *Anthoxanthum* (vernal graſs). The calyx is a bivalvular glume, with one flower, 1; the corolla is an uniflorous bivalvular glume, each valve having a dorſal ariſta, 2; the nectarium is diphillous, thin, cylindrical, embracing the germen, ſtamen, and ſtyle 3, 3; the filaments like two hairs, 4, 4; the antheræ double forked, 5, 5; the germen oblong, 6; and the ſtyles thread ſhaped, 7, 7.

Order 3. *Piper* (black pepper). The perianthium monophyllous, 1; no corrolla, or filaments; the antheræ are two, placed at the root of the germen, 2; the germen is large, 3; there are no ſtyles, but there are briſtly ſtigmas, 4; a fillyform ſpadix, covered with flowers, 5.

CLASS III.

Order 1. *Crocus* (garden crocus). The calyx a ſpatha, 1; the corolla is monopetalous; its tube, 2, is long, and its limb divided into ſix parts, 3; the filaments are three and awl-ſhaped, 4; the antheræ are arrow ſhaped, 5; the germen is roundiſh, 6; the ſtyle filliform, 7; the ſtigmas are three, 8, 8.

Order 2. *Avena Fatua*, (wild oats). The calyx is a bivalvular glume generally with many flowers; the valves without beards, 1; the wild oat having a beard, 2; the corolla bivalvular, having a beard ſpirally wreathed, and growing out at its bark; the filaments are three, and like hairs, 3; the antheræ oblong and bifurcate, 4; the germen obtuſe, 5; the ſtyles are two, reflex, thread like, and feathered at the top, 6; but the ſtigmas undivided.

Order 3. *Mallugo* (Virticillute). The calyx a perianthium of five leaves, 1; no corolla; the filaments three, lying cloſe to the piſtil, 2; the antheræ ſimple, 3; the germen ovate and triſulcate, 4; the ſtyles are three and ſhort, 5.

CLASS IV.

Order 1. *Dipſacus* (laciniated teazel). The common perianthium of the calyx is multiflorous, 1; the proper perianthium ſcarce diſtinguiſhable to the naked eye, 2; the univerſal corolla equal, 3; the proper corolla monopetalous, 4; the filaments are four, 5; the antheræ incumbent, 6; the germen, 7; and the ſtyle filiform, 8.

Order 2. *Hamamelis* (witch hazel). The involucrum is triphyllous, 1; the calyx a double perianthium, the exterior diphyllous, and the interior tetraphyllous, 2; the corolla has four long linear petals, 3; the nectarium four folioles, truncated, and grown to the corolla, 4; the filaments are four and linear, 5; the antheræ obovate like two together, with a ſmall elevated top, 6; the germen ovate and hairy, 7; the ſtyles two, 8; and the ſtigmas truncated, with an elevated top, 9.

Order 3. *Potamogeton*, (pond weed). The corolla hath four petals, 1, the filaments are four, but very ſhort, 2; the antheræ are twins, 3; the germina are four, 4; no ſtyle; the ſtigmas obtuſe, 5.

CLASS V.

Order 1. *Nerium* (roſe bay). The perianthium monophyllous, and quinquepartite, 1; the corolla of one leaf, and funnel ſhaped, but divided at the upper part into five, 2; the filaments are five, and ſhort, 3; the antheræ arrow ſhaped, inclining together, and terminating in a long thread, 4; the germen roundiſh and bifid, 5; the ſtyle cylindric, 6; and the ſtigma truncate, 7.

Order 2. *Anethum* (common fennel). The univerſal umbel conſiſts of many partial umbels, 1; a partial umbel, 2; and univerſal involucrum none; a partial one none; the proper perianthium obſolete; the univerſal corolla uniform; the floſcules all fertile, and conſiſting of five petals, 3; the filaments and capillary, 4; the antheræ roundiſh, 5; the germen, 6; the ſtyles two, 7; and the ſtigmata obtuſe, 8.

Order 3. *Turnera*. The perianthium monophyllous, its tube cylindrical, the limb quinquepartite, 1; the petals five, 2; the filaments five, 3; the antheræ, 4; the conic germen, 5; the ſtiles three, 6; a ſtile magnified, 7; the ſtigmas are bundles of hairs, 8.

Order 4. *Parnaſſiah* (graſs of Parnaſſus). The petals five, 1; the filaments five, 2; the antheræ, 3; the nectaria five, 4; the germen ovate, 5; no ſtyle; the ſtigmas four, 6.

Order 5. *Craſſula* (navelwort). The perianthium pentaphyllous, 1; the petals five, united at their baſe, 2; the filaments five, 3; the antheræ oblong, 4; the germina five, 5; the nectaria five, 6; the ſtyles five, 7; and the ſtigma obtuſe, 8.

Order 6. *Myoſurus* (mouſe tail). The perianthium pentaphyllous, 1; no corolla; the nectaria five, 2; the filaments five, 3; the antheræ oblong, 4; the germina numerous, 5; each germen is conic and ſmooth, 6; no ſtyles; ſtigmas ſimple, 7.

CLASS VI.

Order 1. *Amaryllis* (belladona). The corolla hexapetalous, bell-ſhaped, with a hook on every other petal, 1; the filaments ſix, 2; the antheræ 3; the germen, 4; the ſtyles, 5; and the ſtigmas, 6.

Order 2. *Oryza* (rice). The glume of the calyx, 1; the corolla is bivalve, 2; the nectaria are two, 3; the filaments ſix, and capillary, 4; the antheræ bifid, 5; the germen ſhaped like a top, 6; the ſtyles two, 7; and the ſtigmas elevated, 8.

Order 3. *Rumex* (great curled dock). The perianthium triphyllous; the petals three, 1; the filaments ſix, 2; the antheræ, 3; the germen, 4; the ſtyles three, 5; the ſtigmas, 6.

Order 4. *Petiveria*. The perianthium monophyllous, but the quadripartite, 1; no corolla; the filaments ſix, 2; the antheræ oblong, 3; the germen compreſſed, 4; the ſtyles four, 5; and the ſtigmas, 6.

Order 5. *Aliſma* (great water plantation). The petals three, 1; the filaments ſix, 2; the antheræ roundiſh, 3; the germina more than five, 4; a ſingle germen, 5; the ſtyle, 6; and ſtigma, 7.

CLASS VII.

Order 1. *Æſculus* (horſe cheſnut). The perianthium monophyllous, tubulous; quinquefid, 1; corolla, five petals inſerted in the calyx, 2 *a*; the filaments ſeven, inſerted in the receptacle, ſubulate, bending downwards, pilous, 2 *b*, 3 *a*; anthera ovate, riſing upright, 2 *c*, 3 *b*; germen ovate and villous, 4 *a*, 5 *a*, ending in a ſubulate ſtyle, 5 *b*; ſtigma acuminate, 5 *c*.

Order 3. *Staturus* (lizard's tail). The amentum (or catkin) oblong, covered with flowers, 1; the proper perianthium monophyllous, ovate, lateral, coloured, and hairy, 2, 3; corolla none; filaments ſeven, filiform, 3 *a*; anthera oblong, erect, 3 *b*; germina four, ovate 4 *a*; ſtyles thickiſh, ſubulate, 4 *b*; ſtigmas ſimple, acute 4 *c*.

CLASS VIII.

Order 1. *Oenothera* (tree primroſe). The perianthium monophyllous, the tube cylindraceous, the limb quadripartite, 1; corolla, four petals, obcordate, 2 *a*; inſerted at the diviſures of the calyx, 3; filaments eight, ſubulate, incurved, inſerted in the mouth of the calyx, ſhorter than the corolla, 2 *b*, 4 *a*; antheras oblong, incumbent, 2 *c*, 4 *b*; germen cylindraceous, ſtanding under the corolla, 5 *a*; ſtyle filiform, of the length of the ſtamina, 5 *b*; ſtigmas quadrifid, thick, obtuſe, reflexed, 5 *c*.

Order 2. *Galenia*. The perianthium ſmall, quadrifid, and concave, 1; corolla none; filaments eight, like hairs, 2 *a*; anthera divided into two lobes, 2 *b*, 3 *a*; germen nearly round, 2 *c*, 4 *a*; ſtyles two, ſimple, reflexed, 4 *b*; ſtigmas, ſimple, obtuſe, 4 *c*.

Order 3. *Polygonum* (buck wheat). The perianthum turbinate, on the outſide coloured, quinquepartite, 1 *a*, 2 *a*; corolla none, except the coloured calyx: filaments often eight, ſubulate, ſhort, 2 *b*, 3 *a*; antheras ſubrotund, incumbent, 2 *c*, 3 *b*; the germen triquetrous, 2 *d*, 4 *a*; ſtyles often three, filiform, very ſhort, 4 *b*; ſtigmas ſimple, 4 *c*.

Order 4. *Adoxa*, (tuberous moſchatel). The flowers terminating in a head, 1; perianthium below the flowers, bifid, ſpreading flat, 2; corolla monopetalous, quadrifid, ſpreading flat, 3 *a*; filaments eight, 3 *b*, 4 *a*; antheras ſubrotund, 3 *c*, 4 *b*; germen within the receptacle of the corolla, 3 *d*, 5 *a*; ſtyles four, ſimple, erect, 5 *b*; ſtigmas ſimple, 5 *c*.

CLASS IX.

Order 1. *Caſſita* (berry bearing). The perianthium triphillous; the folioles acute, concave, a little ſpreading, 1 *a*, 2 *a*; petals three, their margins from the middle to their points convolute, 2 *b*; the nectarium is formed of three glands, coloured, truncate, the length of the germen, and ſtanding round it, 3 *a*, 4 *a*; filaments nine; 2 *c*, 4 *b*; antheras with three lobes, 4 *c*; germen ſtanding under the flower, 2 *d*, 4 *d*, 5 *a*; ſtyle, 5 *b*; ſtigma trilobate, 5 *c*.

Order 2. *Rheum* (palmated rhubarb). Calyx none; corolla monopetalous, the limb cut into ſix ſegments, 1 *a*; filaments nine, inſerted into the corolla, 1 *b*; antheras twins, 1 *c*; germen three-cornered, 2 *a*; ſtyles ſcarce any, 2 *b*; ſtigmas three, reflex, plumoſe, 2 *c*.

Order 3. *Butomus* (flowering ruſh). The involucrum ſimple, triphyllous, 1; petals ſix, 2 *a*; filaments nine, of which ſix are exterior, 3 *a*; antheras as if compoſed of two plates, 3 *b*; germens ſix, 4 *a*, terminating in ſtyles, 4 *b*; ſtigmas ſimple, growing to the inſide of the ſtyles, 4 *c*.

CLASS X.

Order 1. *Kalmina* (narrow leaved kalmia). The perianthium quinquepartite, 1; corolla monopetalous, partly hypocrateriform, and partly infundibuliform, cut into five ſegments, 2 *a*; ten nectariferous horn-ſhaped cavities, which before the flower is perfectly blown, contain the ſtamens and antheras like a ſheath, 2 *b*, 3 *a*; filaments ten, inſerted into the baſe ef the corolla, 3 *b*; antheras ſimple, 3 *c*; germen roundiſh, 4 *a*; ſtyle filiform, 4 *b*; ſtigma obtuſe, 4 *c*.

Order 2. *Saxifraga* (ſaxifrage). The perianthium monophyllous, quinquepartite, 1; petals five, 2 *a*; filaments ten, 3 *a*; antheras ſubrotund, 3 *b*; germen roundiſh, tapering upwards, 3 *c*, 4 *a*, ſo as to form two ſhort ſtyles, 4 *b*; ſtigmas obtuſe, 4 *c*.

Order 3. *Stellaria* (greater ſtilchwort). The perianthium pentaphyllous, 1; petals five, bipartite oblong, 2 *a*; filaments ten, every other ſhorter, 3 *a*; antheras heart-ſhaped, 3 *b*; ſtigmas obtuſe, 4 *c*.

Order 4. *Oxalis* (wood ſorrel). The perianthium quinquepartite, 1; corolla monopetalous, quinquepartite, the ungues joined together at their baſes, 2 *a*; filaments ten, capillary, the exterior ſhorter than the interior, 3 *a*; antheras ſubrotund, furrowed, 3 *b*; germen quinquangular, 4 *a*; ſtyles five, filiform, 4 *b*; ſtigmas obtuſe, 4 *c*.

Order 5. *Phytolacca*, (American nightſhade) Calyx none (except the corolla is taken for a coloured calyx); petals five, 1 *a*, 2 *a*; filaments ten (eight or twenty), 2 *b*; antheras ſubrotund, 2 *c*; germen orbicular, divided on the outſide by little bands or wreaths, 2 *d*, 3 *a*, terminating with ten (or eight) ſtyles, 3 *b*; ſtigmas ſimple, 3 *c*.

CLASS XI.

Order 1. *Aſarum* (aſarabacca). The perianthium monophyllous, bell-ſhaped, ſemitrifid, coriacious, coloured, villous, 1; corolla none; filaments twelve, ſubulate, inſerted on the top of the germen, 2 *a*, 3 *a*; antheras, oblong, joined to the middle of the filaments, 2 *b*, 3 *b*; germen below the calyx, and hid within its ſubſtance, 3 *c*, 4 *a*; ſtyle, a cylindraceous cone, hexagonal, 3 *d*, 4 *b*; ſtigma ſtar-ſhaped, 3 *e*, 4 *c*.

Order 2. *Agrimonia* (lizard's tail). The perianthium monophyllous, quinquefid, ſitting on the top of the germen, 1 *a*; ſurrounded by another calyx, 1 *b*; petals five, and inſerted in the calyx, 2 *a*; filaments capillary, inſerted into the calyx, 2 *b*; antheras twins, 2 *c*; germen ſitting under the calyx, 3 *a*; ſtyles two, ſimple, 3 *b*; ſtigmas 3 *c*.

PLATE V.

CLASS XI.

Order 3. *Euphorbia* (ſpurge). Perianthium monophyllous, ventricoſe, having at the mouth four teeth, ſometimes five, 1 *a*, 2 *a*; petals four, ſome few five, turbinated, gibbous, ſwelled, truncated, 1 *b*, 2 *b*, with the calycine denticles alternate, 2 *c*; the ungues faſtened to the margin of the calyx, 2 *d*; filaments many, twelve or more, filiform, articulated, inſerted on the receptacle, 3 *a*; antheras didymous, ſubrotund, 3 *b*; germen ſubrotund, triquetrous, with a foot ſtalk, 4 *a*; ſtyles three, bifid, 4 *b*; ſtigmas obtuſe, 4 *c*.

Order 5. *Sempervivum*, (houſe leek). The perianthium divided into from ſix to twelve ſegments, with hairs round their margin, 1; petals, from ſix to twelve, a little larger than the calyx, 2 *a*; filaments from ſix to twelve, 2 *b*; antheras, ſubrotund; before they diſcharge their pollen, ſubovate, 3 *a*; with four furrows, after the pollen is diſcharged, 3 *b*; germens from ſix to twelve, placed in a circle, erect, 4 *a*, terminating in as many ſtyles, 4 *b*; ſtigmas, acute, villous, 4 *c*.

CLASS XII.

Order 1. *Punica* (pomegranated). The perianthium monophyllous, bell ſhaped, quinquefid, 1; petals five, inſerted into the calyx, 2 *a*; filaments numerous, capillary inſerted into the calyx, 3 *a*; antheras a little oblong, 3 *b*; germen placed below the calyx, 3 *c*, 4 *a*; ſtyle ſimple, 4 *b*; ſtigma headed, 4 *c*.

Order 2. *Cratægus* (bean tree). The perianthium monophyllous, having five teeth, 1; petals five, inſerted in the calyx, 2 *a*; filaments twenty, inſerted in the calyx, 3 *a*; antheras ſubrotund, 3 *b*; germen below the flower, 4 *a*; ſtyles two, 4 *b*; ſtigmas, 4 *c*. Note, Fig. 4. is a Longitudinal Section.

Order 3. *Sorbus* (quicken tree). The perianthium monophyllous, having five teeth, 1 ; petals five, ſeſſile, inſerted into the calyx, 2 *a* ; filaments twenty, inſerted into the calyx, 2 *b* ; antheras roundiſh, 2 *c* ; germen ſtanding under the receptacle, 3 *a* ; ſtyles three, 3 *b* ; ſtigmas capitate, 3 *c*. Note, Fig. 3. is a longitudinal ſection.

Order 4. *Pyrus* (apple). The perianthium monophyllous, ſemiquinquefid, 1 ; petals five, inſerted into the calyx, 2 *a*, 3 *a* ; filaments twenty, inſerted into the calyx, 3 *b* ; antheras ſimple, 3 *c* ; germen placed below the calyx, 3 *d* ; ſtyles five, 3 *e* ; ſtigmas ſimple, 3 *f*. Note, Fig. 3. is a longitudinal ſection.

Order 5. *Rubus* (bramble or briar). The perianthium monophyllous, quinquepartite, 1 ; petals five, inſerted in the calyx, 2 *a* ; filaments many, inſerted in the calyx, 2 *b* ; antheras ſubrotund, compreſſed, 2 *c*, 3 ; germens numerous, 4 *a* ; ſtyles filliform, coming out of the ſides of the germens, 4 *b* ; ſtigmas ſimple, 4 *c*.

CLASS XIII.

Order 1. *Sarracenia* (ſide ſaddle flower). The calyx is a double perianthium, the inferior with three ſmall leaves, 1 *a*, the ſuperior with five leaves, large and coloured, 1 *b*, 2 *a* ; petals five, inflex, aſſurgent, betwixt the angles of the ſtigma, covering the ſtamens, embracing the top of the ſtigma, 2 *b* ; filaments many, 3 *a* ; antheras ſimple, 3 *b* ; germen roundiſh, furrowed, 3 *c* ; ſtyle cylindrical, growing thicker at the top, 3 *d* ; ſtigma ſhield ſhaped, the ſtyle inſerted in its middle, membranaceous, quinquangular, overſhading the ſtyle, germen, and ſtamens, like an umbrella, 2 *c*, 3 *e*.

Order 2. *Pœnia* (piony). The perianthium pentaphyllous, the folioles ſubrotund, reflex, unequal in ſize and ſituation, 1 ; petals, five, 2 *a* ; filaments numerous, ſhort, about three hundred ſtanding in three circles round the germens, 3 *a* ; antheras oblong, quadrangular, large and quadrilocular, 3 *b* ; germens two, ovate and downy, 3 *c c* ; ſtigmas recurvate, 3 *d d*.

Order 3. *Aconitum* (wolfsbane). Calyx none ; petals five, unequal, the uppermoſt helmet ſhaped and tubulate, the two lateral ones are broad, ſubrotund, oppoſite, connivent, the two undermoſt are oblong, bending downwards, 1 *a b c* ; nectaria two, covered by the helmet ſhaped petal, 1 *d* ; filaments many, ſhort, 1 *c*, 2 *a* ; antheras heart ſhaped, 2 *b* ; germens three (ſometimes five), 3 *a* ; terminating in a ſtyle, 3 *b* ; ſtigmas ſimple, acuminate, 3 *c*.

Order 5. *Aquilegia* (columbine). Calyx none ; petals five, 1 *a*, 2 *a* ; the nectaria five, equal, with the petals placed alternate 1 *b* ; each is horn ſhaped, on the upper part gradually broad, aſcending obliquely on the outer ſide with an opening or mouth fixed on the inner ſide to the receptacle, 4 ; the baſe advancing to a long tube, growing narrower, the apex obtuſe, incurved ; filaments from thirty to forty, the outer ſhort, 1 *c*, 5 *a* ; antheras oblong, 5 *b* ; germens five, 6 *a*, terminating in ſubulated ſtyles, longer than the ſtamens, 5 *c*, 6 *b* ; ſtigmas ſimple, 5 *d*, 6 *c* ; the germens are each covered with two paleas, 5 *e*.

Order 6. *Stratiotes* (water aloe). The ſpatha diphyllous, uniflorous, 1, 2 *a*, on both ſides carinated, the carinas jagged with ſhort ſpines ; perianthium monophyllous, tripartite, 2 *b*, 3 ; petals three, obcordate, 2 *c* ; filaments twenty, ſhort, inſerted in the receptacle, 4 *a* ; antheras ſimple, ſagittated, and lanceolated, 4 *b* ; germen inferous, 5 *a* ; ſtyles ſix, bipartite, 5 *b*, longer than the ſtamens ; ſtigmas ſimple, 5 *c*.

Order 7. *Ranunculus* (crowfoot). The perianthium pentaphyllous, 1 ; petals five, 2 ; the nectarium at the ungues of each petal hath a hollow or cavity, 3 *a* ; the eſſential character conſiſts in the nectarium, the other parts being commonly inconſtant and different, which when unknown, cauſes a great deal of confuſion ; the nectarium is in ſome ſpecies only an open pore, in others ſurrounded with a cylindraceous margin, and ſome few cloſed by an emarginated ſcale ; filaments many, four in the magnified one, *b* ; germens numerous, collected in a ſmall head, 5 *a* ; ſtyles none ; ſtigmas reflexed, very ſmall ; a germen magnified, 5 *b* ; its ſtigma, 5 *c*.

CLASS XIV.

Order 1. *Melittis* (baſtard balm), The perianthium monophyllous, bell ſhaped, villous, the mouth bilabiate, the upper lip higher, the inferior lip ſhorter and trifid, 1 ; corolla monopetalous, gaping, the tube long and narrow, the upper lip erect, the inferior, patent, trifid, 2 ; filaments four, the inner ones ſhorter than the outer, 3 *a* ; antheras in pairs, croſs ways, bifid, 3 *b* ; germen quadrifid, villous, 4 *a* ; ſtyle filiform, 4 *b* ; ſtigma bifid, 4 *c*.

Order 2. *Melianthus* (honey flower). The perianthium large, quinqueparte ; the ſuperior lacinias erect, oblong, 1 *a*, the under lacinia very ſhort, 1 *b*, ſhaped like a bag, downwards gibbous ; the two middle lacinias lanceolate, 1 *c* ; petals five, the upper one erect, 2 *a* ; the other four on the upperſide patent, reflexed at the apex, 2 *b* ; the nectarium is in the undermoſt lacinia of the calyx filaments four, 2 *c* ; antheras cordate, oblong, on the fore part quadrilocular, 2 *d* ; germen tetragonous, ending in four knobs, 3 *a* ; ſtyle 3 *b* ; ſtigma, quadrifid, 3 *c*.

CLASS XV.

Order 1. *Lunaria* (honeſty, moonwort, or ſattin flower). the perianthium tetraphyllous, the folioles ſpread at their apex, two of them are gibbous at the baſe like a ſack, 1 ; corolla tetrapetalous, each petal terminating with an unguis, the length of the calyx, 2 *a* ; filaments ſix, four longer and two ſhorter. 3 *a* ; antheras, 3 *b* ; germen on a pedicle, 3 *c* ; ſtyle of a conic form, 3 *d* ; ſtigma, 3 *c*.

Order 2. *Cheiranthus* (ſtock July flower). The perianthium tetraphyllous, the two exterior folioles are gibbous at their baſes, 1 ; corolla tetrapetalous, 2 *a* ; filaments ſix, four longer and two ſhorter, 3 *a* ; antheras bifid at the baſe, 3 *b* ; germen, in ſhape of a priſm, tetragonous, 3 *c* ; ſtyled ſhort, 3 *d* ; ſtigma bipartite, 3 *e*.

CLASS XVI.

Order 1. *Hermannia* (Ethiopian alder). The perianthium monophyllous, quinquefid, 1 ; corolla pentapellous, 2 *a*, twiſting from the right to the left, 3 (Note, Fig. 3. is magnified) ; the ungues of the petals on both ſides are provided with a nectariſerous membrane, rolled up lengthway, and in form of a tube, 4 ; filaments five, joined together in one body at the baſe, 5 *a* ; antheras, 5 *b* ; germen ſubrotund, pentagonous, quinquangular, 6 *a* ; ſtyles five, ſtanding near each other, 6 *b* ; ſtigmas, ſimple, 6 *c*.

Order 2. *Geranium* (cranes bill). The perianthium monophyllous, quinquepartite, 1 ; petals five, 2 *a* ; filaments ten, five longer, five ſhorter, alternately, 3 *a* ; antheras turn on the apex of the filament like the needle of a compaſs, 3 *b* ; germen quinquangular, having a beak like that of a crane, 4 *a* ; ſtyle, 4 *b* ; ſtigmas five reflexed, 4 *e*. Note, The African geraniums have commonly the calyx at the baſe, tubulous and monophyllous, the petals unequal, the filaments at their baſe ſlightly grown together, generally no more than ſeven antheras, their ſeeds uncovered with long feathery beards. The European geraniums, &c. have a calyx conſiſting of ſix leaves.

Order 4. *Pentapetes* (Indian vervain mallow). The involucrum uniflorous, triphyllous, 1 *a*, 2 *a* ; the perianthium monophyllous, quinquepartite, 1 *b*, 2 *b* ; corolla monopetalous, the tube ſhort, the limb quinquepartite, 3 *a* ; filaments fifteen, connected at the baſe into a tube, 3 *b*, 4 *a* ; five filaments long, without antheras or farina, between two or three filaments, with their anthera, ſtands one of the longer ones, without their anthera, 4 *b* ; anthera, 3 *c*, 4 *c* ; germen ſubrotund, with five furrows, 5 *a* ; ſtyle, cylindraceous, 5 *b* ; ſtigma, 5 *c*.

Order 5. *Alcea* (roſe mallow). The perianthium double ; the exterior monophyllous, divided into ſix ſegments, 1 *a* ; the interior monophyllous, ſemiquinquefid, 1 *b* ; petals five, joined together at their baſe, 2 *a* ; filaments numerous, forming at the baſe a pentagonous cylinder, inſerted into the corolla, 2 *b*, 3 *a* ; antheras reniform, 3 *b* ; germen orbicular, 1 *c* ; ſtyle cylindraceous, 1 *d* ; ſtigmas numerous (twenty), 1 *e*.

CLASS XVII.

Order 2. *Fumaria* (yellow fumitory). The perianthium diphyllous, 1, 2 *a* ; corolla oblong, tubulated, gaping, 2 *b* ; filaments two, each incloſed in its lip, 3 *a* ; antheras three, terminating each filament, 3 *b* ; germen oblong, 3 *c*, 4 *a* ; ſtyle the length of the filaments in this ſpecies, 3 *d*, 4 *b* ; ſtigma, 3 *c*, 4 *c*.

Order 3. *Polygala* (milkwort). The perianthium tripartite, 1 ; one of the folioles ſtands above the corolla, and two below it, 2 *a* ; corolla butterfly ſhaped, the number of petals undetermined, 3 ; the wings, 3 *a* ; the vexillum (or ſtandard), 3 *b* ; filaments diadelphous, eight in one body, 4 *a* ; antheras eight, 4 *b* ; germen oblong, 5 *a* ; ſtyle, 5 *b* ; ſtigma terminates with a navel, 5 *c*.

Order 4. *Lathyrus* (everlaſting tea). The perianthium monophyllous, ſemiquinquefid, campanulate, 1 ; corolla butterfly ſhaped, 2, the carina (or keel), 2 *a*, opens in the middle internally ; filaments diadelphous, one ſtamen ſtanding by itſelf, the others in one body divided into nine, 3 *a* ; antheras, 3 *b* ; ſtigma villous, 4 *c*.

CLASS XVIII.

Order 1. *Theobroma*. The perianthium quinquepartite, the folioles plain with three nerves, 1 ; petals five, with five nerves, inſerted by the unguis into the ſquamas of the exterior nectarium under and within its apex, 2 *a* ; filaments five, ſhort, between the ſquamas of the interior nectarium, as the antheras, which are from three to ſeven, in each family, grow on the outſide of the nectarium ; the antheras are didymous, divaricated, uniform, and yellow, 3 *a* ; german ſtanding above the flowers, cylindraceous, quinquangular, 4 *a* ; ſtyles five, approximate, 4 *b* ; ſtigmas 4 *c*.

Order 2. *Citrus* (orange). The perianthium monophyllous, quinquedentate, 1 ; petals five, 2 *a* ; filaments about twenty, ſtanding in a circle, or cylinder, joined together in many or few ſmall bodies, 3 *a* ; antheras, 3 *b* ; germen, 4 *a* ; ſtyle 4 *b* ; ſtigma globoſe, hath within nine loculaments, 4 *c* ; the ſtigma magnified, 4 *d*.

Order 3. *Hypericum* (St. John's wort). The perianthium quinquepartite, 1 ; petals five, having round the margin, in this ſpecies, glandules, 2 *a*, 3 *a* ; filaments numerous, grown together at the baſe in five or ſix phalanxes, 3 *b* ; antheras ſmall, on both ſides canaliculated ; on the apex a black gland, 4 *a* ; germen ovate, in this ſpecies, 5 *a*, ſtyles three, ſpreading, 5 *b* ; ſtigma, 5 *c*.

CLASS XIX.

ORDER 1. *Leontodon* (dandelion). The common calyx, 1; the interior ſcales linear, 1 *a*; the exterior ſcales fewer, often reflexed 1 *b*; the compound corolla, 2; the corollulas, of which it is compoſed, being hermaphrodite, 3; the proper corolla monopetalous, quinquedentate, 3; filaments five, 4 *a*; antheras cylindraceous, tubuloſe, 4 *b*; germen, 5 *a*; ſtyle 5 *b*; ſtigmas two, revoluſe, 5 *c*.

ORDER 2. *Xeranthemum* (eternal flower). The common calyx, 1; the compound corolla unequal, in which the hermaphrodite corollulas are very numerous, tubular, placed in the diſk; the female corollulas leſs numerous, tubular, placed in the circumference, 2 *a*, 3 *a*; the firſt being the proper corollas of the hermaphrodite floſcules, are funnel ſhaped, much ſhorter than the calyx, the limb quinquefid, 4, 5; the ſecond, being the proper corollas of the female floſcules, are tubular, 6 *a*; ſtamens of the hermaphrodite flowers have five ſhort filaments, 5 *a*; antheras cylindraceous, tubular, 5 *b*; germen of the hermaphrodites, ſhort, coronate, crowned in this ſpecies with a crown of five ſetaceous points, 4 *a*; the ſtyle filiform, 5 *c*; ſtigma bifid, 5 *d*; germen of the females as in the hermaphrodites, 6, 7; ſtyle 7 *a*; ſtigma, elevate, 7 *b*.

ORDER 3. *Helianthus* (ſun flower). The calyx, 1; the compound corolla radiate, its corollulas are either thoſe of hermaphrodite floſcules, numerous, and placed in the diſk, 2 *a*, or thoſe of the females floſcules, leſs numerous, much longer, and placed in the radius, 2 *b*; the proper corolla of the hermaphrodite floſcules are cylindraceous, 3; the proper corolla of the female floſcules in the form of a tongue, 4; filaments of the hermaphrodites, five, 5 *a*; antheras cylindraceous, 3 *a*, 5 *b*; germen of the hermaphrodite floſcules oblong, 5 *c*; ſtyle filiform, 5 *d*; ſtigma bipartite, reflex, 5 *e*; germen of the female floſcules ſmall, 4 *a*; ſtyle none; ſtigma none.

ORDER 4. *Calendula* (marygold). The common calyx ſimple, 1; the corolla a compound radiated flower, 2; the hermaphrodite corollulas many in the diſk, 3 *a*; the female corollulas many, 3 *b*; the proper hermaphrodites tubulous, 4; the limb quinquefid, 4 *a*; the female tongue ſhaped, 5, with three teeth, 5 *a*; filaments of the hermaphrodite five, 6 *a*; antheras cylindraceous, tubulous, 6 *b*; germen of the hermaphrodite oblong, 6 *c*; ſtyle filiform, 6 *d*; ſtigma bifid, 6 *e*; germen of the female oblong, trigonous, 5 *b*; ſtyle filiform, 5 *c*; ſtigmas two, 5 *d*.

ORDER 5. *Ethinops*, (globe thiſtle). The calyx a common one, containing many flowers, 1 *a*; the partial perianthium uniflorous, 2 *a*; corolla monopetalous, funnel ſhaped, the border divided into five, reflex, ſpreading, 2 *b*; filaments five, like hairs, ſhort, 3 *a*; antheras cylindraceous, with five teeth, 3 *b*; germens oblong, 4 *a*; ſtyle filiform, 4 *b*; ſtigma double, 4 *c*.

ORDER 6. *Lobelia* (cardinal flower). The perianthium monophyllous, quinquedentate, growing round the germen, 1 *a*; corolla monopetalous, the tube cylindraceous, 1 *b*; the limb quinquepartite, 1 *c*; filaments five, 2 *a*; antheras growing together in the form of an oblong cylinder, 2 *b*; germen 3 *a*; ſtyle cylindraceous, 3 *b*; ſtigma, 3 *c*.

CLASS XX.

ORDER 1. *Orchis*. The calyx, the ſpatha, 1 *a*; the ſpadix, 1 *b*; perianthium none; petals five, the two interior form a helmet, 2 *a*; filaments two, 2 *b*; antheras, 2 *c*; germen oblong, 2 *d*; ſtyle 2 *e*; ſtigma, 2 *f*.

ORDER 2. *Siſyrinchium* (bermudiana). Calyx an univerſal ſpatha, diphyllous, 1; petals ſix, 2 *a*; filaments three, iſſuing from the outward coat of the ſtyle, 3 *a*; antheras bifid at their lower end, fixed to the ſtyle at the bottom of the ſtigma, 3 *b*; germen, 3 *c*; ſtyle, 3 *d*; ſtigma trifid, 3 *e*.

ORDER 4. *Paſſiflora* (paſſion flower). The involucrum three leaved, placed ſo as to leave ſome place betwixt it and the flower, 2 *a*; calyx a perianthium monophyllous, quinquepartite, the keel ending in a hooked briſtle, 2 *b*, 3 *a*; petals five, 2 *c*, 3 *b*; nectarium a triple crown, ſurrounding the piſtillum, divided into rays, 4 *a*, *b*, *c*; filaments five, fixed to the column, growing together at the baſe, 5 *a*; antheras, 5 *b*; germen, 5 *c*; ſtyles three, 5 *d*; ſtigmas, 5 *e*.

ORDER 5. *Ariſtolochia* (birthwort). Calyx none; corolla monopetalous, tubulous, the limb dilated, 1; filaments none; antheras ſix, quadrilocular, at their baſe joined to the ſtigmas, 2 *a*; germen oblong, ſtanding below the flower, angular, 2 *b*; ſtyle ſcarce any; ſtigma ſubgloboſe, ſex-partite, concave, 2 *c*.

ORDER 7. *Arum* (cuckow pint). The calyx and ſpatha, monophyllous, 1; the ſpadix club-ſhaped, 2 *a*; below ſurrounded with germens, 2 *b*; corolla none; filaments none; otherwiſe than like nectarias, which are thickiſh at their baſe, 2 *c*; terminating in a filiform cirrhis or tendrils, 2 *d*; in a double order, coming out in the middle of the ſpadix; antheras many, ſeſſile, tetragonous, between the double order of the cirrhis or tendrils, 2 *e*, joined to the ſpadix; germens many, covering the baſe of the ſpadix, 2 *f*; ſtyles none; ſtigmas being a beard of little hairs, 2 *g*.

PLATE VI.

CLASS XXI.

ORDER 1. *Zonichellia* (triple-headed pond-wort). Male flowers; the calyx monophyllous, tridentated at the mouth, 1; corolla none; filament one, 1 *a*; anthera ſagittated, 1 *b*.

Female flower cloſe to the male; the calyx a monophyllous perianthium, ſcarce viſible, 2; corolla none; germens four, 3 *a*; ſtyles four; 3 *b*; ſtigmas four, 3 *c*.

ORDER 3. *Tripſacum* (Americana). The male flowers; the calyx a glume or chaff, bearing on each ſide two flowers, having two valves, 1; corolla the chaff, bivalve, 1, 2; filaments three, 3 *a*; antheras, 3 *b*.

The female flowers; the calyx, the chaff, divided into two or four, 4; at the baſe winding into a gaping hollow, 5 *a*; the corolla, the chaff, having three valves, 6; germen oblong, 7 *a*; ſtyles two, 7 *b*; ſtigmas hairy, 7 *c*.

ORDER 4. *Urtica* (Roman nettle). The male flowers; the perianthium tetraphyllous; the folioles have a prickle at the apex, 1; petals none; filaments four, 1 *a*; antheras bilocular 1 *b*.

Female flowers, 7; the perianthium two valves, 3, 4 *a*; corolla none; germen, 4 *a*; ſtyles none; ſtigma 4 *b*.

ORDER 5. *Parthenium* (Virginia flower). The common perianthium ſimple, pentaphyllous, 1; corolla compound and convex; the hermaphrodite corollules are many in the diſk, 2 *a*; the females ſtanding round the hermaphrodites, five in the radius, 2 *b*; the property of the hermaphrodite florets monopetalous, 3; tubulous, the mouth quinquefid, 3, 4; the female florets monopetalous, 5, 6, tubulous; the filaments of the hermaphrodites five, capillary, 7 *a*; antheras, 7 *b*; germen of the hermaphrodites within its proper receptacle, hardly to be obſerved, 4 *a*, 7 *c*; ſtyle capillary, 3 *a*; ſtigma none; germen of the females below the flower, 6 *a*; in form of a top, heart-ſhaped, compreſſed, large; ſtyle filiform, 6 *b*; ſtigma two, filiform, 6 *c*.

ORDER 8. *Juglans* (walnut). The male flowers diſpoſed in an oblong amentum, 1; the calyx, the common amentum, all over looſely imbricated, in form of a cylinder, conſiſting of uniflorous ſcales, 2; each fixed in the centre on the outſide of the corolla, bending outwards, 3; corolla ſex-partite, with footſtalks, 2 *a*; inſerted both in the inner centre of the corolla and the rachis, 1 *a*; filaments many (eighteen), very ſhort, 4 *a*; antheras, 4 *b*.

The female flowers have no amentum, two or three are ſitting on the ſame plant, and are ſeſſile, 5; calyx is the perianthium, it is quadrifid, 6 *a*; corolla quadripartite, acute, erect, 6 *b*; germen oval, 7 *a*; ſtyles two, very ſhort, 7 *b*; ſtigma large, on the top lacerated, 7 *c*.

ORDER 9. *Pinus* (Scotch fir). The male flowers growing in a ſpike, 1; calyx, the ſcales of the gem, open during the flowering time; thoſe near the baſe and apex ſteril, 1 *b*, *c*; corolla none, unleſs the little ſcales which adhere to the antheras may be ſo called, 2 *a*; filaments many, growing round a column, in little oval ſpikes, 1 *d*, 3 *a*; antheras oval, after the diſcharge of the pollen they become flexulous and lacerated, 3 *b*; endowed with dorſal ſcales, 3; theſe ſcales are oblong, tapering at both ends.

The female flowers on the ſame plant, 4; the calyx, the common catkin, ovate, conſiſting of ſcales, of which each contains two flowers, 5; corolla none; germen elevated, ſmall, 5 *a*; ſtyle, 5 *b*; ſtigma hairy, 5 *c*.

ORDER 10. *Momordica* (male balſam apple). The male flowers; the perianthium monophyllous, concave, quinquefid, 1; corolla quinquepartite, 2; filaments three, 3 *a*; antheras in two of the filaments are biſid, having ears on both ſides, 3 *b*; the third having only on one ſide an ear.

Female flowers on the ſame plant with the male, 4; perianthium monophyllous, ſtanding above the germen, quinquepartite, 5 *a*; corolla as in the male, 4 *a*; filaments three, very ſhort, without antheras, 5 *b*; germen ſtanding below the flowers, of a conic form, large, 5 *c*; ſtyle one, 5 *d*; ſtigmas three, 5 *e*, 6 *a*.

ORDER 11. *Andrachmne* (baſtard alpine). The male flowers, 1; perianthium pentaphyllous, 2; petals five, 1 *a*; nectaria one within each petal, 1 *b*; filaments five inſerted at the baſe of the ſtyle, 3 *a*; antheras, 3 *b*.

The female flowers on the ſame plant with the males, 4; perianthium pentaphyllous, 4 *a*; petals none; nectaria the ſame as in the male flowers; germen globoſe, 5 *a*; ſtyles three, bipartite 5 *b*; ſtigmas globoſe, 5 *c*.

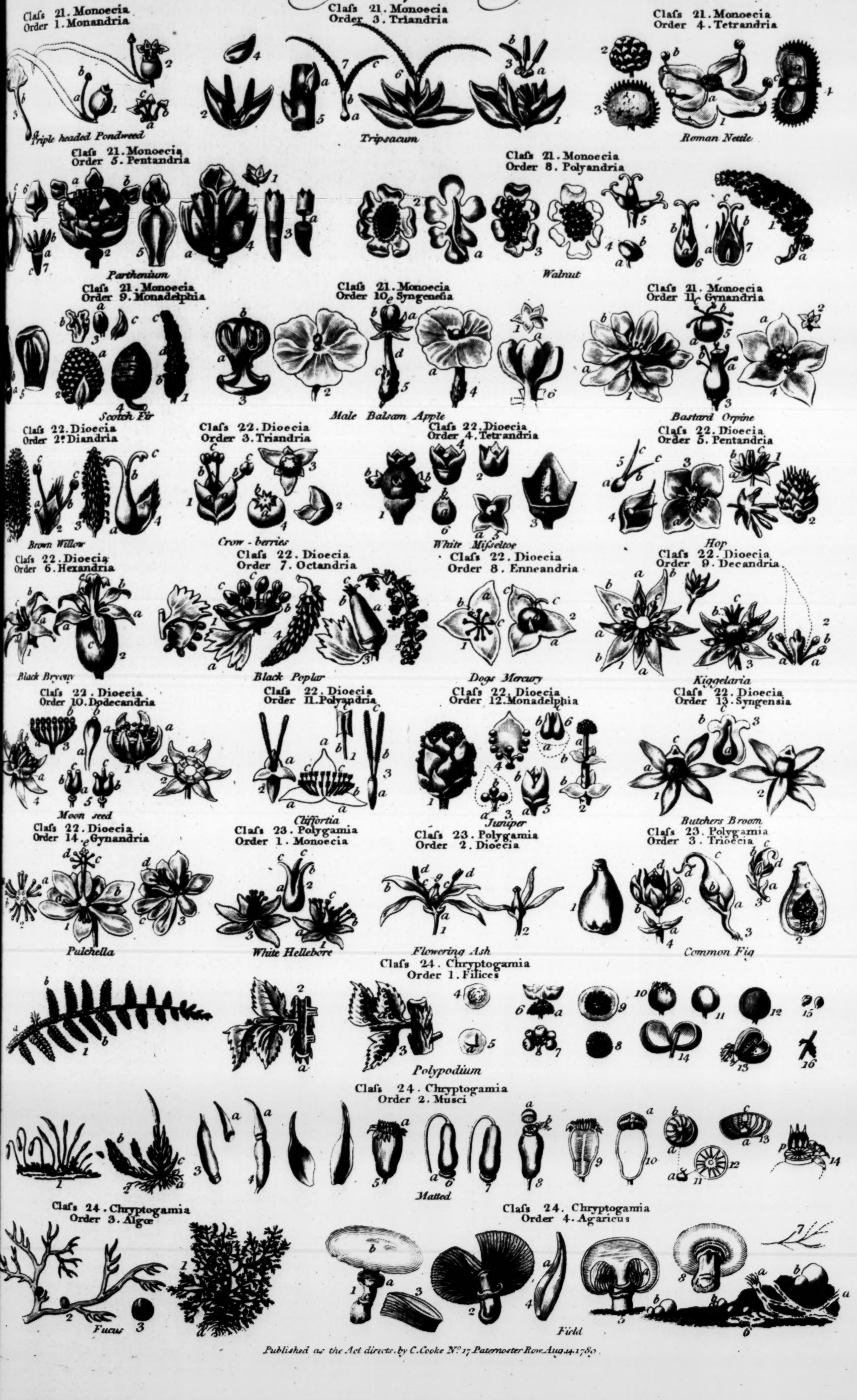
CLASS XXII.

ORDER. 2. *Salix* (brown willow). The male, 1; the calyx, the common amentum, oblong, with an involucrum formed of the gem, 1 *a*; conſiſting of ſquamas, having one flower, 2; petals none; nectarium a cylindraceous gland in the centre of the flowers, 2 *a*; filaments two, 2 *b*; antheras didymous, quadrilocular, 2 *c*.

The female, 3; the amentum and ſquamas the ſame as in the male; corolla none; germen ovate, 4 *a*; attenuated into a taper ſtyle, not very diſtinct, 4 *b*; ſtigmas two, biſid, revolute, 4 *c*.

ORDER 3. *Empetrum* (crow berries). The male, 1; perianthium tripartite, 2; petals three, 1 *a*; filaments three, 1 *b*; antheras bipartite, 1 *c*.

Claſses and Orders of Flowers, according to Linneus.
See System of Botany.


Claſs 21. Monoecia
Order 1. Monandria
Triple headed Pondweed
Claſs 21. Monoecia
Order 3. Triandria
Tripsacum
Claſs 21. Monoecia
Order 4. Tetrandria
Roman Nettle
Claſs 21. Monoecia
Order 5. Pentandria
Parthenium
Claſs 21. Monoecia
Order 8. Polyandria
Walnut
Claſs 21. Monoecia
Order 9. Monadelphia
Scotch Fir
Claſs 21. Monoecia
Order 10. Syngenesia
Male Balsam Apple
Claſs 21. Monoecia
Order 11. Gynandria
Bastard Orpine
Claſs 22. Dioecia
Order 2. Diandria
Brown Willow
Claſs 22. Dioecia
Order 3. Triandria
Crow-berries
Claſs 22. Dioecia
Order 4. Tetrandria
White Miſseltoe
Claſs 22. Dioecia
Order 5. Pentandria
Hop
Claſs 22. Dioecia
Order 6. Hexandria
Black Bryony
Claſs 22. Dioecia
Order 7. Octandria
Black Poplar
Claſs 22. Dioecia
Order 8. Enneandria
Dogs Mercury
Claſs 22. Dioecia
Order 9. Decandria
Kiggelaria
Claſs 22. Dioecia
Order 10. Dodecandria
Moon seed
Claſs 22. Dioecia
Order 11. Polyandria
Cliffortia
Claſs 22. Dioecia
Order 12. Monadelphia
Juniper
Claſs 22. Dioecia
Order 13. Syngensia
Butchers Broom
Claſs 22. Dioecia
Order 14. Gynandria
Pulchella
Claſs 23. Polygamia
Order 1. Monoecia
White Hellebore
Claſs 23. Polygamia
Order 2. Dioecia
Flowering Ash
Claſs 23. Polygamia
Order 3. Trioecia
Common Fig
Claſs 24. Chryptogamia
Order 1. Filices
Polypodium
Claſs 24. Chryptogamia
Order 2. Musci
Matted
Claſs 24. Chryptogamia
Order 3. Algœ
Fucus
Claſs 24. Chryptogamia
Order 4. Agaricus
Field

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The female, 3; perianthium and petals as in the male; germen depreſſed, 4 *a*; ſtyle ſcarce any; ſtigmas nine, 4 *b*.

Order 4. *Viſcum* (white miſeltoe). The male, 1; perianthium quadripartite, 2; corolla and filaments none; antheras four, oblong, acuminate, one joined to each of the calycine folioles, 1 *b*, 3 *a*.

The female very often oppoſite to the male flowers, 4; perianthium tetraphyllous, fixed on the germen, 5 *a*; corolla none; germen oblong, trigonous, 6 *a*; ſtyles none; ſtigma obtuſe, 6 *b*.

Order 5. *Humulus* (hops). The male, 1; perianthium pentaphyllous, 1 *a*; corolla none; filaments five, 1 *b*; antheras with four furrows, 1 *c*.

The females, 2; univerſal involucrum quadripartite, 2 *a*; the partial involucra tetraphyllous, 3 *a*; the folioles ſubrotund and ovate, having eight flowers, 3 *b*; each flower hath its perianthium monophyllous, 4; corolla none; germen, 5 *a*; ſtyles two, 5 *b*; ſtigmas, 5 *c*.

Order 6. *Tamus* (black briony). The male, 1; perianthium ſexpartite, 1 *a*; corolla none; filaments ſix, 1 *b*; antheras, 1 *c*.

The female, 2; perianthium monophyllous, ſexpartite, ſitting on the apex of the germen, 2 *a*; petals none; nectarium an oblong point, adhering to the baſe of every ſingle ſegment of the perianthium, 2 *b*; germen ovately oblong, ſtanding under the calyx, 2 *c*; ſtyle cylindraceous, 2 *d*; ſtigmas three, 2 *e*.

Order 7. *Populus* (black poplar). The male, 1; the common amentum oblong, conſiſting of uniflorous ſquamas, 1 *a*, 2; petals none; filaments eight, 1 *b*; anthera tetragonous, large, 1 *c*.

The female, 3; amentum and ſquamas as in the male, 4; germen ovate, narrow at each end, 3 *a*; ſtyle ſcarcely to be obſerved, 3 *b*; ſtigma quadrifid, 3 *c*.

Order 8. *Mercurialis* (dog's mercury). The male, 1; perianthium tripartite, 1 *a*; corolla none; filaments nine or twelve, 1 *b*; antheras globoſe, didymous, 1 *c*.

The female, 2; perianthum as in the male; corolla none; nectaria two ſharp points, one on each ſide of the germen, 2 *a*; germen roundiſh, 2 *b*; ſtyles two, reflexed, 2 *c*; ſtigmas acute, reflexed, 2 *d*.

Order 9. *Kiggelaria*. Male, 1; perianthium monophyllous, quinquepartite, 1 *a*; petals five, longer than the calyx, 1 *b*; nectaria five, obtuſe, with three lobes, 1 *c*; filaments ten, 2 *a*; antheras, 2 *b*.

The female, 3; calyx and corolla the ſame as in the male; germen ſubrotund, 3 *a*; ſtyles five, 3 *b*; ſtigmas obtuſe, 3 *c*.

Order 10. *Meniſpermum* (moon ſeed). Male 1; perianthium hexaphyllous, 1; petals eight, 2 *a*; filaments ſixteen, cylindric, 3 *a*; anthera, 3 *b*.

Female, 4; calyx and corolla the ſame as in the male; filaments eight, ſimilar to thoſe of the male, 4 *a*; antheras pellucid, ſterile, 4 *b*; germens two or three, ſtanding on a pedicle, 5 *a*; ſtyles, 5 *b*; ſtigmas, 5 *c*.

Order 11. *Cliffertia* (Ethiopian holly). Male 1; perianthium triphyllous, 1 *a*; corolla none; filaments about thirty, 1 *b*; anthera didymous, 1 *c*.

Female, 2; perianthium triphyllous, 2 *a*; corolla none; germen, 3 *a*; ſtyles two, feathery, 3 *b*; ſtigmas, 3 *c*.

Order 12. *Juniperus* (juniper). Male, 1; the amentum in form of a cone, having a common rachis, 2 *a*; to which there are three oppoſite flowers, 2 *b*; the tenth flower terminating the amentum, each flower ſerving for a baſe fixed to the pedicle of the column; corolla none; filaments (in the terminating flowers) three, at the baſe joined in one body, in the lateral flowers ſcarcely to be obſerved, 3 *a*; antheras three, ſeparate in the terminating flowers, 3 *b*; in the lateral ones fixed to the ſcales of the calyx, 4.

The female, 5; perianthium tripartite, joined with the germen, 5 *a*; petals three, 5 *b*; germen below the flower, 6 *a*; ſtyles three, 6 *b*; ſtigmas, 6 *c*.

Order 13. *Ruſcus* (butcher's broom). Male, 1; perianthium hexaphyllous, 1 *a*; petals none; nectarium, 1 *b*; filaments none; antheras three, inſerted on the apex of the nectarium, at their baſe coherent, 1 *c*.

Female, 2; perianthium as in the male; petals as in the male; nectarium as in the male; germen hid within the nectarium, 3 *a*; ſtyle cylindraceous, 3 *b*; ſtigma, 3 *c*.

Order 14. *Clutia* (pulchella). Male, 1; perianthium pentaphyllous, 1 *a*; petals five, ſhorter than the calyx, 1 *b*; the exterior nectaria tripartite, placed within the petals, 2 *a*; the interior nectaria, 2 *b*; filaments five, fixed in the middle of the ſtyle, ſpreading horizontally, 1 *c*; antheras ſubrotund, 1 *d*; germen none; ſtyle cylindraceous, club-ſhaped, 1 *e*.

Female, 3; perianthium and petals as in the male; nectaria exterior none; the interior five, in pairs, ſituated as in the male, 3 *a*; germen ſtanding above the flower, 3 *b*; ſtyles three, bifid 3 *c*; ſtigmas, 3 *d*.

CLASS XXIII.

Order 1. *Veratrum* (white helibore). Hermaphrodite flowers, 1; calyx none, except the corolla be taken for it, 1 *a*; which conſiſts of ſix petals; filaments ſix, 1 *b*; anthera quadrangular, 1 *c*; germens three, 2 *a*; ſtyles three, 2 *b*; ſtigmas, 2 *c*.

The male flowers on the ſame plant, below the females, 2; calyx, corolla, and ſtamens the ſame as in the hermaphrodite.

Order 2. *Fraxinus* (flowering aſh). Hermaphrodite flower, 1; calyx none; ſometimes it hath a monophyllous perianthium, quadripartite, 1 *a*; corolla none; ſometimes it hath four petals, 1 *b*; filaments two, 1 *c*; antheras having four furrows, 1 *d*; germen ovate, 1 *e*; ſtyle cylindraceous, 1 *f*; ſtigma 1 *g*.

The female, 2; all as in the hermaphrodite. The common female aſh has very often ſome hermaphrodite flowers interſperſed; and the hermaphrodite female flowers, have neither calyx nor corolla. The flowering aſh having both a corolla and a calyx, is always a true hermaphrodite, and without male flowers intermixt.

Order 3. *Ficus* (common fig). Calyx a common one, obovate, large, fleſhy, concave, ſhut up with many ſcales, 1; the ſcales magnified, 2 *a*; whoſe interior ſurface is all over covered with florets, of which the uppermoſt approaching the calycine margin are hermaphrodites, and are few, 2 *b*; thoſe underneath are females, which are numerous, 2 *c*; the hermaphrodite flowers, each whereof ſitting on a peduncle, 3; the proper perianthium, tripartite, 3 *a*, 4 *a*; corolla tetrapetalous, fixed at the baſe of the ſtamens, 4 *b*; filaments four, 4 *c*; antheras two in the middle of each filament, 4 *d*; germen oval; 3 *b*; ſtyle, 3 *c*; ſtigma, 3 *d*.

The females flowers, each whereof ſitting on a peduncle, 5; the proper perianthium quinquepartite, 5 *a*; corolla none; germen oval, 5 *b*; ſtyle coming out on one ſide of the apex of the germen, 5 *c*; ſtigmas two, 5 *d*.

Note, The fructifications ſhould be examined a little before the maturity of the fruit. The fruit of a fig is not a pericarpium, but a receptacle, the interior ſides of which ſupport the flowers with the fructification.

CLASS XXIV.

Order 1. *Polypodium*. The ſtipes on the forepart channelled, 1 *a*, 2 A; on the hind part rounded, covered with chaffy ſcales; the front is oblong, acute, bipinnate, branches alternate, 1 *b*, ſpreading, lanceolate, pinnate; the pinnæ for the moſt part alternate, ſeſſile, grown together at the baſe; the fructification in rows, 3 *a*; one row on each ſide of the mid-rib; the clypei (or ſhields) membranaceous, 4, orbiculate, peltate, 5, pedunculated, is at the time of flowering, flat, covering the fructifications, 4; after the flowering reflexed, 6, lacerated, deciduous; the capſular globules roundiſh, 6 *a*, numerous, faſciculated, on ſmall footſtalks, 7; the upper ſide of the clypeus (or ſhield) magnified, 4; the under ſide 5; the clypeus after the flowering reflexed, with mature globules, 6; the whole cluſter of globules diſengaged from the pinna and the clypeus, 8; the ſame diſengaged from the pinna, and ſtill adhering to the clypeus, 9; a few globules with their foot-ſtalks, 7; a ſingle globule in the ſtate of flowering, rough on the upper part, half-way down, with ſmall tubercles, and four ſhallow wrinkles, 10; the ſame nearly ripe, 11; the ſame ripe, the roughneſs and wrinkles being then vaniſhed, 12; the ſame burſt in two, throwing out the ſeeds, 13; the ſame empty, 14: the ſeeds, 15; the conceptacle of the ſeeds, 16. Note, The frons is a ſpecies of trunk, whoſe branches and leaves are blended together, and generally united with the fructification, which is only applicable to ferns and palms; and the ſtipes is the baſe of this trunk in palms, ferns, and muſhrooms.

Order 2. *Bryum* (matted). Calyx, the calyptra, 1, 2, 3, 4 *a*; anthera, ſubrotund or oblong, 5 *a*; the mouth with a little ciliated ring, covered with a conic operculum, 6 *a*; receptacle, no apophyſis; perichetium none, but a tubercle for the baſe of the peduncle, root fibrous, 2 *a*; trunk erect, ſomewhat branched, 2 *b*; leaves, 2 *c*; capſule, at firſt erect, 2, green, afterwards pendulous, 7, and reddiſh; the operculum magnified, 8 *a*; *fig.* 2, the moſs in its early ſtate with is calyptra, *a*; *fig.* 3 *a*, the calyptra taken off; *fig.* 4, as the moſs increaſes, the calyptra *a* withers; *fig.* 6, as the calyptra increaſes it becomes pendulous; *fig.* 8, the operculum *a* taken off to diſcharge the ſeeds *b*; *fig.* 10, a longitudinal ſection, to ſhew how the petals or ſetæ are placed within, and how the anthera is fixed to the operculum *a*; *fig.* 11. 5, when the operculum (*a*) is taken off, the outer row of petals or ſetæ ſpring back, but the inner remain erect; each row contains ſixteen petals, but in leſs than ſix or ten ſeconds, fold themſelves up, as in *fig.* 8 and 14; *fig.* 9. a longitudinal ſection of the ſame; *fig.* 11. the operculum on the inner ſide with the anthera *a*; *fig.* 12. the anthera taken out of the operculum *a c*; *fig.* 13. a horizontal ſection of the operculum with the anthera, much magnified *a c*; *fig.* 14, the ſituation of the petals or ſetæ greatly magnified, *p*; *fig.* 15. two leaves, the outſide *e*, the inſide *i*.

Order 3. *Fucus* (ſcarlet fruit). Root fibrous, 1 *a*; leaves linear, cartilaginous, ſmooth, without joints, very branched, the branches alternate, the little branches many on each ſide alternately, 1, 2; in *fig.* 2. the branches are magnified, the fruit, the veſicles lateral, ſcattered without order, ſeſſile globous, black, the ſize of poppy ſeeds; *fig.* 3. is a veſicle magnified.

Order 4. *Agaricus* (muſhroom). The fungus horizontal with thin plates underneath, 2; the ſtem erect, cylindraceous, ſtriated, white, ſolid, bulbous at the baſe, 1 *c*, 2 *c*; the volva or calyx growing in the middle 1 *a*, 2 *a*; the cap convex, white, ſomewhat lacerated and ſquamated, 1 *b*; the lamellas or thin plates, 2, 3, 4, a little convex, entire, a ſingle lamella, 4 *a*, at firſt reddiſh 5 *a*, afterwards a brown black, 2, 3, 4; a ſection, *fig.* 3. a maſs of old horſe dung, collected by the gardeners, wherein are lodged white ſhreds or filaments, 6 *a*, which contain the ſeeds or cauſes of muſhrooms; a ſingle ſhred or filament 7; the manner in which the fungi firſt appear 6 *b*; a fungus on its under ſide, before it expands itſelf, to ſhew how the pileus and the volva are connected, 8; a vertical ſection of the ſame, 5.

Having entered rather profuſely into the terms and minute diſtinctions neceſſary to qualify the botaniſt in the claſſic order and generic arrangement of plants, I ſhall proceed conciſely to deſcribe the genera, according to the ideas of Linnæus.

THE GENERA

Is an aſſemblage of ſeveral plants in one or more common characters, with reſpect to the ſtructure of certain parts whereby they are diſtinguiſhed from other plants.

The diſtribution of plants into genera and ſpecies, is abſolutely neceſſary to eaſe the memory and prevent it being oppreſſed with an extraordinary number of different names. The knowledge of a genus comprehends, in a kind of miniature, all the plants belonging thereto, each being denominated from ſome particular circumſtance peculiar to the whole kind to ſave the embarraſſment naturally produced by ſuch a variety of names.

The genera of plants by the Sexual Syſtem of Linnæus are regulated by the fructification only, ſo that all vegetables which agree in their parts of fructification are to be put together and arranged under one genus, and all that differ to be ſeparated. The characteriſtic mark is to be determined by the number, figure, proportion, and ſituation of all the parts; but as there are few genera in which all the parts are conſtant in every one of the ſpecies, we ought, wherever it is poſſible, to fix upon ſome one ſingle circumſtance that is conſtant, and make it the eſſential character. There is, however, no one part of fructification that can be relied on as a conſtant characteriſtic mark of all genera; but in ſome, one part of the fructification is found to be the moſt conſtant, and in others another; the more conſtant any part of the fructification is found through the ſeveral ſpecies of any genus, the more it may be relied on with certainty as a characteriſtic mark of that genus. But if this characteriſtic mark is wanting in any particular ſpecies, caution ſhould be obſerved leſt different genera ſhould be confounded; and, when it is obſerved in ſome ſpecies of another genus near a kin to it, care ſhould be taken that the genera are not multiplied by parting ſpecies that ſhould really ſtand together.

Although the Sexual Syſtem ſo greatly improved by Linnæus has been well received and almoſt univerſally admired, yet various learned and practical botaniſts deny the exiſtence of ſexes in plants. The reader may probably find entertainment and inſtruction in a conciſe ſelection of the arguments employed by both parties on this ſubject; beginning with the opinions adduced in favour of the Sexual Syſtem, as follows:

SECT. VI.

ON THE SEXES OF PLANTS.

LINNÆUS is at great pains in tracing the notion of ſexes in plants to the remoteſt periods of antiquity. He informs us, that Empedocles, Anaxagoras, and other ancient philoſophers, not only attributed the diſtinction of ſexes to plants, but maintained that they were capable of perceiving pleaſure and pain.

Hippocrates and Theophraſtus are next introduced as diſtinguiſhing the conyza, the abies, the filix, &c. into male and female. The latter of theſe writers affirms that the fruit of the male palm will not germinate, unleſs the pollen of the male be ſhaked over the ſpatha of the female previous to the ripening of the ſeed.

Dioſcorides takes notice of a male and female mandragora, mercurialis, ciſtus, &c.

Pliny does not confine his views of ſex to animals, but exclaims, that every thing this earth produces is characterized by the diſtinction of ſex.

From the days of Pliny to thoſe of Cæſalpinus, who lived in the 16th century, the analogy between the vegetable and animal ſeems to have been entirely neglected. Cæſalpinus tells us, that the males of the oxycedrus, taxus, mercurialis, urtica, and cannabis, are barren; and that the females of theſe plants only bear fruit.

After Cæſalpinus, we find Dr. Grew and Sir Thomas Millington engaged in a converſation concerning the utility of the ſtamina and ſtyli of plants. The reſult of this converſation was the mutual agreement of theſe two eminent naturaliſts, that the ſtamina and ſtyli of vegetables were analogous to the organs of generation in animals, and that they were adapted by nature to anſwer the ſame purpoſes. Dr. Grew in his anatomy of plants, after enumerating the analogies between plants and animals, concludes, that the pollen probably emits certain vivific effluvia, which may ſerve for the impregnation of the ſeeds.

Mr. Ray gave a further ſanction to the doctrine of ſexes, by concurring with Grew, and adding ſome further illuſtrations from analogy.

In the year 1695, Camerarius attempted to prove the ſexes of plants. But, as he truſted ſolely to the palm-tree, and withal ſeemed to be doubtful as to the authenticity of the fact, he cannot be conſidered as having done any thing in confirmation of the ſexual hypotheſis.

Mr. Morland, in the year 1703, adopted the ſame hypotheſis; but gave it a new modification, by ſuppoſing that the pollen contained the ſeminal plant in miniature, and conſequently that one pollen at leaſt behoved to be conveyed into every ſeparate ſeed before it could be properly impregnated. Analogy and the ſtructure of the parts are the only arguments he employs.

Vaillant, in the year 1717, judiciouſly conſidering that the canal in the ſtylus of moſt plants was too narrow to admit the pollen itſelf, republiſhed Dr. Grew's theory of impregnation by means of a ſubtile ſeminal aura.

Theſe are the ſentiments of the principal botaniſts with regard to the generation of plants, till the celebrated Linnæus made his appearance as a botanical writer, who has extended the idea ſo far as to compoſe a complete ſyſtem upon it.

Although Linnæus can have no claim to the ſuppoſed diſcovery of the ſexual hypotheſis, his being preciſely the ſame with that of Dr. Grew; yet, as he is the chief ſupporter and improver of this doctrine, we ſhall give a ſuccinct narration of the arguments he makes uſe of in order to prove that vegetables propagate their ſpecies by a regular commerce of ſexes.

In a treatiſe, intitled *Sponſalia Plantarum*, publiſhed as an inaugural diſſertation by Walhbom, in the firſt volume of the *Amœnitates Academicæ*, all the arguments made uſe of by Linnæus in his *Fundamenta Botanica* and other works, are collected and arranged in one view. But as Walhbom honeſtly attributes all the merit of this diſſertation to his great maſter, we ſhall here drop his name altogether, and give the arguments as the property of Linnæus, by whom they were originally employed.

Linnæus, then, firſt attempts to ſhow, that vegetables are endowed with a certain degree of life; and, ſecondly, that they propagate their ſpecies in a manner ſimilar to that of animals.

"That vegetables are really living beings, ſays he, muſt be obvious at firſt ſight; becauſe they poſſeſs all the properties contained in that accurate definition of life laid down by the great Dr. Harvey, namely, *Vita eſt ſpontanea propulſio humorum*. But univerſal experience teaches, that vegetables propel humours or juices: hence it is plain that vegetables muſt be endowed with a certain degree of life."

Not truſting ſolely to a ſyllogiſm founded on a definition, Linnæus proceeds to ſupport the life of vegetables by arguments drawn from the following particulars in their œconomy; the firſt of which he intitles

I. "NUTRITIO. The very idea of nutrition implies a propulſion of humours, and, of courſe, the idea of life. But vegetables derive their nouriſhment from the earth, air, &c. and conſequently muſt be conſidered as living creatures.

"II. ÆTAS. Every animal muſt not only begin to exiſt, and have that exiſtence diſſolved by death, but muſt likewiſe paſs through a number of intermediate changes in its appearance and affections. *Infancy*, *youth*, *manhood*, *old age*, are characteriſed by *imbecility*, *beauty*, *fertility*, *dotage*; are not all theſe viciſſitudes conſpicuous in the vegetable world? Weak and tender in *infancy*; beautiful, and ſalacious in *youth*; grave, robuſt, and fruitful, in *manhood*; and when *old age* approaches, the head droops, the ſprings of life dry up, and in fine, the poor tottering vegetable returns to the *duſt* from whence it ſprung.

"III. MOTUS. No inanimate body is capable of ſelf-motion. Whatever moves ſpontaneouſly, is endowed with a living principle: for motion depends on the ſpontaneous propulſion of humours; and whereever there is a ſpontaneous propulſion of humours, there alſo is life. That vegetables are capable of motion, is evident from the following facts: plants, when confined within doors, always bend towards the light, and ſome of them even attempt to make their eſcape by the windows. The flowers of many plants, eſpecially thoſe of the ſyngeneſia claſs, purſue the ſun from eaſt to weſt, rejoicing in his beams. Who then can deny that vegetables are poſſeſſed of living and ſelf moving powers?

"IV. MORBUS. The term diſeaſe means nothing more than a certain corruption of life. It is well known, that vegetables are ſubject to diſeaſes, as well as animals: when over heated, they turn thirſty, languiſh, and fall to the ground; when too cold, they are tormented with the chilblain, and not unfrequently expire: they are ſometimes afflicted with cancers; and every plant is infeſted with lice peculiar to its ſpecies.

"V. MORS. Death is oppoſed to life, the former being only a privation of the latter, Experience ſhows, that every living creature muſt die. But, as vegetables are daily cut off by internal diſeaſes and external injuries; as they are ſubject to death from the attacks of hunger, thirſt, heat, cold, &c. with what propriety could vegetables be thus ſaid to die, unleſs we allow that they previouſly lived?

, VI. ANATOMIA. Under this article we are referred to Malpighius and Grew for the organic fibres, membranes, canals, veſicles, &c. of plants, as additional proofs of their living powers.

"VII. ORGANIZATIO. Vegetables not only propel humours, but alſo prepare and ſecern a number of different juices for the fruit, the nectar, &c. analagous to the various ſecretions in animal bodies."

From theſe facts and obſervations, Linnæus concludes, that plants are unqueſtionably endowed with life as well as animals; and then proceeds in the following manner to ſhow how theſe animated vegetables propagated their ſpecies.

After diſcuſſing the long exploded doctrine of equivocal generation, he lays hold of another maxim of Dr. Harvey, viz. *Omne vivum ex ovo.* "It being fully evident, (ſays he), from the foregoing chain of reaſoning, that vegetables are endowed with life, it neceſſarily follows, agreeable to this maxim of Harvey's, that every vegetable muſt in like manner derive its exiſtence from an *egg*. But as vegetables proceed from eggs, and as it is the diſtinguiſhing property of an egg to give birth to a being ſimilar to that which produced it, the ſeeds muſt of courſe be the eggs of vegetables.

"Granting then that the ſeeds of vegetables are intended by nature to anſwer the ſame end as the ggs of animals, and conſidering at the ſame time that no egg can be fecundated without receiving an impregnation from the male, it follows, that the ſeed or eggs of vegetables cannot be fecundated by any other means. Hence alſo the neceſſity of vegetables being provided with organs of generation. But where are theſe organs ſituated? The anſwer is eaſy: We have already found impregnated ſeeds within the flowers of plants; and it is natural to expect that the *genitalia* ſhould not be at a greater diſtance. Now, as *copulation* always precedes *birth*, and every *ſhower* precedes the *fruit*, the *generating faculty* muſt be aſcribed to the *flower*, and the *birth* to the *fruit*. Again, as the *antheræ* and *ſtigmata* are the only eſſential parts of flowers, theſe parts muſt neceſſarily be the *organs of generation*."

Being thus far advanced, Linnæus affirms, that the *antheræ* are the *teſtes*, and that the pollen performs the office of the male *ſemen*. Theſe affirmations he attempts to eſtabliſh by the following arguments; the firſt of which he terms,

"1. *Præcedentia*. The antheræ, or vegetable teſtes, always precede the fruit; and as ſoon as the antheræ come to maturity, which conſtantly happens before the maturity of the fruit, they continue to throw out their pollen as long as the flower laſts; but decay and fall off whenever the fruit comes to perfection.

"2. *Situs*. The antheræ of all plants are uniformly ſituate in ſuch a manner that the pollen may with the greateſt facility fall upon the ſtigma or female organ.

"3. *Tempus*. The antheræ and ſtigmata always flouriſh at the ſame time, whether the flowers be of the hermaphrodite or dioicous kind.

"4. *Localumenta*. When the antheræ are diſſected, they diſcover as great a variety or ſtructure as the pericarpium or ſeed capſules: for ſome of them have one cell, as the murcury; ſome two, as the hellebore, &c.

"5. *Caſtratio*. If all the antheræ be cut off from an hermaphrodite plant, juſt before the flowers begin to expand, taking care at the ſame time that no plant of the ſame ſpecies grow near it, the fruit will either prove entirely abortive, or produce barren ſeeds.

"6. *Figura*. When the pollen of different plants is examined by the microſcope, it exhibits as great a variety of figures as is diſcoverable in the ſeeds themſelves.

"The accumulated force of theſe arguments (concludes Linnæus) amounts to a full demonſtration that the antheræ are the teſtes, and that the pollen is the ſemen or genitura, of vegetables.

"The male organ being thus inveſtigated, we hope, (ſays Linneæus), that none will heſitate to pronounce the ſtigma to be the female organ, eſpecially when the following obſervations are ſufficiently attended to.

"The piſtillum is compoſed of the germen, ſtylus, and ſtigma. The germen, being only a kind of rudiment of the future fœtus or ſeed, ceaſes to exiſt as ſoon as the flower comes to maturity. Neither is the ſtylus an eſſential part, as many flowers have no ſtylus. But no fruit ever comes to maturity without the aſſiſtance of the ſtigma. It follows, that the ſtigma muſt be the female organ adapted by nature for the reception of the pollen or or impregnating ſubſtance. This will appear ſtill clearer from the following chain of reaſoning.

"1. *Situs*. The ſtigmata are always ſituate ſo that the pollen may with moſt eaſe fall upon them. Beſides, it is remarkable, that in moſt plants (though not in all) the number of the ſtigmata exactly correſponds with the loculamentum or cells of the pericarpium.

"2. *Tempus*. Here the obſervation, that the ſtigmata and antheræ conſtantly flouriſh at the ſame time, is repeated.

"3. *Decidentia*. The ſtigmata of moſt plants, like the antheræ, decay and fall off as ſoon as they have diſcharged their proper function; which evidently ſhows, that their office is not to ripen the fruit, but ſolely to anſwer the important purpoſe of impregnation.

"4. *Abſciſſio*. The argument here is preciſely the ſame with the caſtration of the antheræ; and the reſult is likewiſe the ſame, namely, the deſtruction of the fruit.

"Theſe arguments (concludes Linnæus) are ſufficient to demonſtrate, that the ſtigma is the female organ of generation, or that organ which is ſuited for the reception and conveyance of the ſemen to the *vegetable eggs*. Hence, plants may be ſaid to be *in actu veneris*, when the anthæra, or teſticuli, ſpread their pollen over the ſtigma or female *vulva*."

To ſhew how the *coitus* of vegetables is effected, is our author's next object of inveſtigation. He affirms, that the pollen is conveyed, by means of the wind or inſects, to the moiſt ſtigma, where it remains until it diſcharges a ſubtile fluid, which being abſorbed by the veſſels of the ſtigma, is carried to the ſeeds or ova, and impregnates them. His proofs are taken from the following particulars.

"1. *Oculus*. When the flowers are in full blow, and the pollen flying about, every one may then ſee the pollen adhering to the ſtigma. This he illuſtrates by mentioning as examples the viola tricolor, iris, campanula, &c.

"2. *Proportio*. The ſtamina and piſtilla, in moſt plants, are of equal heights, that the pollen, by the intervention of the wind, may with the greater facility, fall upon the ſtigma.

"3. *Locus*. The ſtamina of moſt plants ſurround the piſtillum, to give the pollen an opportunity of falling upon the ſtigma at every breeze of wind. Even in the monœcia claſs, the male flowers ſtand generally above the female ones, to afford an eaſier conveyance of the pollen to the ſtigma.

"4. *Tempus*. It is remarkable that the ſtamina and piſtilla conſtantly appear at the ſame time, even in plants belonging to the monœcia.

"5. *Pluvia*. The flowers of moſt plants expand by the heat of the ſun, and ſhut themſelves up in the evening or in rainy weather. The final cauſe of this muſt be to keep the moiſture from the pollen, leſt it ſhould be thereby coagulated, and of courſe prevented from being blown upon the ſtigma.

"6. *Palmicolæ*. That the cultivators of palm-trees were in uſe to pull off the ſpadices from the males, and ſuſpend them over the ſpathæ of the females, is atteſted by Theophaſtrus, Pliny, Proſper Alpinus, Kempfer, and many others. If this operation happened to be neglected, the dates were ſour and deſtitute of nuts. Kempfer adds this ſingular circumſtance, that the male ſpadix, after being thoroughly dried and kept till next ſeaſon, ſtill retained its impregnating virtue.

"7. *Flores nutantes*. As the pollen is ſpecifically heavier than air, ſuch flowers as have their piſtillum longer than the ſtamina, hang down, or incline to one ſide, e. gr. the fritillaria, campanula, &c. An eaſy admiſſion of the pollen to the ſtigma is the final cauſe of this appearance.

"8. *Submerſi*. Many plants that grow below water, emerge when their flowers begin to blow, and ſwim upon the ſurface till they receive impregnation, and then ſink down.

"9. *Omnium florum genuina conſideratio*. Here a number of particulars are recited. We ſhall confine ourſelves to thoſe that are moſt ſtriking and applicable to the ſubject.

"When the flowers of the male hemp are pulled off before thoſe of the female are fully expanded, the females do not produce fertile ſeeds. But as a male flower is ſometimes found upon a female plant, this may be the reaſon why fertile ſeeds are ſometimes produced even after this precaution has been obſerved.

"The tulip affords another experiment to the ſame purpoſe. Cut off all the antheræ of a red tulip before the pollen is emitted; then take the ripe antheræ of a white tulip, and throw the pollen of the white one upon the ſtigma of the red; the ſeeds of the red tulip being thus impregnated by one of a different complexion, will next ſeaſon produce ſome red, ſome white, but moſt variegated flowers."

In the year 1744, Linnæus publiſhed a deſcription of a new genus, which he called *peloria*, on the ſuppoſition of its being a *hybrid* or *mule* plant, i. e. a plant produced by an unnatural commixture of two different genera. The root, leaves, caulis, &c. of this plant are exceedingly ſimilar to thoſe of the antirrhinum linaria; but the flower and other parts of the fructification are totally different. On account of its ſimilarity to the linaria in every part but the flower, Linnæus imagined it to have been produced by a fortuitous commixture of the linaria with ſome other plant, although he has never yet been able to point out the father.

This doctrine of the production of *mule* plants has ſince been greatly prized and carefully propagated by Linnæus and the other ſupporters of the ſexual hypotheſis. In the third volume of the *Amœnitates Academicæ*, there is a complete diſſertation, intitled *Plantæ Hybridæ*, wherein the doctrine of *vegetable mules* is much improved and extended. This diſſertation contains a liſt of 47 mules, with their ſuppoſed fathers and mothers. For example,

The VERONICA SPURICA is ſaid to be a *mule* plant *begot by* the verbena officinalis *upon* the veronica maritima.

The delphinium hybridum, a *mule begot* by the aconitum napellus *upon* the delphinium elatum.

The arctotis calendula, a *mule begot* by the calendula pluvialis *upon* the arctotis triſtis.

The aſclepias nigra, a *mule begot* by the cynanchum acutum *upon* the aſclepias vincetoxicum, &c.

From the examples given in this diſſertation, Linnæus draws this concluſion, that only two ſpecies of each genus exiſted *ab* *origine*; and that all the variety of ſpecies which now appear have been produced by unnatural embraces betwixt ſpecies of different genera.

Under this head, Linnæus likewiſe quotes from Ray the ſtory of Richard Baal gardener at Brentford. This Baal ſold a large quantity of the ſeeds of the braſſica florida to ſeveral gardeners in the ſuburbs of London. Theſe gardeners, after ſowing their ſeeds in the uſual manner, were ſurpriſed to find them turn out to be plants of a different ſpecies from that which Baal made them believe they had purchaſed; for, inſtead of the braſſica florida, the plants turned out to be the braſſica longifolia. The gardeners, upon making the diſcovery, commenced a proſecution of fraud againſt Baal in Weſtminſter hall. The court found Baal guilty of fraud, and decerned him not only to reſtore the price of the ſeeds, but likewiſe to pay the gardeners, for their loſt time, and the uſe of their ground. "Had theſe judges (ſays Linnæus) been acquainted with the ſexual hypotheſis, they would not have found Baal guilty of any crime, but would have aſcribed the accident to the fortuitous impregnation of the braſſica florida by the pollen of the braſſica longifolia."

Linnæus next proceeds to celebrate the utility of inſects, becauſe they convey the pollen of the male to the ſtigma of the female. "In this way, (ſays he), it is reaſonable to think that many dioicous plants are impregnated. Nay, even the hermaphrodites themſelves are greatly obliged to the different tribes of inſects, which, by fluttering and treading in the corolla, are conſtantly ſcattering the pollen about the ſtigma.

"Upon the whole, then, (concludes Linnæus), the coitus of vegetables is evident to a demonſtration. This coitus is nothing more than the conveyance of the pollen to the ſtigma, to which it adheres till it burſts and diſcharges a ſubtile elaſtic fluid. This fluid or aura is abſorbed by the veſſels of the ſtylus, and carried directly to the ovarium or germen, where the myſterious work of impregnation is fully completed."

THESE are the arguments employed by Linnæus and other advocates for the ſexual commerce of vegetables; and the following is

IN OPPOSITION TO THE SEXUAL SYSTEM.

It is admitted by Pontedera, Dr. Alſton, &c. that ſome of the ancients applied the terms *male* and *female* to ſeveral plants. But then they deny that theſe terms conveyed the ſame ideas to the ancients that they do to the moderns. *Male* and *female*, when applied to plants, were to the ancients mere terms of diſtinction, ſerving only as trivial names to diſtinguiſh one ſpecies or variety from another. The ancients were ignorant of the very characters which conſtitute the difference between what is called a *male* and *female* plant among the moderns. Theophraſtus, Dioſcorides, Pliny, and in a word, the whole ancient botanical writers, confound the very notion of the modern ſexes: they call the real female, or ſeed bearing plant, the *male*; and the male, or barren plant, the *female*. Nay, they have even applied the terms *male* and *female* to many plants which bear nothing but hermaphrodite flowers.

Such is the nature of this controverſy, that it cannot be determined with any degree of certainty, but by experiments made upon dioicous plants. If a female plant can produce fertile ſeeds without having any communication with the pollen of the male, the uſe of this pollen with reſpect to the impregnation of ſeeds muſt of neceſſity be entirely ſuperſeded.

Now, both Camerairus and Dr. Alſton tried theſe experiments with the ſame ſucceſs. Thoſe two eminent botaniſts took female plants of the mercury, ſpinage, and hemp; tranſplanted them at a great diſtance from any males of the ſame genus, and beſides had them incloſed by double row of hedges. The reſult was that each of theſe plants produced great quantities of fertile ſeeds. Tournefort made the ſame trial upon the lupullus, Miller upon the bryony, and Geoffroy upon the mays; and all of them declare that the ſeeds of theſe plants were as fertile as if they had been ſurrounded by a thouſand males.

Linnæus, in his firſt argument for the coitus of plants, refers every man to the evidence of his ſenſes.

"Do we not ſee (ſays he) the ſtigma of almoſt every hermaphrodite flower covered over with the pollen or impregnating ſubſtance? Do not we ſee the parietaria, the urtica, &c. by violent exploſions, diſcharging their pollen in the open air, that it may be carried in that vehicle to the ſtigmata of their reſpective females?" All this is admitted by the oppoſers of the ſexes: but then they deny that theſe exploſions, &c. are intended to create any intercourſe between the male and the female; and further alledge, that this ejection of the pollen is intended by nature to throw off ſomething excrementitious, or at leaſt ſomething which, if retained, would prove noxious to the fructification.

Linnæus takes his ſecond argument from the proportion which the ſtamina bear to the ſtylus, alledging that they are generally of the ſame height. This obſervation (ſay the anti-ſexualiſts) is not only contrary to experience, but, allowing it to be univerſal, no concluſion can be drawn from it either for or againſt the ſexual hypotheſis.

The third argument is taken from the *locus* or ſituation of the ſtamina with reſpect to the ſtylus: "and as the male flowers in the monœcia claſs ſtand always above the female flowers, it muſt be concluded (ſays Linnæus) that the intention of nature, in this diſpoſition of the parts, is to allow a free and eaſy acceſs of the pollen to the ſtigma. But the ſtamina cannot be ſaid to ſurround the piſtillum in the monandria and diandria claſſes: and the poſition of the male flowers in the monœcia claſs is a mere chimera; for in the ricinus, one of the examples which Linnæus mentions in confirmation of his doctrine, the female flowers ſtand uniformly ſome inches above the males.

That the ſtamina and piſtilla generally come to perfection at the ſame time, and that this happens even in the dioecous plants, is Linnæus's fourth argument. But, as it is acknowledged by Linnæus himſelf, that there are many exceptions with reſpect to this fact, the oppoſers of the ſexual hypotheſis alledge that it carries the beſt anſwer in its own boſom.

The fifth argument is founded on the circumſtance of ſome flowers ſhutting up their petals in rainy or moiſt evenings. But many flowers do not ſhut themſelves up, either in the night or moiſt weather, as the paſſion-flower, &c. The lychnis noctiflora, mirabilis peruvianæ, &c. open their flowers in the night, and ſhut them at the approach of the ſun. Hence this is another final cauſe (ſay the anti-ſexualiſts) perverted to ſupport a favourite hypotheſis.

We come now to the culture of the palm-tree, which is the ſixth and moſt plauſible argument employed by the ſexualiſts. Of this, the moſt authentic account we have is the following by Dr. Haſſelquiſt, in one of his letters to Linnæus, dated Alexandria May 18, 1750. "The firſt thing I did after my arrival was to ſee the date-tree, the ornament and a great part of the riches of this country. It had already bloſſomed; but I had, nevertheleſs, the pleaſure of ſeeing how the Arabs aſſiſt its fecundation, and by that means ſecure to themſelves a plentiful harveſt of a vegetable, which was ſo important to them, and known to them many centuries before any botaniſt dreamed of the difference of ſexes in vegetables. The gardener informed me of this before I had time to inquire; and would ſhew me, as a very curious thing, the male and female of the date or palm-trees: nor could he conceive how I, a Frank, lately arrived, could know it before; for, ſays he, all who have yet come from Europe to ſee this country, have regarded this relation either as a fable or miracle. The Arab ſeeing me inclined to be further informed, accompanied me and my French interpreter to a palm-tree, which was very full of young fruit, and had by him been wedded or fecundated with the male when both were in bloſſom. This the Arabs do in the following manner: When the ſpadix has female flowers, that come out of its ſpatha, they ſearch on a tree that has male flowers, which they know by experience, for a ſpadix which has not yet burſted out of its ſpatha: this they open, take out the ſpadix, and cut it lengthwiſe in ſeveral pieces, but take care not to hurt the flowers. A piece of this ſpadix with male flowers they put lengthwiſe between the ſmall branches of the ſpadix which hath female flowers, and then lay the leaf of a palm over the branches. In this ſituation I yet ſaw the greateſt part of the ſpadices which bore their young fruit; but the male flowers which were put between were withered. The Arab beſides gave me the following anecdotes: Firſt, unleſs they, in this manner, wed and fecundate the date-tree, it bears no fruit. Secondly, they always take the precaution to preſerve ſome unopened ſpathæ with male flowers from one year to another, to be applied for this purpoſe, in caſe the male flowers ſhould miſcarry or ſuffer damage. Thirdly, if they permit the ſpadix of the male flowers to burſt or come out, it becomes uſeleſs for fecundation: it muſt have its *maidenhead*, (theſe were the words of the Arab), which is loſt in the ſame moment the bloſſoms burſt out of their caſe. Therefore the perſon who cultivates date-trees muſt be careful to hit the right time of aſſiſting their fecundation, which is almoſt the only article in their cultivation. Fourthly, on opening the ſpatha, he finds all the male flowers full of a liquid which reſembles the fineſt dew; it is of a ſweet and pleaſant taſte, reſembling much the taſte of freſh dates, but much more refined and aromatic: this was likewiſe confirmed by my interpreter, who hath lived 32 years in Egypt, and therefore had opportunities enough of taſting both the nectar of the bloſſoms, and the freſh dates."

Now, though this account ſeems fully to confirm the fact, viz. that ſuch a practice obtains among the Arabs, and that they aſſert its efficacy in fecundating the trees, it is certain (ſay the oppoſers of this doctrine) that no intelligent perſon, who is not already wedded to an hypotheſis, will attempt to found an argument upon the aſſertions of a people ſo full of ridiculous ſuperſtitions. Before Dr. Haſſelquiſt, or any other perſon, can draw any argument from the abovementioned account, he ought to ſee the experiment ſeveral times repeated, with his own eyes, and not take it upon the word of a people who, beſides their ſuperſtition, may very probably find it their intereſt to impoſe upon travellers.

Mr. Milne, author of the Botanical Dictionary, however, relates an experiment, near akin to the abovementioned, which merits ſome attention: "In the garden of M. de la Serre, of the Rue S. Jacques at Paris, was a female turpentine tree, which flowered every year, without furniſhing any fruit capable of vegetation. This was a ſenſible mortification to the owner, who greatly deſired to have the tree increaſed. Meſſieurs Duhamel and Juſſieu very properly judged that they might procure him that pleaſure by the aſſiſtance of a male piſtachio tree. They ſent him one very much loaded with flowers. It was planted in the garden of M. de la Serre, very near the female turpentine tree, which the ſame year produced a great quantity of fruits, that were well-conditioned, and roſe with facility. The male plent was then removed; the conſequence of which was, that the turpentine-tree of M. de la Serre in none of the ſucceeding years bore any fruit that, upon examination, was found to germinate."

Upon this experiment it is obſerved by the antiſexualiſts, that, though it were a thouſand times repeated, it never could be deciſive. The nature of the controverſy, ſay they, is ſuch, that one experiment is more deciſive in favour of their opinion, than 10,000 can be againſt them. The reaſon is plain: If there is ſuch a thing as a ſexual intercourſe in vegetables, it is as wonderful that any ſeeds ſhould be perfected without that intercourſe, as that a virgin ſhould have a child; the laſt is not in the leaſt more extraordinary than the firſt. One experiment, therefore, which ſhews that ſeeds may be perfected without ſuch ſexual intercourſe, is either to be reſolved into a miracle, or muſt prove abſolutely deciſive againſt the ſexual ſyſtem; while numberleſs experiments ſuch as that abovementioned could prove nothing, becauſe we know not what effect vegetables may have by growing in each others neighbourhood, independent of any ſexual intercourſe.

In Milne's Botanical Dictionary, under the article *Sexus Plantarum*, the author quotes Dr. Alſton's experiments partially. The facts recorded by Dr. Alſton are as follow. 1. Three ſets of ſpinach, planted at a great diſtance from each other, proved all of them fertile, and ripened *plenty* of ſeeds, which were found to anſwer as well as other ſpinach ſeed. 2. A plant of hemp growing by itſelf, being taken care of, produced about 30 good ſeeds, though in a ſituation very much expoſed, and plucked up too ſoon, on account of bad weather, in the autumn. 3. This experiment, which is the moſt remarkable of the three, we ſhall give in the Doctor's own words. "In the ſpring of 1741, I carried two young ſeedling plants of the French mercury, long before there was any in, from the city phyſic-garden, the only place where it was then to be found in this country, to the king's garden at the Abbey; which are more than 700 yards diſtant from one another, with many high houſes, trees, hedges, and part of a high hill, between them: and planted one of them in one incloſure, where it was ſhaded from the ſun the greateſt part of the day; and the other in another, 25 yards diſtant, expoſed to the ſouth and weſt. Both plants ripened fertile ſeeds; and the laſt ſhed them ſo plentifully, that it proved a troubleſome weed for ſeveral years, though none of the ſpecies was to be found in that garden for more than 20 years preceding."

This experiment Mr. Milne hath thought proper not to take any notice of, though he quotes the other two, and on them has the following remark. The reſult of theſe, and ſuch like experiments, can be accounted for, on the principle of the ſexes, in no other way than on the ſuppoſition that ſome male flowers have been intermixed with the female, and operated the fecundation in queſtion. This appears the more propable, as only *a part* of the ſeeds in the above experiments attained to perfect maturity, ſo as to be capable of vegetation."

The ſeventh argument of Linnæus is taken from the *flores nutantes*. The piſtils of theſe flowers, according to Linnæus, are always longer than the ſtamina; and nature has aſſigned them this penſile poſture, that the pollen, which is ſpecifically heavier than air, may the more conveniently fall upon the ſtigma. But the piſtils of the campanula, lilium, and many other *flores nutantes*, are not longer than the ſtamina. Beſides, granting this were uniformly the caſe; yet, as the pollen is heavier than air, this poſture muſt of neceſſity either make the pollen miſs the piſtillum altogether, or at any rate, it can only fall upon the back part of the piſtil in place of the ſtigma; and of courſe, ſuch a direction would rather tend to fruſtrate than promote the impregnation of the ſeed.

The eighth argument is taken from the *plantæ ſubmerſæ*, which are ſaid to emerge as ſoon as their flowers begin to blow, leſt the pollen ſhould be coagulated or waſhed off by the water. But many ſubmarine and aquatic plants fructify entirely below water; and, ſuppoſing they did not, the ſame argument would equally prove it to be the intention of nature, that the pollen ſhould be blown away by the winds, as that it ſhould be ſubſervient to the impregnation of the ſeed.

The ninth and laſt argument is intitled *Omnium florum genuina conſideratio*; which (ſay the antiſexualiſts) is nothing more than a collection of vague obſervations upon the ſtructure and œconomy of particular plants, ſome of them true, others falſe, but all of them evidently thruſt in as ſupports to a favourite hypotheſis.

Thus we have given a ſhort view of the fundamental principles of the ſexual ſyſtem; of the arguments made uſe of, and the facts adduced to ſupport it: to theſe we have ſubjoined the principal arguments brought againſt it; together with the moſt noted experiments made by its oppoſers.

Before putting a period to this ſection, it may not be improper to obſerve, that it appears the facts hitherto brought in ſupport of the ſexual ſyſtem are, on the one hand, too few, and thoſe not ſo fully authenticated as could be wiſhed; and, on the other hand, that the experiments adduced by its oppoſers ſeem neither to have been made with ſufficient accuracy, nor perhaps upon ſuch plants as would have been moſt proper for determining the point in diſpute. In the mean time, we make no doubt but the gentlemen on both ſides will continue to make the moſt exact and careful inquiries and experiments, in order to bring it to a final determination; though from the nature of the queſtion itſelf, as well as the remoteneſs of place where ſome of the plants grow that may be thought neceſſary to be ſubjected to experiment, and the difficulty of getting acceſs to perform thoſe experiments in a proper manner, it is not improbable that many years may yet elapſe before the world be favoured with that determination.

SECT. VII.

THE NATURAL METHOD OF CLASSIFICATION.

Beſides all the abovementioned methods of claſſing and diſtributing plants into their different orders, genera, &c, which are deduced from the fructification, and are therefore called *artificial*, Linnæus and moſt other botaniſts are of opinion that there is a natural method, or nature's ſyſtem, which we ſhould diligently endeavour to find out. That this ſyſtem, ſay they, is no chimera, as ſome imagine, will appear particularly from hence, That all plants, of what order ſoever, ſhow an affinity to ſome others; and thus, as formerly obſerved, not only the virtues of a great number of ſpecies may be aſcertained, but we may know with certainty how to find a proper ſuccedaneum for plants, which cannot eaſily be had. Linnæus divides vegetables into the 59 natural orders following.

I. Palmæ. Theſe are perennial, and moſtly of the ſhrub and tree kind. The ſtem is in height from 2 to 100 feet and upwards. The roots form a maſs of fibres, which are commonly ſimple, and without any ramifications. The ſtem is generally ſimple, without branches, cylindrical, and compoſed of ſtrong longitudinal fibres. The leaves, which are a compoſition of a leaf and a branch, by Linnæus called *frondes*, are of different forms; being ſometimes ſhaped like an umbrella or fan; ſometimes ſingly or doubly winged; the ſmall or partial leaves, which are often three feet in length, being ranged alternately. The branches, or principal leaves, are ſix, eight, ten, or twelve feet long; the length varying according to the age and ſize of the plant. They are covered at firſt with a thick brown duſt, like thoſe of the ferns. The baſe of the leaves frequently embraces the greater part of the ſtem. The flowers are male and female upon the ſame or different roots; except in ſtratiotes, which bears hermaphrodite flowers only; and palmetto, in which the flowers are hermaphrodite and male upon diſtinct roots. The flowers are all diſpoſed in a panicle or diffuſed ſpike, except in the hydrocharis, ſtratiotes, and valliſneria; in which they proceed ſingly from the wings or angles of the leaves. The common calix, in this order, is that termed a *ſpatha* or *ſheath*, and has either one or two valves. The ſpadix, or head of flowers protruded from the ſheath, is generally branched. Each flower is generally furniſhed with a perianthium or proper flower-cup, conſiſting of three leaves or diviſions that are ſmall and permanent. The petals are three in number, of a ſubſtance like leather, and permanent like the leaves of the calix. The flowers of zamia have no petals. The ſtamina are from 2 to 20 and upwards, cohering ſlightly at their baſe. The ſeed-buds are from one to three in number, placed in the middle of the flower, and ſupporting a like number of ſtyles, which are very ſhort. The ſeed-veſſel is generally a pulpy fruit of the berry or cherry kind, containing one cell filled with fibrous fleſh, and covered with a ſkin which is of a ſubſtance like leather. The ſeeds are in number from one to three in each pulpy fruit, of a hard bony ſubſtance, round or oval, and attached by their baſe to the bottom of the fruit. Theſe plants, particularly the ſeeds, are aſtringent, and of efficacy in dyſenteries.

II. Piperitæ. Theſe plants are moſtly herbaceous and perennial. The ſtalks of pothos creep along rocks and trees, into which they ſtrike root at certain diſtances. The greateſt height which any of them is known to attain, is 15 feet; the greater part do not exceed three or four. The fleſhy roots of many of theſe plants are extremely acrid when freſh. They loſe this pungent quality, however, by being dried, and become of a ſoapy nature. The ſmell of many of them is extremely fetid, frequently reſembling that of human excrements. The flowers, however, of an Ethiopian dracunculus or arum, and the cover in which they are involved, are ſaid to emit a very fragrant odour. With regard to their virtues, theſe plants are commonly aſtringent.

III. Calamariæ. In this claſs the baſe of the leaf, which embraces the ſtalk like a glove, has no longitudinal aperture, but is perfectly entire. The ſtalk is generally triangular, and without knots or joints. The roots of ſome are long and knotty; in others, they are compoſed of fleſhy fibres which pierce deep into the ground; and in others, of a bulb. The flowers are either hermaphrodite, or male and female upon the ſame root. The mode of infloreſcence in this order is generally a ſpike; ſometimes a capitulum or head. The calix is either a gluma or an amentum. The corolla is wanting. The filaments of the ſtamina are three in number, ſhort, ſlender like a hair, and ſometimes briſtly. The antheræ are generally long, ſlender, and erect. The ſeed-bud is very ſmall, blunt, and ſometimes three-cornered. The ſtyle is thread-ſhaped, and of the length of the ſcaly calix. The ſtigmata are generally three in number; ſlender, hairy, and ſometimes permanent. The virtues, uſes, and ſenſible qualities, of this order of plants, are the ſame with thoſe of the following.

IV. GRAMINA. Moſt of theſe plants are annual or perennial herbs; ſome of them creep upon the ground, others are erect. The roots, in the greateſt number, are creeping, and emit fibres from each knot or joint; in others they are ſimply branching and fibrous. The ſtems and branches are round. The leaves are ſimple, alternate, entire, very long, and commonly narrow. They form below a ſort of ſheath, which embraces or ſurrounds the ſtem, and is generally cleft or divided on one ſide through its whole length. The flowers are either hermaphrodite, male and female on the ſame root, or hermaphrodite and male on the ſame root. They proceed either ſingly from the ſheath of the leaves, or are formed into a panicle or looſe ſpike. The calix and corolla in this order are not ſufficiently aſcertained; in ſome a ſingle ſcale or huſk, in others two, ſupply the place of both covers; ſome graſſes have four huſky ſcales, two of which ſerve for the calix, and the other two for the corolla: ſome have five; others ſix, four of which conſtitute the calix, and the other two are termed improperly enough the *huſky petals*. The corolla is ſometimes compoſed of one petal with two diviſions; and in general the huſks of the calix are always placed oppoſite to thoſe of the corolla. The ſtamina are generally three in number, and placed irregularly with regard to the ſituation of the calix and corolla. The antheræ are long, furniſhed with two cells, and ſlightly attached to the filaments. The ſeed-bud is placed upon the ſame receptacle as the calix, corolla, and ſtamina. The ſtyle is generally double, and crowned with a hairy ſtigma or ſummit. The ſeed-veſſel is wanting. The ſeeds are ſingle, oval, and attached below to the bottom of the flower. The roots of the graſſes are opening; ſuch as have an aromatic ſmell are ſtomachic; their ſeeds are mealy, mucilaginous, and nouriſhing. All the parts of theſe plants are wholeſome.

V. TRIPELOTOIDÆ, from *trees*, three: and *petalum*, a petal). Theſe plants have no very ſtriking characters, and are nearly allied to the graſſes. All the genera of this order have not the circumſtance expreſſed in the title.

VI. ENSATÆ. This order, which is very nearly allied to the graſſes and liliaceous plants, furniſhes a very beautiful collection of perennial herbs, which are of different heights, from one inch to 15 feet. The roots are tuberous or fleſhy, and garniſhed with fibres; the ſtalks are ſimple, and commonly flat or compreſſed on the ſides. The leaves are ſimple, alternate, entire, ſword ſhaped, and, like the liliaceous plants, form at their origin a ſheath or glove, which in the greateſt number is cleft or divided through the whole length, except at the baſe, where it is entire, and embraces the ſtalk like a ring. The flowers are hermaphrodite, and generally proceed from the ſummit of the ſtalks either ſingly, in an umbel, a ſpike, or in a panicle. In pontederia they proceed from the wings or angles of the leaves either ſingly or in an umbel.

Moſt of theſe plants want the perianthium or flower cup; the flowers burſt from a common cover or ſheath, termed by Linnæus *ſpatha*, which in this order is frequently permanent. The petals are in number from one to ſix. The ſtamina are generally three. The ſeed-bud is placed ſometimes above the flower, ſometimes below it. The ſtyle is generally ſingle, and crowned with a triple ſtigma. The ſeed veſſel is a dry capſule, generally of an oblong ſhape, and opens at three valves, diſcovering the ſame number of cells, each incloſing a quantity of roundiſh ſeeds. Theſe plants reſemble the liliaceous in their powers and ſenſible qualities; very few of them, however, are uſed in medicine.

VII. ORCHIDEÆ. The roots of many of theſe plants are compoſed of one or more fleſhy tubercles or knobs, attached to the lower part of the ſtem, and ſending forth fibres from the top. Thoſe of orchis bear an obvious reſemblance to the ſcrotum in animals; from which circumſtance the genus has derived its name. The leaves are of a moderate ſize, inſcribed with a number of longitudinal nerves or ribs, and without any footſtalk. At their origin they form, round the ſtalk, a kind of ſheath, which is long, entire, cylindrical, but not furniſhed, like the graſſes and ſome other plants, with a crown at top. The flowers are hermaphrodite, and placed at the ſummit of the ſtalk either in a ſpike or in a panicle. The calyx is that ſort termed by Linnæus a *ſpatha* or *ſheath*, that burſting open protrudes a head or cluſter of flowers, termed the *ſpadix*, which have no perianthium or flower-cup. The petals are five in number, and very irregular. The nectarium in this order is remarkably conſpicuous; yet ſo different in the different genera, that Linnæus has employed it for his principal character, or mark of diſtinction, inſtead of the root, which had chiefly engaged the attention of former botaniſts. It has the appearance of a ſixth petal. The filaments are always two in number, and placed upon the piſtillum or female organ. The antheræ are erected, and generally covered by the upper lip of the nectarium. The ſeed bud is either oblong or pillar ſhaped, twiſted like a ſcrew, and univerſally placed below the receptacle of the flower. The ſtyle is ſingle, very ſhort, and forms one ſubſtance with the inner margin of the nectarium. The ſeed veſſel is generally a capſule with one cavity or cell, and three valves or openings, which are keel-ſhaped, and open on the angular ſides, being jointed both at the bottom and top. The ſeeds are numerous; very ſmall, like ſaw-duſt; and attached, without footſtalks, to a ſlender receptacle or rib, which extends itſelf lengthwiſe in the middle of each incloſure or valve. The plants of this order are reckoned ſtrong aphrodiſiacs.

VIII. SCITAMINEÆ. This claſs conſiſts of beautiful exotic plants, all natives of very warm countries. Some of them furniſh exquiſite fruits; but though the plants riſe very high, they are perennial only by their roots. Thoſe which have only one filament, have in all their parts an aromatic odour, and an acrid or poignant taſte; qualities, however, poſſeſſed in a much greater degree by the roots, which are hot and reſinous.

IX. SPATHACEÆ, ſo called becauſe their flowers are protruded from a *ſpatha* or ſheath. They are nearly allied in habit and ſtructure to the liliaceous plants, from which they are chiefly diſtinguiſhed by the ſpatha, out of which their flowers are protruded.

X. CORONARIÆ. Theſe plants are herbaceous, perennial, and from one inch to 15 feet high. The roots are either bulbous, fibrous, or compoſed of ſmall fleſhy knots, which are jointed at top. The bulbs either conſiſt of ſcales laid over each other like tiles, or are ſolid. The ſtem of the liliaceous bulbous plants is properly wanting; what ſupplies its place being nothing elſe than the baſe of the leaves, which, wrapping or enfolding each other, form at bottom a roundiſh fleſhy bulb hitherto diſtinguiſhed, though perhaps improperly, by the name of *root*. In the others the ſtem is ſimple, that is, has few branches, and is either furniſhed with leaves, or riſes naked. The branches are alternate and cylindrical. The leaves are ſimple, alternate, and entire. Thoſe next the root, termed *radical leaves*, generally form at their origin a ſheath, which in a great number is entire; that is, goes all round; whilſt in others, it is cleft or divided longitudinally on one ſide. The flowers are univerſally hermaphrodite, except in white hellebore, which has both male and hermaphrodite flowers mixed together on the ſame root. The flowers are ſometimes ſingle, and terminate the ſtem; ſometimes they form an umbel, ſometimes a ſpike, and ſometimes a panicle. The calix or flower-cup, in this order, according to Linnæus, is generally wanting. In ſtrict propriety, however, the ſingle cover that is preſent in moſt of theſe plants, though beautifully coloured, ought to be denominated a *calix*; as its diviſions, generally ſix in number, are placed oppoſite to the ſtamina. The petals, or, to ſpeak more properly, the coloured leaves of the flower, are in number from one to ſix. Plants which have a ſingle petal, have the limb or upper part ſplit into ſix diviſions or ſegments. The petals in ſome ſpecies are rolled or turned back. The nectarium is various; in the lily it is a longitudinal line which runs through each petal, and reaches from the baſe to the middle. In crown imperial, it is a ſmall hollow or pore, formed at the baſe of each petal; in aſphodel it conſiſts of ſix very ſmall valves, which, approaching, form a globe, and are inſerted into the baſe of the petal; in hyacinth, it is compoſed of three melliferous pores, ſituated on the top of the ſeed-bud. In pine-apple, it is a ſmall ſcale lying within the ſubſtance of each petal above the baſe; and in albuca, or baſtard ſtar of Bethlehem, it conſiſts of two ſharp-pointed bodies proceeding from the furrows of the ſeed-bud, and covered by the broader baſe of the three fertile filaments. In ſome ſpecies of lily the nectarium is hairy; in others it is naked. The ſtamina are ſix in number; erect, and inſerted into the common receptacle, if the flower conſiſts of many petals; into the tube, or diviſions of the corolla, if it conſiſts of one. The antheræ are long, commonly divided below, and ſlightly attached by their ſides to the filaments on which they turn like a vane or the needle of a compaſs. The ſeed-bud is ſingle, and placed either within the flower-cup, or below it. The ſtyle is ſingle, thread-ſhaped, and generally of the length of the petals. The ſtigma is generally ſingle, of a conic form, and ſhaggy or hairy at the extremity. The ſeed-veſſel is generally a capſule, divided externally into three cells. With reſpect to the powers of the plants of this order, it may be affirmed in general, that ſuch as have little taſte or ſmell, as the roots of tulip, and ſtar of Bethlehem, are perfectly innocent; whilſt thoſe which have a heavy nauſeous ſmell, as ſquill, hyacinth, crown imperial, and ſpider-wort, are at leaſt ſuſpicious, and frequently prove noxious.

XI. SARMENTOSÆ, (from *ſarmentum*, a long ſhoot, like that of a vine). This order conſiſts of plants which have climbing ſtems and branches, that, like the vine, attach themſelves to the bodies in their neighbourhood for the purpoſe of ſupport. Theſe plants are far from being a true natural aſſemblage; in fact, they ſcarce agree in a ſingle circumſtance, except that expreſſed in the title, which is far from being peculiar to this order.

XII. HOLERACEÆ. This order conſiſts of plants which are uſed for the table, and enter into the œconomy of domeſtic affairs: it contains trees, ſhrubs, perennial, and annual herbs. Some of the woody vegetables retain their green leaves during the winter. The roots are very long, and frequently ſpindle-ſhaped; from the knots on the ſtems and branches of ſuch plants as creep on the ground, or float on the water, proceed fibrous and branching roots. The ſtems and young branches are cylindric; and in the greateſt part of the aquatic plants of this order, the ſtalks are hollow within. The buds are of a conic form, and naked; that is, not accompanied with ſcales. The leaves are generally ſimple, entire, alternate, and attached to the branches by a cylindric foot-ſtalk, which is ſometimes very long, but commonly very ſhort. Some plants of this kind have two ſtipulæ or ſcales which are attached to the branches near the origin of the foot-ſtalk of each leaf. In many others, inſtead of ſtipulæ, each leaf bears on its foot-ſtalk a membranaceous ſheath, which is cylindric, frequently fringed on the margin, and pierced or penetrated by the ſtem. The flowers are either hermaphrodite; male and female upon the ſame root; male and female upon different roots; hermaphrodite and male on the ſame root; hermaphrodite and male on different roots.

XIII. Succulentæ. The order conſiſts of flat, fleſhy, and juicy plants, moſt of them ever-greens. They are aſtringent, refreſhing, and very wholeſome.

XIV. Gruinales, from *grus* a crane. Theſe conſiſt of *geranium*, vulgarly called *cranes-bill*, and a few other genera which Linnæus conſiders as allied to it in their habit and external ſtructure. This order furniſhes both herbaceous and woody plants. The roots are ſometimes fibrous, ſometimes tuberous. In ſome ſpecies of wood-ſorrel they are jointed. The ſtems are cylindric; the young branches, in ſome, nearly ſquare. The buds are of a conic form, and covered with ſcales. The leaves are either ſimple or compound. The flowers are hermaphrodite; they proceed from the wings of the leaves either ſingly or in cluſters. The calix or flower-cup conſiſts of five diſtinct leaves, or of one leaf divided almoſt to the bottom into five parts. It generally accompanies the ſeed-bud to its maturity. The petals are five in number, ſpreading, and frequently funnel-ſhaped. The ſtamina are generally ten in number, awl-ſhaped, erect, and of the length of the petals. The ſtamina are generally oblong; and frequently attached to the filaments by the middle, ſo as to lie, and ſometimes to veer about, upon them. The ſeed-bud is either oblong, or five-cornered. The number of ſtyles is either one, or five. In *tribulus*, the ſtyle is wanting. The ſeed-veſſel is generally a five-cornered capſule, with one, three, five, or ten cells. The ſeeds are generally equal in number to the internal diviſions or the cells of the ſeed-veſſel; one ſeed being placed in each cell.

XV. Inundatæ. The plants of this order are aquatic, of low ſtature, herbaceous, and moſtly perennial. The roots are fibrous. The ſtem is generally wanting. In its place are an aſſemblage of leaves, which wrapping or enfolding each other mutually form a ſheath; and from the middle of this ſheath is produced the foot-ſtalk of the flower. The leaves are ſometimes alternate, ſometimes placed in whirls round the ſtem. In a great many genera the foot-ſtalk is extended at its origin into a membranaceous ſubſtance, which forms a ſheath that is cleft through the whole length, on the ſide oppoſite to the leaf. The flowers are hermaphrodite, or male and female on the ſame root. The flower-cup is either wanting, or conſiſts of three, four, or five diviſions or leaves, which accompany the ſeed-bud to its maturity. The petals are generally wanting. The ſtamina are in number from one to 16 and upwards. The filaments in ſome genera are ſo ſhort, that they ſeem wanting. The antheræ are ſhort, and generally marked with four longitudinal furrows. The ſeed-buds are in number from one to four, the ſtyle is frequently wanting. The ſeed-veſſel is univerſally wanting, except in Elatine, which has a dry capſule, with four external openings, and the ſame number of cells. The ſeeds are generally four in number.

XVI. Calyciflor.æ, (from *calix* the flower-cup, and *flos* the flower), conſiſting of ſuch plants as have the ſtamina (the flower inſerted into the calix). All the plants of this order are of the ſhrub and tree kind. Some of them riſe to the height of 12 or 14 feet; others not above two or three. The roots are branching, fibrous, and woody. The ſtems are cylindric. The branches, when young, are cornered; the buds of a conic form, and without ſcales. The leaves are ſimple, alternate, and attached to the branches by a very ſhort foot-ſtalk. The flowers are either male or female upon diſtinct roots, or hermaphrodite and male on the ſame root. The calix is a perianthium compoſed of one leaf divided into two, three, or four ſegments. It is commonly placed upon the germen or ſeed-bud, which accompanies it to maturity. The corolla is univerſally wanting, except in *trophis*, the male plants of which, according to Linnæus, have four obtuſe and ſpreading petals. The ſtamina are generally four in number, ſlender like a hair, ſhort, placed at a conſiderable diſtance from the ſtyle, and inſerted into the tube of the calix. The piſtillum is compoſed of a roundiſh germen, crowned with the calix; a ſingle thread-ſhaped ſtyle; and a cylindric ſtigma. The ſeed-veſſel is either an obtuſe oval fruit of the cherry kind, or a globular berry with one cell, containing a roundiſh ſeed. The plants of this order are aſtringent.

XVII. Calycanthemæ, (from *calix* the flower-cup, and *ανθος* the *flower*); conſiſting of plants, which, among other characters, have the corolla and ſtamina inſerted in the calix. This order furniſhes trees, ſhrubs, and annual, biennial, and perennial herbs. The herbaceous annuals are by much the moſt numerous. The roots are branching and fibrous; the ſtems and branches cylindric, ſquare, or four-cornered while young. The buds are of a conic form, and without ſcales. The leaves are generally either alternate, ſimple, and attached to the branches by a ſhort foot-ſtalk, or oppoſite at the bottom of the ſtem; and in ſome, alternate towards the top. They are univerſally ſeſſile; that is, attached to the branches, without any foot-ſtalk. The calix is univerſally a perianthium, and generally monophyllous, or compoſed of one leaf. The corolla conſiſts of four, five, and ſix petals, which are attached to the tube of the calix, and are ſometimes placed alternate, ſometimes oppoſite to the diviſions of the limb. The ſtamina, which are in number from 4 to 20 and upwards, are attached to the tube of the calix either on its margin, or lower down. When the number of ſtamina is double the diviſions of the calix, the ſtamina which ſtand oppoſite to theſe diviſions are a little longer than the reſt. The antheræ are generally of a hemiſpherical figure; frequently cleft or ſlit below; and by that aperture attached ſlightly to the filaments, on which they often veer about like a vane or needle. They are furrounded longitudinally, and open on the ſides into two loculi or cells. The pollen, or male duſt, conſiſts of a number of minute particles, of an oval figure, yellow and tranſparent. The germen or ſeed-bud is placed either above or under the receptacle of the flower. The ſtyle is ſingle, thread-ſhaped, and of the length of the ſtamina. The ſtigma is generally ſingle and undivided. The ſeed-veſſel is a capſule, which is generally divided internally into four loculi or cells. The ſeeds are numerous, minute, and frequently three cornered. The plants of this order are reckoned aſtringent.

XVIII. Bicornes, (from *bis* twice, and *cornu* a horn), plants whoſe antheræ have the appearance of two horns. This appearance, however, is not very conſpicuous, unleſs in a few genera. The plants of this order are all of the ſhrub and tree kind. The roots are branching and fibrous. The ſtems and branches are cylindric. The buds conic, ſometimes covered with ſcales, and ſometimes naked. The leaves are generally alternate. In moſt plants of this order they are either ſeſſile, or ſupported by a very ſhort foot-ſtalk, which is ſemi-cylindric, and flat above. The flowers are univerſally hermaphrodite, except in one genus, the Indian date-plum, where hermaphrodite and male flowers are produced in the ſame ſpecies upon diſtinct roots. They proceed either ſolitary, or in a corymbus from the angles formed by the leaves and branches; or hang down in ſpikes and cluſters at the end of the branches; each flower having a ſmall ſcale or floral leaf placed under it. In moſt plants of this order the calix is placed around or below the germen. The calix is univerſally a perianthium, and generally monophyllous or of one piece, deeply divided into four or five ſegments, which are permanent, that is, accompany the germen to its maturity. The ſegments are often acute, and ſometimes coloured. The corolla is generally monopetalous, and bell or funnel ſhaped; the figure, however, is not very conſtant, even in plants of the ſame genus. The limb, or upper part of the petal, is generally divided into four or five ſegments, which are ſometimes rolled back, ſometimes bent inwards. The limb too is ſometimes ſlightly cut, ſometimes divided almoſt to the bottom. The tube, or lower part of the petal, is cylindric, and generally of the ſame length with the calix. The number of ſtamina is from 4 to 20. Theſe are generally erect, and attached to the lower part of the tube of the corolla. The antheræ are bifid or forked below, and, being ſlightly attached to the filaments, are frequently inverted in ſuch a manner as to exhibit the appearance of two horns at top. The germen or ſeed-bud is generally roundiſh, and ſeated above the receptacle. The ſtyle is ſingle, thread-ſhaped, of the ſame length with the corolla, and in a few genera permanent. The ſeed veſſel is either a capſule with five cells, a roundiſh berry, or an oblong four-cornered nut with two cells. The plants of this order are aſtringent.

XIX. Hesperideæ, (from the Heſperides, whoſe orchards are ſaid to have produced golden apples). The plants of this order are of the ſhrub and tree kind, and moſtly evergreen. The bark of the ſtalks is ſlender, and comes off in thin plates. The leaves are generally oppoſite, and covered with ſmall tranſparent points. In ſome, the leaves are placed oppoſite at the bottom of the ſtalks, and alternate above. The buds are of a conic form, the flowers generally hermaphrodite; they proceed from the wings of the leaves either ſingly, or in cluſters like ivy-berries. The calix is placed above the ſeed-bud, and accompanies it to its maturity. The petals are three, four, or five in number, and ſtand upon the brims of the tube of the calix. The ſeed-bud is large, oblong, and placed below the receptacle of the flower. The ſtyle is ſingle, awl-ſhaped, of the length of the ſtamina, and terminated with a ſingle ſtigma. The ſeed-veſſel in ſome genera is a berry furniſhed with one or three cells; a capſule with four cells, or of the nature of a cherry, containing a ſtone. The ſeeds are generally numerous, ſmall and oblong. The leaves and fruits are aſtringent, the berries eſculent.

XX. Rotaceæ, (from *rota*, a wheel), conſiſting of plants with one wheel-ſhaped petal without a tube. Theſe reſemble in quality thoſe of the order of preciæ, to which they are in all reſpects very nearly allied; but very few of them can be ſaid in ſtrict propriety to poſſeſs the character ſpecified in the title.

XXI. Preciæ, (from *precius* early). Theſe conſiſt of primroſe, an early flowering plant, and ſome others which agree with it in habit and ſtructure, though not always in the character or circumſtance expreſſed in the title. Theſe plants, which poſſeſs no ſtriking uniform characters, are, in general, innocent in their quality; yet the root of ſow-bread is dangerous, if taken internally.

XXII. Caryophylleæ. All the plants of this order are herbaceous, and moſtly annual. Some of the creeping kinds do not riſe above an inch, and the talleſt exceed not ſeven or eight feet. The roots are branching, fibrous, and of a moderate length. The ſtems are cylindrical. The branches proceed from the wings or angles of the leaves, and are generally oppoſite, and as it were jointed at each knot. In ſome ſpecies of ceraſtium the branches are ſquare. The leaves are generally placed oppoſite in pairs, ſo as to reſemble a croſs; and are ſlightly united at the bottom by their foot-ſtalks, which form a ſort of glove round the ſtem. The hairs are ſimple, like ſilk. The flowers are hermaphrodite; but ſome have male and female flowers upon diſtinct roots. They either ſtand ſingle on their foot-ſtalks, and proceed from the wings or angles of the leaves and branches, or are diſpoſed in a ſpike, corymbus, umbel, or panicle. The calix is permanent, and compoſed either of one piece with five indentments, or of four or five diſtinct leaves. The corolla generally conſiſts of five petals, which have claws of the length of the calix; and a ſpreading limb, ſometimes entire, but oftener cleſt or divided in two. The ſtamina are in number from 3 to 15, and of a moderate length. When their number is double the diviſions of the calix, they are attached alternately to the claws of the petals, thoſe ſo attached being ſhorter than the reſt; the remaining ſtamina are inſerted into the common receptacle, and ſtand oppoſite to the ſegments of the calix. In ſome genera of this order the number of ſtamina is found to vary, even in the different flowers of the ſame plant. The antheræ are ſhort, hemiſpherical, marked with four longitudinal furrows, frequently divided or cleft below, moſt commonly erect; ſometimes, however, *incumbent*, that is, faſtened to the filaments by the ſides. The pointal is compoſed of a ſingle ſeed-bud, which is generally roundiſh, ſometimes cornered. The ſtyles are thread-ſhaped, of the length of the ſtamina, and crowned with a ſimple ſtigma, which is ſleek or ſmooth externally, and ſlightly hollowed or vaulted within. The ſeed-veſſel is a dry capſule, of an oval form, of the length of the calix, and conſiſts of one or three cells. The plants of this order are innocent in their quality; they abound in a watery ſort of phlegm, and have bitter ſeeds. With reſpect to their virtues, they are reckoned aſtringent, attenuating, and deterſive.

XXIII. Trihilatæ, (from *tres* three, and *hilum* an external mark on the ſeed); conſiſting of plants with three ſeeds, which are marked diſtinctly with an external cicatrix or ſcar, where they were faſtened within to the fruit.

XXIV. Corydales, (from κορυς a helmet); conſiſting of plants which have irregular flowers, ſomewhat reſembling a helmet or hood. Theſe plants are moſtly herbaceous and perennial. The roots are tuberous or knobby. The ſtems are generally branching. The leaves are alternate, ſometimes ſimple, but moſt commonly winged. The foot-ſtalk of the leaves is ſtrait or narrow, except in *epimedium*, where it is large, and has a membranaceous edge or border. The flowers are univerſally hermaphrodite. They proceed either ſingly from the wings or angles of the leaves, or are collected in cluſters at the end of the branches. The calix conſiſts of two, four, five, or ſix leaves, which are frequently coloured, and commonly fall off immediately before or very ſoon after the expanſion of the petals. The corolla is generally irregular; of one, or many pieces; gaping; and furniſhed with a nectarium, which is very different in the different genera. The ſtamina are in number from two to ſix, and of a proportionate length, except in honey-flower, which has two ſhorter than the reſt. The filaments are diſtinct, except in two genera, fumitory and *monnierea*, which have two ſets of ſtrings or filaments united in a cylinder. The antheræ are univerſally diſtinct, except in *impatiens*, where they are formed into a cylinder divided at the baſe. The ſeed-bud is generally roundiſh, but ſometimes angular or cornered. The ſtyle is commonly ſingle, extremely ſhort, ſlender, or thread-ſhaped, and crowned with a ſimple ſtigma. The ſeed-veſſel is either a hollow blown-up berry, a capſule of one cell, a longiſh, or a roundiſh pod. The ſeeds are generally numerous and round.

XXV. Putamineæ, (from *putamen* a ſhell); conſiſting of a few genera of plants allied in habit, whoſe fleſhy ſeed-veſſel or fruit is frequently covered with a hard woody ſhell. Moſt of theſe plants are acrid and penetrating; and yield, by burning, a great quantity of fixed alcali. With reſpect to their virtues, they are powerful aperients. The Indians pretend that the fruit of a ſpecies of caper-buſh, which they call *baducca*, extinguiſhes the flames of love.

XXVI. Multisiliquæ, (from *multus* many, and *ſiliqua* a pod); conſiſting of plants which have more ſeed-veſſels than one. From the etymology of the term, one would naturally imagin that the ſeed-veſſels in queſtion were of that kind called by Linnæus *ſiliqua*, or pod: but the fact is, that not a ſingle plant of this order bears pods; the greater part having many dry capſules, and the remainder being furniſhed properly with no ſeed-veſſel, but bearing numerous diſtinct ſeeds. Plants of this order are moſtly perennial herbs; the ſtems of ſome are erect; others creep upon the ground, and produce roots near the origin of each leaf; laſtly, others climb, and attach themſelves to the bodies in their neighbourhood, either by the footſtalk of the leaves, or by tendrils and claſpers which terminate the footſtalk. The greateſt height of thoſe which riſe erect, ſeldom exceeds eight feet. Thoſe which climb rarely exceed 15 or 20 feet. The roots are generally fleſhy. In ſome they are hand-ſhaped; in others finger-ſhaped, or cylindric. In ſome ſpecies of hellebore and ranunculus they are divided into ſpherical knobs. Laſtly, in ſome plants of this order, the roots are fibrous. The ſtems and young branches are cylindric. The leaves, which are of different forms, being ſometimes ſimple and entire, ſometimes hand-ſhaped or winged, are generally alternate. The foot-ſtalk, which is ſometimes cylindric, ſometimes angular, is membranous, and very large at its origin, ſurrounding a great part of the ſtem from which it proceeds. The flowers are hermaphrodite. They proceed either ſingly from the wings of the leaves or termination of the branches, or terminate the branches in a ſpike, panicle, or head. The calix in ſome is wanting; in others it is generally compoſed of five pieces, which fall off with the petals. The petals are in number from 4 to 15; generally equal, and ſometimes diſpoſed in two or three ſeries; five is the prevailing number. The ſtamina are in number from 5 to 300, diſtinct, and attached generally in ſeveral rows or ſeries to the receptacle. The ſeed-buds are generally numerous; the ſtyle is frequently wanting. In ſome the ſeed-veſſel is wanting; in others it is compoſed of ſeveral dry capſules, each containing a ſingle cell. The ſeeds are numerous, and frequently angular. Moſt of theſe plants are acrid, and many of them poiſonous. In general, plants that have a great number of ſtamina are noxious in their quality. When burnt, theſe plants furniſh a fixed alcali; by diſtillation there is drawn from them a kind of nitrous and aluminous ſubſtance. With reſpect to their virtues, they are cauſtic and purgative.

XXVII. Rhæædeæ, conſiſting of poppy, and a few genera which reſemble it in habit and ſtructure. Theſe plants, upon being cut, emit plentifully a juice, which is white in poppy, and yellow in the others. With reſpect to their virtues, they ſeem to operate principally upon the nerves. Their juice is ſoporific and narcotic, their ſeeds leſs ſo, their roots aperient. Applied externally, they are ſlightly corroſive.

XXVIII. Luridæ, conſiſting of plants whoſe pale and ominous appearance ſeems to indicate ſomething baleful and noxious in their nature and quality. Moſt of theſe plants are herbaceous and perennial. Many of them are of the maſqued tribe of flowers; others reſemble theſe in their general appearance, but differ from them eſſentially in the equality of their ſtamina. The roots are generally branched, ſometimes tuberous. The ſtems and branches are cylindric. The leaves are generally ſimple, and placed alternate. The flowers are hermaphrodite. They proceed either ſingly or in cluſters from the angle formed by the leaves and branches. In ſome ſpecies of lycium, they terminate the branches. The calix is generally of one piece deeply divided into five parts. The corolla conſiſts of one petal, which is either bell, funnel, or wheel ſhaped. The ſtamina are four or five in number; and thoſe either of equal lengths, as in the greater, or unequal. The ſeed-bud is placed above the receptacle of the flower. The ſtyle is ſingle; and is terminated by a ſummit which is hemiſpherical, and frequently channelled or furrowed. The ſeed-veſſel, in ſuch as have equal ſtamina, is a berry; in the reſt, it is generally a capſule. The ſeeds are numerous, and frequently kidney-ſhaped. Theſe plants in general are poiſonous. They have an inſipid taſte, and a nauſeous diſagreeable ſmell.

XXIX. Campanaceæ, (from *campana* a bell); plants with bell-ſhaped flowers. The plants of this order are herbaceous and perennial. The roots are either ſpindle-ſhaped, or branching and fibrous. The ſtems are round. The branches are generally alternate. The leaves are ſimple, alternate, and commonly attached to the branches by a ſemi-cylindric foot-ſtalk, which is furrowed above. The indentments are terminated by a ſmall white tubercle or knob, which renders them conſpicuous. The flowers are hermaphrodite; and proceed either ſolitary from the wings of the leaves, or are collected into a ſpike and head at the end of the flower-ſtalk. The calix is univerſally a perianthium ſituated upon or round the germen, and generally compoſed of one leaf deeply divided into five ſegments. The corolla is monopetalous, and of the bell, funnel, or wheel ſhape. The tube, in flowers of the bell and wheel ſhape, is very ſhort; in thoſe of the funnel-ſhape, very long. In Greek valerian, the tube is ſhut with five valves, which are placed on its apex or top. The limb or upper part of the corolla is deeply divided into five ſegments, which ſpread, and are alternate with the diviſions of the calix. The corolla is generally permanent. The ſtamina are five in number, attached to the baſe of the tube of the corolla, alternate with its diviſions, and oppoſite to thoſe of the calix. The filaments are diſtinct; very large at their origin; and frequently approach ſo as to form a ſort of vault, which covers the ſummit of the germen. They are ſlender and awl-ſhaped above. The antheræ are very long; oval; marked with four longitudinal furrows, either diſtinct, or united in a cylinder. The pollen is compoſed of very ſmall, ſpherical, white, ſhining, and tranſparent particles. The germen is roundiſh, and ſituated either wholly or in part under the flower. The ſtyle is generally ſingle, and of the length of the ſtamina or corolla. The ſtigma is commonly ſingle, but deeply divided. The ſeed-veſſel is a roundiſh capſule, generally divided into three cells, and furniſhed externally with the ſame number of valves. The ſeeds are ſmall, numerous, attached to a receptacle in the centre of the fruit, generally rounded, and ſometimes cornered. This order furniſhes many excellent medicines. The plants abound with a white milky juice, which, upon the ſtalk being cut, flows out in great quantities.

XXX. CONTORTÆ, (from *con* together, and *torqueo* to twiſt); conſiſting of plants which have a ſingle petal that is twiſted, or bent towards one ſide. This order furniſhes trees, ſhrubs, and fat ſucculent plants, ſome of which retain their leaves during the winter. The herbaceous vegetables in this order are generally perennial. The roots are ſometimes branching, but commonly fleſhy, ſucculent, and garniſhed with fibres or ſtrings like thoſe of turnip. The ſtems are round, and in ſome genera pulpy and ſucculent. The branches are ſometimes placed alternate, and ſometimes oppoſite. The buds are of a conic form, and naked or without ſcales. The leaves are ſometimes alternate, ſometimes placed oppoſite in pairs, and not ſeldom ſurround the ſtem in whirls. They are attached to the branches by a cylindrical foot-ſtalk, which is ſhort, and frequently united to the foot-ſtalk of the oppoſite leaf. The defenſive and offenſive weapons in this order are a downy ſort of pubeſcence, and ſimple, or forked prickles, which, in ſome genera, iſſue from the wings of the leaves. The flowers are hermaphrodite; and ſtand either ſingly upon their foot-ſtalks, or are collected into umbels and cluſters. Theſe bunches or collections of flowers ſometimes terminate the branches, ſometimes proceed from the angles of the branches, and ſometimes ſtand at the ſide of the wings without iſſuing from them. The flower-cup is compoſed of one leaf divided almoſt to the baſe in five unequal ſegments, which embrace each other, and are permanent, or accompany the ſeed-bud to its maturity. The corolla conſiſts of one petal, which in the different genera is bell, ſalver, funnel, or wheel ſhaped. The limb, or upper ſpreading part of the petal, is generally divided into five equal parts, which are ſlightly bent or twiſted to the left, and embrace or enfold each other like the petals of the mallow tribe. The tube is generally long and cylindrical; ſometimes club-ſhaped, and often wanting. In ſeveral flowers of this order the petal is accompanied with that ſpecies of ſuperfluity termed a *nectarium.* In the different genera, however, it aſſumes very different appearances. The ſtamina are five in number, ſhort, equal, attached at the ſame height to the tube of the petal, alternate with its diviſions, and oppoſite to thoſe of the calix. The antheræ are generally erect, and frequently approach ſo as to form a compact body in the middle of the flower. The ſeed-bud is either ſingle or double. In ſome the ſtyle is wanting. The ſtigma is frequently double. The ſeed-veſſel in ſome genera is a pulpy fruit, of the berry and cherry kind; but moſt frequently that ſpecies termed by Linnæus *conceptaculuum*, and *folliculus*, which has one valve or external incloſure, opens lengthways on one ſide, and has not the ſeeds faſtened to it. Two of theſe dry fruits, with a ſingle cell, compoſe the ſeed-veſſel of moſt plants of this order. The ſeeds are generally numerous, and in ſeveral genera crowned with a long pappus or downy wing like that of the compound flowers, by means of which they eaſily diſperſe and ſow themſelves. The plants of this order being cut, emit a juice which is generally milky, and ſometimes of a greeniſh white. From the circumſtance of their abounding in this milky juice, the greater part are deemed poiſonous; repeated obſervations having eſtabliſhed this aphoriſm, That milky plants, except thoſe of the plain compound flowers, are generally of a baneful deſtructive nature, and ought at leaſt to be adminiſtered with caution. With reſpect to their ſenſible qualities, they are bitter; particularly the ſeeds, roots, and bark, in which reſides their principal virtue.

XXXI. VEPRECULÆ, (from *vepres* a briar or bramble), conſiſting of plants reſembling the daphne, dirca, gnirdia, &c. but which, however, do not conſtitute a true natural aſſemblage.

XXXII. PAPYLIONACE, plants that have papilionaceous flowers, i. e. ſomewhat reſembling a butterfly in ſhape; of which number are all the leguminous plants. The plants of this order are of very different duration; ſome of them being herbaceous, and thoſe either annual or perennial; others woody vegetables of the ſhrub and tree kind, a few of which riſe to the height of 70 feet and upwards. The herbaceous plants of this order generally climb; for, being weak and as it were helpleſs of themſelves, they are provided by nature with tendrils, and even ſharp pointed hooks, at their extremities, to faſten upon the neighbouring trees or rocks; or the ſtalks are endowed with a faculty of twiſting themſelves, for the purpoſe of ſupport, around the bodies in their neighbourhood. The pea, vetch, and kidney bean, afford familiar examples of this appearance. The ſhrubs and trees of this order are moſtly armed with ſtrong ſpines. The roots are very long, and furniſhed with fibres; but ſome genera have fleſhy knobs or tubercles placed at proper intervals along the fibres. The ſtems are cylindric, as likewiſe the young branches, which are placed alternately: thoſe which climb, twiſt themſelves from right to left, in a direction oppoſite to the apparent motion of the ſun. The bark of the large trees is extremely thick and wrinkled, ſo as to reſemble a net with long meſhes; the wood is very hard in the middle, and commonly coloured or veined. The buds are hemiſpherical, without ſcales, and proceed from branches horizontally a little above the angle which they form with the leaves. The leaves are alternate, and of different forms, being either ſimple, finger-ſhaped, or winged. This laſt form is very common; the lobes or leſſer leaves are entire, and ſometimes placed in pairs, but moſt commonly the winged leaf is terminated by an odd lobe.

The winged or pinnated leaves of this order have a daily or periodical motion, depending upon the progreſs of the ſun in his diurnal courſe. The common footſtalk of the winged and compound leaves is marked on the upper ſurface with a cavity or furrow which runs through its whole length. The flowers are hermaphrodite; and proceed either from the wings of the leaves, or from the extremity of the branches. The calix is a perianthium of one leaf, bell ſhaped, bunching out at the bottom, and cut on its brim or margin into five irregular diviſions or teeth; the lowermoſt of which, being the odd one, is longer than the reſt: the other four ſtand in pairs, of which the uppermoſt is ſhorteſt, and ſtands fartheſt aſunder. The bottom of the calix is moiſtened with a ſweet liquor like honey, ſo may be deemed the nectarium of theſe plants. The petals are four or five in number, very irregular, and from their figure and poſition bear an obvious reſemblance to a butterfly expanding its wings for flight. Theſe petals have been characterized by diſtinct names: the upper one, which is commonly the largeſt, is termed the *ſtandard*, (*vexillum*); the two ſide petals, the wings, (*alæ*); and the lowermoſt, which is generally united at top, and divided at bottom, the *keel* (*carina*). The ſtamina are generally ten: theſe are either totally diſtinct, or united by the filaments into one or two bundles involving the ſeed-bud. In the latter caſe, where there are two ſets of united filaments, one of the ſets is compoſed of 9 ſtamina, which are united into a crooked cylinder, that is cleft on one ſide through its whole length: along this cleft lies the tenth filament or ſtamen, which conſtitutes the ſecond ſet, and is often ſo cloſely attached to the ſecond bundle, that it cannot be ſeparated without ſome difficulty. The antheræ are ſmall, round, marked with four longitudinal furrows, and ſlightly attached to the filaments. In lupine, the antheræ are alternately round and oblong. The ſeed-bud is ſingle, placed upon the receptacle of the flower, oblong, cylindrical, ſlightly compreſſed, of the length of the cylinder of the united ſtamina by which it is involved, and ſometimes elevated by a ſlender footſtalk which iſſues from the centre of the calix. The ſtile is ſingle, ſlender, and generally crooked or bent. The ſtigma is commonly covered with a beautiful down, and placed immediately under the antheræ. The ſeed veſſel is that ſort of pod termed a *legumen*, which is of an oblong figure, more or leſs compreſſed, with two valves, and one, two, or more cavities. Theſe cavities are often ſeparated, when ripe, by a ſort of joints. The ſeeds are generally few in number, round, ſmooth, and fleſhy. Jointed pods have generally a ſingle ſeed in each articulation. The ſeeds are all faſtened along one ſuture, and not alternately to both, as in the other ſpecies of pod termed *ſiliqua*. The plants of this family are, in general, mucilaginous. From the inner bark of moſt of them flows, either naturally or by inciſion, a clammy liquor, which dries and hardens like gum; the juice of others is ſweet like ſugar; ſome taſte bitter, and are purgative, emetic, or even mortal. A ſpecies of eaſtern aſtragalus, with goats-rue leaves, is ſaid to be remarkably cauſtic, and to burn the tongue exceſſively when chewed. In general, however, theſe plants are ſoft and clammy. With reſpect to their virtues, the plants of this order are highly emollient; ſome of them are vulnerary and aſtringent; and the root of anonis, or reſt-harrow, is diuretic.

XXXIII. LOMENTACEÆ: (from *lomentum*, a colour uſed by painters). Many of theſe plants furniſh beautiful tinctures, and ſome of them are much uſed in dyeing. They very much reſemble the laſt order, differing only in the following particulars. 1. In all plants of this order, except milk-wort, the ſtamina are diſtinct. The flower is not ſhaped like a butterfly, but is leſs irregular, and frequently conſiſts but of one petal. The leaves are ſometimes ſimple, but moſt commonly winged. The ſeeds are generally marked with a circular furrow on both ſides. Like thoſe of the leguminous tribe, the plants of this order are generally mucilaginous. From the inner bark of the greater number exſudes, either naturally or by inciſion, a mucilaginous liquor, which ſometimes dries upon the plant, and becomes a gummy ſubſtance.

XXXIV. CUCURBITACEÆ, (from *cucurbita* a gourd); conſiſting of plants which reſemble the gourd in external figure, habit, virtues, and ſenſible qualities. The plants of this order, which generally climb, and have long diffuſed branches, are moſtly herbaceous and perennial. The roots in the perennial plants of this order are ſhaped like thoſe of the turnip; in the annuals, they are branching and fibrous. The ſtems are cylindric and ſucculent. The young branches have generally five corners. In ſome ſpieces of paſſion flower they are ſquare. The leaves are alternate, angular, and ſometimes hand ſhaped. They are attached to the branches by a foot ſtalk, which is pretty long and cylindrical, without any furrow. From the wing or angle of each of the upper leaves proceeds a tendril, which is either ſimple, or branching, and twiſts itſelf ſpirally round the different bodies in its neighbourhood, for the purpoſe of ſupporting and training of the branches. The lower leaves have no tendril. The flowers are either hermaphrodite, or male and female. In this laſt, the male flowers are generally ſeparated from the female upon the ſame root; and that either in the ſame wing or angle of the leaves, or in different angles. The flower cup, in the female flowers, is placed upon the ſeed bud; and generally conſiſts of one bell-ſhaped leaf, that is deeply divided into five unequal ſegments, and, unlike the other plants which have the calix ſeated upon the fruit, falls off with the petals and the other parts of the flower. The corolla conſiſts of one petal, with five equal diviſions, which adhere to the tube of the calix, as if glued to it. A ſpecies of paſſion flower, termed by Linnæus *paſſiflora ſuberoſa*, wants the petals. The ſtamina are in number from one to five, ſhort, and generally inſerted into the calix. The filaments are diſtinct; the antheræ of many genera are united in a cylinder. In the paſſion flower they are ſlightly attached to the filaments, on which they turn like a vane or the needle of a compaſs. The ſeed bud is ſingle, and placed below the receptacle of the flower. The ſtyle is generally ſingle, cylindrical, of the length of the calix, and crowned with a triple ſtigma. The ſeed veſſel is generally pulpy, of the apple or berry kind, and conſiſts of one, two, or three cells. The ſeeds are numerous, generally flat or compreſſed, and ſometimes covered with that kind of proper coat called by Linnæus *arillus*. The fruit of theſe plants is generally purgative and refreſhing; that of ſome of them proves a very violent emetic when uſed too freely.

XXXV. Senticosæ, (from *ſentis* a briar or bramble); conſiſting of the roſe, bramble, and other plants which reſemble them in port and external ſtructure. Theſe plants are ſo nearly allied in form, habit, and ſtructure, to thoſe of the natural order *Pomaceæ*, that they ought never to have been ſeparated from it. The leaves have a ſtyptic taſte; the fruits are acid and cooling. With reſpect to their virtues, the leaves are vulnerary and aſtringent, the roots are diuretic. The acid fruits, as ſtrawberry and raſpberry, are uſed with ſucceſs in putrid and bilious fevers, as likewiſe in cotagious and epidemic dyſenteries, which prevail in ſummer and autumn, and are occaſioned by a ſudden tranſition from a hot to a cold air, or by the acrid humour which flows into the inteſtines.

XXXVI. Pomaceæ, (from *pomum* an apple); conſiſting of thoſe which have a pulpy eſculent fruit, of the apple, berry, or cherry kind. The plants of this order, which furniſhes many of our moſt eſteemed fruits, are moſtly of the ſhrub and tree kind. The roots are branched, fibrous, and in the greater part very long. The ſtems and branches are cylindric. Theſe laſt are placed alternate; and when young, are in ſome genera, angular. The bark is thick and wrinkled. The buds are of a conic form, placed in the angles of the leaves, and covered with ſcales which lie over each other like tiles. The leaves, which differ in form, being in ſome genera ſimple, in others winged, are, in the greater number, placed alternate. The footſtalk of the leaves is furrowed above, and frequently accompanied by a number of knobs like glands. Moſt of theſe plants are furniſhed with two ſtipulæ at the origin of the young foot-ſtalks of the leaves. Theſe, in ſome genera, are pretty large; in others, they are ſo ſmall as ſcarce to be perceived; and in cocoa-plum in particular, they by their minuteneſs reſemble hairs. The flowers are univerſally hermaphrodite, except in *ſpiræa aruncus*, in which male and female flowers are produced on diſtinct plants. In the greater number of genera they are produced in cluſters or heads at the end of the branches. The calix is of one piece, with five ſegments or diviſions, which are permanent, and placed above the ſeed-bud in ſome; in the reſt, they either fall off with the flower, or wither upon the ſtalk. The petals are five in number, and are inſerted into the tube of the calix. The ſtamina are generally 20 and upward, and attached like the petal to the margin of the tube of the calix. The antheræ are ſhort, and ſlightly attached to the filaments. The ſeed-bud is ſingle; and in thoſe genera which have the calix permanent, it is placed below the receptacle of the flower. The ſeed-veſſel is a pulpy fruit of the apple, berry, or cherry kind. Thoſe of the apple kind are divided internally into a number of cavities or cells. The ſeeds are numerous. The pulpy fruits of this order are acid, eſculent, and of great efficacy in putrid and bilious fevers.

XXXVII. Columniferæ, (from *columna* a pillar, and *fero* to bear); conſiſting of plants whoſe ſtamina and piſtil have the appearance of a column or pillar in the centre of the flower. This order furniſhes a choice collection of herbs both annual and perennial, ſhrubs, and trees. Theſe are very different in ſize and height, from the creeping mallows, and low ſhrubby tea tree, to the fleſhy limes, and the more lofty ſilk-cotton trees, which by ſome modern writers are affirmed to be ſo large as not to be fathomed by 16 men, and ſo tall that an arrow cannot reach their top. The ſhrubs and trees of this order are deciduous, pretty thick, of a beautiful appearance, with an erect ſtem, which is formed by its branches and foliage into a round head. The roots are extremely long, branch but little, and either run perpendicularly downwards, or extend themſelves horizontally below the ſurface. The ſtems are cylindric. The young branches, though commonly of the ſame figure, are ſometimes angular. The bark is thick and pliant. The wood, in general, very ſoft and light. The buds are of a conic form, naked, or without ſcales; and ſituated either at the extremity of the branches, or in the angle formed by the branch and leaf. The leaves are alternate, ſimple, divided into ſeveral lobes, and frequently hand or finger ſhaped. The ribs or nerves on the back of the leaf, in ſome genera of this order, are provided near their origin with a number of hollow furrows or glands, which, being filled with a clammy honey-like liquor, have been conſidered as ſo many veſſels of ſecretion. The footſtalk of the leaves is cylindric, ſwelled at its origin, and appears jointed at its junction with the branch. The flowers are univerſally hermaphrodite. except in *higgeleria*, and a ſpecies of Virginian marſhmallow, called by Linnæus *napæa diocia*; the former of which bears male and female, the latter male and hermaphrodite, flowers on different roots. In many plants of this order, the flowers generally open about nine in the morning, and remain expanded till one in the afternoon. The flowers either terminate the branches, proceed from the angles of the leaves, or are diſpoſed either ſingly or in a corymbus along the branches or ſtem. In moſt of theſe genera the calix is ſingle, but in others frequently double. In theſe laſt the inner calix is always of one piece, generally divided into five ſegments; the outer conſiſts either of one leaf, of three diſtinct leaves, or of many. The calix, when ſingle, is ſometimes compoſed of one leaf, which is permanent, or of ſeveral diſtinct leaves which are generally coloured, and fall off with the petals. In plants that have a double calix, both flower cups are generally permanent. The petals in this order are from four to nine: five is the prevailing number. The ſtamina, which are in number from 5 to 20 and upwards, are generally inſerted into the common receptacle of the calix, or into the piſtillum or ſeed-bud. The filaments are either diſtinct, or united in a cylinder, which, proceeding from the receptacle of the calix, ſurrounds the ſeed-bud, and attaches itſelf to the baſe of the petals, with which it ſlightly unites. The antheræ are frequently roundiſh, and placed erect on the filament; moſt commonly, however, they are oblong or kidney-ſhaped, and ſlightly attached by the middle, or ſides, to the filaments, on which they turn like a vane or needle. This laſt is particularly the characteriſtic of all the mallow tribe. The ſeed-veſſel is generally a capſule; ſometimes a pulpy fruit of the berry or cherry kind. In ſome, it is a woody or membranous capſule, divided into as many cells internally as there were partitions in the ſeed-bud. The ſeeds are generally ſolitary, ſometimes angular, and ſometimes kidney-ſhaped. Theſe plants are mucilaginous and lubricating.

XXXVIII. Tricoccæ, (from τρεις, *three*, and κοκκος, a *grain*); conſiſting of plants with a ſingle three-cornered capſule, having three cells or internal diviſions, each containing a ſingle ſeed. The ſingle ſeed-veſſel of theſe plants is of a ſingular form, and reſembles three capſules, which adhere to one common footſtalk as a centre, but are divided externally into three pretty deep partitions. This family is not completely natural. It muſt be obſerved, however, that the character expreſſed in the title is a ſtriking one; and that though the plants which poſſeſs it are not connected by ſuch numerous relations as to form a true natural aſſemblage, yet they are by that circumſtance diſtinguiſhed from all other plants with as great, nay greater facility, than by any artificial character yet known. But all the genera of this order have not the ſtriking character juſt mentioned.

XXXIX. Siliquosæ, (from *ſiliqua* a pod), conſiſting of plants which have a pod for their ſeed-veſſel. This order chiefly furniſhes biennial and perennial herbs of an irregular figure. The roots are long, branched, crooked, and fibrous. In ſome they are ſucculent and fleſhy, in others jointed. The ſtems and young branches are cylindric. The leaves, which differ in point of form, being ſometimes ſimple, ſometimes winged, are generally placed alternate. The flowers are hermaphrodite, and in the greater number diſpoſed in a ſpike at the extremity of the branches. The flower-cup is compoſed of four leaves, which are oblong, hollow, blunt, bunched at the baſe, and fall with the flower. Theſe leaves are ſometimes erect, and ſometimes ſpread horizontally. The petals, which are four in number, ſpread at top, and are diſpoſed like a croſs: the claws or lower part of the petals are erect, flat, awl-ſhaped, and ſomewhat longer than the calix. The upper part widens outwards. The ſtamina are ſix in number; two of which are of the length of the calix, and the remaining four ſomewhat longer, but ſhorter than the petals. The antheræ are of an oblong figure, pointed, thicker at the baſe, and erect. Betwixt the ſtamina, in plants of this order, are generally lodged one, two, or four, round greeniſh knots, which in ſome genera are ſo ſmall as to elude the ſight. Theſe glands, called by Linnæus *glandulæ nectariferæ*, and uſed very improperly by that author as an eſſential character in diſcriminating the genera, ſeem to be prominences of the receptacle of the flower, occaſioned by the ſtamina being deeply lodged in its ſubſtance. The ſeed-bud is ſingle, and ſtands upon the receptacle of the flower. The ſtyle, which is either cylindric or flat like a ſcale, is of the length of the four longer ſtamina in ſome genera; in others it is very ſhort, or even wanting. It accompanies the ſeed-bud to its maturity. The ſtigma is blunt, and ſometimes deeply divided into two parts. The ſeed-veſſel is either a long pod, or a ſhort and round one. Either ſort has two valves or external openings, and in a great many genera the ſame number of interval cavities or cells, the partition of which projects at the top beyond the valves. The ſeeds are roundiſh, ſmall, and attached alternately by a ſlender thread to both ſutures or joinings of the valves. Theſe plants have a watery, ſharp, lixivial taſte; and are charged with a fixed alcaline ſalt, which is drawn from them by burning, and being diſtilled without any addition produces a volatile alcali. Moſt of them have a ſtinking ſmell. With reſpect to their virtues, they are diuretic, attenuating, deterſive, and antiſcorbutic. Theſe qualities, however, are moſt eminently poſſeſſed by the live plants; when dried, they either entirely diſappear, or are greatly diminiſhed. Applied externally, theſe plants are uſeful in diſeaſes of the ſkin, as the itch, leproſy, &c.

XL. Personatæ, (from *perſona*, a maſque); conſiſting of a number of plants whoſe flowers are furniſhed with an irregular, gaping, or grinning petal, in figure ſomewhat reſembling the ſnout of an animal. This order furniſhes both herbaceous and woody vegetables of the ſhrub and tree kind. The roots are generally fibrous and branched. The ſtems and branches are cylindric when young, except in ſome ſpecies of figwort, in which they are ſquare. The leaves are ſimple, generally placed oppoſite in pairs at the bottom of the branches, but in many genera ſtand alternate towards the top. The flowers are univerſally hermaphrodite; they proceed either ſingly or in cluſters from the wings of the leaves, or terminate the branches in a ſpike, panicle, or head. The calix is of one leaf, which is cut into two, three, four, or five ſegments, or diviſions, that are permanent. The corolla is compoſed of one irregular petal, with two lips reſembling, as was already obſerved, the head or ſnout of an animal. In ſome plants the ſtamina are two or four in number, and of an equal length; in others they are univerſally four in number, two of which are long, and two ſhort. The ſeed-bud is ſingle, and placed above the receptacle of the flower. The ſtyle is ſingle; thread-ſhaped; bent in the direction of the ſtamina; and crowned with a ſtigma, which is generally blunt, and ſometimes divided in two. The ſeed-veſſel is a capſule, generally divided internally into two cavities or cells, and externally into the ſame number of valves or incloſures. The ſeeds are numerous, and affixed to a receptacle in the middle of the capſule. Theſe plants poſſeſs nearly the ſame qualities with the lip-flowers, though in a leſs degree. With reſpect to their virtues, many of them are aperient, anodyne, purgative, and even emetic. The internal uſe of many of them is extremely pernicious; applied externally, they are anodyne, and powerful reſolvents.

XLI. Asperifoliæ, rough-leafed plants. The greateſt part of theſe are herbaceous and perennial. The roots are branching and fibrous; the ſtems and branches rounded; the buds of a conic form, naked or without ſcales. The leaves are ſimple, alternate, commonly very rough to the touch, and in moſt of the herbaceous plants ſeſſile or attached to the ſtem and branches without any foot-ſtalk. In the few trees, however, of this order, the leaves have a foot-ſtalk, the lower part of which, after the fall of the leaves, remains like a ſpine or thorn. The hairs are ſimple, and generally very rough to the touch. The flowers are in ſome genera ſolitary; but commonly collected into a ſpike or corymbus. They do not proceed from the angle formed by the ſtem or branch with the leaf, as in many plants; but from the ſide of the leaf, or from that part of the ſtem which is oppoſite to the leaf. They are almoſt univerſally hermaphrodite: in a few ſpecies of *cordia*, male and female flowers are produced upon different roots. The calix is compoſed of one leaf, which is divided from three to ten equal or unequal parts. Thoſe with four naked ſeeds have the calix deeply divided into five parts which are permanent. The corolla is monopetalous, or compoſed of one petal, which in different plants is bell, funnel, ſalver, and wheel ſhaped. The diviſions of the limb or upper part of the petal are generally five, alternate with thoſe of the calix; equal and regular, except in *echium*. The ſtamina are five in number, alternate with the diviſions of the corolla. They are equal, attached to the tube of the corolla a little above its origin, and of the ſame height. The antheræ are in ſome genera *connivent*; that is, approach, and form a compact body above the filaments. The piſtillum is generally compoſed of a ſlender ſtyle of the ſame length with the ſtamina, and crowned with a ſimple ſtigma. It proceeds from a germen or ſeed-bud, which in ſome plants is undivided, but generally ſplit into four. The ſeeds are generally four in number, and lodged in the bottom of the calix. Moſt of the rough-leafed plants are uſed in medicine: the flowers are eſteemed cordial; the leaves and roots vulnerary and aſtringent; and the hard bony ſeeds are reckoned powerful promoters of urine. Externally, theſe plants are uſed for burnings and poiſonous bites; they extirpate warts, and relieve diſorders of the loins.

XLII. Verticillatæ, conſiſting of herbaceous vegetables, having four naked ſeeds, and the flowers placed in whorls round the ſtalk. The roots are branched and fibrous. The ſtems are round when old, but ſquare when young; as are likewiſe the young branches, which ſtand oppoſite. The leaves are oppoſite, and in the greater number covered with tranſparent points. Thoſe which are placed next the flower, generally differ from the ſtem-leaves. In the greater number of plants of this kind, the leaves are ſupported upon a long cylindrical foot-ſtalk that is furrowed above. The flowers are univerſally hermaphrodite, except in a ſpecies of thyme mentioned by Mr. Adanſon, which appears to have male or barren flowers on one root, and female or fertile flowers on the other. They are diſpoſed round the ſtem in whorls or ſmall heads with ſhort foot-ſtalks. The calix is of one piece, that is generally cut into five unequal diviſions, whoſe diſpoſition ſometimes repreſents two lips; the uppermoſt of which has commonly a leſs number of diviſions: it accompanies the ſeeds, which it nouriſhes in its boſom, to their maturity. The petal is of the gaping or lip kind, and in the different genera is more or leſs irregular or unequal, either in its tube, or in the diviſions of the lips; the number of which varies from two to five. Theſe diviſions frequently form two lips; of which the uppermoſt, termed the *creſt*, and the *helmet*, is ſometimes entire, ſometimes more or leſs deeply cut in two; the lowermoſt, termed the *beard*, generally into three. The ſtamina are two or four in number. In the greater part there are four ſtamina of unequal length, two of them being long, and two ſhort. Theſe four unequal ſtamina are frequently diſſimilar, and approach by pairs; they are inclined towards the back of the petal, and parallel; the two innermoſt being ſhorteſt, and attached ſomewhat lower than the two others to the tube of the flower. The ſeed-bud, which conſiſts of four diſtinct ovaries, is placed upon the ſeat of the flower, and elevates from their centre a common ſtyle, which is ſlender, bent in the ſame manner as the filaments, which it ſomewhat exceeds in length, and terminated by a double ſtigma or ſummit, the diviſions of which are unequal, and turned backwards. The ſeed-veſſel in this order is wanting. The ſeeds are four in number, and lodged in the bottom of the calix as in a matrix or ſeed-veſſel. Each ſeed has two covers; the one external, of a cartilaginous or leathery ſubſtance; the other internal, membranaceous, of a very fine texture, and placed immediately above the radicle or embryo plant. The plants of this order are fragrant, warm, penetrating, and accounted cordial and cephalic. Their chief virtue reſides in the leaves.

XLIII. Dumosæ, (from *dumus*, a buſh); conſiſting of a number of ſhrubby plants, which are thick ſet with irregular branches, and buſhy. The plants of this order are all of the ſhrub and tree kind, thick and buſhy, riſing from 6 to 25, 30, and even 40 feet high. Many of them too, as baſtard alaternus, holly, iron-wood, new Jerſey tea, ſtar apple, viburnum, winter berry, and ſome others, retain their beautiful leaves during the whole year. The roots are branched and fibrous. The ſtems are cylindric; the young branches ſometimes angular. The buds are naked, that is, without ſcales, in the evergreen ſhrubs of this order; covered with ſcales in moſt of the others. The leaves, which in ſome genera are ſimple, in others compound, are placed alternate in ſome, and oppoſite in others. The flowers are moſtly hermaphrodite. They proceed from the wings of the leaves either ſingly or in cluſters; or they terminate the ſtem in that ſort of flowering head called a *corymbus*. The calix is generally very ſmall, placed below or around the ſeed bud; and conſiſts of one leaf, with four, five, or ſix diviſions, which are permanent. The rhamnus has no calix. The petals are in number from one to five. The ſtamina are either four, five, ſix, or ten. The ſeed bud is generally roundiſh, and placed within the flower. The ſtyle is commonly ſingle, and ſometimes wanting. The ſtigma is either ſingle or triple. The ſeed veſſel is generally a berry, ſometimes a dry capſule; the ſeeds are generaly ſingle egg ſhaped. The berries, bark, and flowers of many of theſe plants are purgative, and act particularly on the lymph and bile.

XLIV. Sepiariæ, (from *ſepes*, a hedge), conſiſting of a beautiful collection of woody plants, ſome of which from their ſize, elegance, and other circumſtances, are very proper furniture for hedges. This order furniſhes woody plants both of the ſhrub and tree kind, moſt of which do not drop their leaves till nearly the time when the new leaves begin to appear.

XLV. Umbellatæ, (from *umbella*, an umbel); conſiſting of plants whoſe flowers grow in umbels, with five petals that are often unequal, and two naked ſeeds that are joined at top and ſeparated below. Theſe plants are herbaceous, and chiefly perrennial. The roots are either tuberous or ſpindle ſhaped, and ſometimes forked. The ſtems are cylindric, full of pitch, and frequently hollow. The branches are alternate. The leaves, which like the branches, are put on alternately, are very different in point of form; being ſimple and entire in ſome; target ſhaped, in a ſpecies of navel wort; finger or hand ſhaped, in ſome others; and winged or pinnated with numerous minute diviſions, as in the greater number. They are ſupported by a foot ſtalk, which is very broad and membranous at its origin, and commonly embraces the whole contour of the ſtem and branches. The flowers are in general hermaphrodite. There are, however, ſome that have male or barren flowers in the ſame umbel. This is particularly the caſe with thoſe umbelliferous plants which have the petals in the flowers of the circumference large and unequal. In theſe plants the flowers in the circumference only prove fertile; thoſe in the centre, or diſc, proving abortive. Oenanthe and imperatoria, on the contrary, have the flowers in the circumference abortive. In ginſeng, hermaphrodite and male flowers are produced upon diſtinct plants. The flowers are diſpoſed in an umbel, which is either ſimple or compound. The common calix in this order is that ſort termed very improperly by Linnæus *involucrum*, or the flower; which in the greater number conſiſts of one or more leaves placed under the partial or univerſal umbel, or both, for the purpoſe of ſupport. The preſence or abſence of one or both of theſe covers affords excellent marks in diſcriminating the genera of this very ſimilar order of plants. The proper calix of each flower, in the aggregate, conſiſts of five minute indentments placed upon the ſeed bud, which it envelops, and accompanies to its maturity. The petals are five in number, and diſpoſed upon the ſides of the flower cup in form of a roſe. In the florets of the centre, the petals are generally pretty equal and ſmall; in thoſe of the circumference, they are frequently unequal and larger; in the greater number, they are heart ſhaped, and cut almoſt to the middle in two. The ſtamina are five in number, placed oppoſite to the diviſions of the flower cup, and alternate with the petals. The ſeed bud is univerſally placed under the ſeat of the flower, and ſupports two ſtyles which are turned backwards, and crowned with ſimple ſummits which do not differ in appearance from the ſtyles. The ſeed veſſel in this order is wanting. The ſeeds are two in number, which, when ripe, ſeparate below, but remain cloſely attached at top. The plants of this order, which grow in dry places, are ſudorific, ſtomachic, and warming. Their virtue reſides chiefly in the ſeeds and leaves. Thoſe which grow in marſhy places are generally poiſonous; but, notwithſtanding the extremely warm and even cauſtic quality of moſt of theſe plants, many of them are employed in the kitchen, and in the œconomy of domeſtic affairs.

XLVI. Hederaceæ, (from *hedera*, ivy), conſiſting of ivy and a few other genera that ſeem nearly allied to it. This order furniſhes both herbaceous and ſhrubby plants; moſt of which, particularly ivy and wine, have creeping branches, which attach themſelves by roots or tendrils to the bodies in their neighbourhood. The roots are long, with few branches. The ſtems and young branches are cylindric. In ſome ſpecies of vine they are ſquare. The leaves are alternate; ſometimes ſimple, ſometimes winged, in which the ſurface of the leaves is covered with points. The foot-ſtalk of the leaves is cylindrical, and without any furrow. The buds are of a conic form, and without any ſcales. The flowers are either hermaphrodite, male and female upon different roots, or hermaphrodite and male upon different roots. In ſome they terminate the branches in an umbel; in others, they proceed in cluſters from the ſide oppoſite to the leaves; and in ſome, they are produced along the branches. The calix conſiſts of one leaf divided into five parts, which are ſmall and generally permanent. The petals in this order are generally five. The ſtamina are in number five; awl-ſhaped, erect, and generally of the length of the petals. Ciſſus has only four ſtamina, which are inſerted into the nectarium, a ſort of border ſurrounding the ſeed-bud. The antheræ are roundiſh, and ſometimes, as in ivy, attached to the filaments by the ſides. The ſeed-bud is ſometimes round, ſometimes ſhaped like a top or pear, and ends in one, two, or five awl ſhaped ſtyles, which are crowned with a ſimple ſtigma. The flowers of the vine have no ſtyle. The ſeed veſſel is of the berry kind, with one, two, or five ſtyles. The ſeeds are from one to five in number; placed either in diſtinct cells, or diſperſed through the pulp without any partition.

XLVII. *Stellatæ*, (from *ſtella*, a ſtar); conſiſting of plants with two naked ſeeds, and leaves diſpoſed round the ſtem in form of a radiant ſtar. This order contains herbs, ſhrubs, and trees. The herbs, which are moſt numerous, are chiefly annual, and creep along the ſurface of the ground. The ſhrubs and trees are moſtly evergreens, which riſe erect, and are of an agreeable conic form. Theſe plants are opening; ſome of their ſeeds, particularly thoſe of coffee, are bitter and cordial; ſome of them are uſed in dyeing, and others in medicine.

XLVIII. Aggregatæ, (from *aggregare*, to aſſemble or collect); comprehending thoſe plants which have aggregate flowers, conſiſting of a number of florets or ſmall flowers, each of which have a proper and common calix.

XLIX. Compoſitæ, conſiſting of plants with compound flowers. In this order Linnæus has conſtructed his firſt or primary diviſions from the different ſexes of the florets, which he terms polygamy; the ſubaltern diviſions are conſtructed from the figure of the petals, the diſpoſition of the flowers, the pappus or crown of the ſeed, the common receptacle, and other circumſtances which characterize the ſubaltern diviſions in other authors.

L. Amentaceæ, (from *amentum*, a catkin), plants bearing catkins; as ſalix, populus, platanus, &c.

LI. Coniferæ, (from *conus*, a cone, and *fero* to bear); conſiſting of plants, whoſe female flowers, placed at a diſtance from the male, either on the ſame or diſtinct roots, are formed into a cone. In this character, the only one expreſſed in the title, the plants in queſtion ſeem to be nearly allied to the family of moſſes; from which, however, they are eaſily diſtinguiſhed by their habit, as well as by the ſtructure of the ſmall flowers, in which the ſtamina are united below into a cylinder, and diſtinct at top. The plants of this order are moſtly of the ſhrub and tree kind, and retain their leaves all the year. The form of theſe plants is generally conic, and extremely beautiful, from the diſpoſition of the branches, which cover the ſtems even to the roots, extending themſelves horizontally and circularly like ſo many rays. The height of ſome genera of this order does not exceed half a foot; that of others approaches to a hundred. The roots are ſhort, branching, not very fibrous, and extend horizontally. The ſtems and branches are cylindric. The bark is thin, and ſplit into ſlender ſcales. The wood, except that of the yew-tree, poſſeſſes little hardneſs. The buds are of a conic form, and naked, or without ſcales. The leaves are entire, ſmall, and thick, frequently triangular, and generally pointed. Juniper has a prickly and thorny leaf. With reſpect to ſituation, they admit of great variety, being either alternate, oppoſite, placed in whirls round the ſtem, or collected into ſmall bundles which proceed from a ſingle point. They are placed on the branches without any ſenſible footſtalk. The flowers in this order are univerſally male and female. In ſome genera, the male flowers are collected into a ſpike, or cone, at the end of the branches; in others, they proceed ſingly from the wings of the leaves, or termination of the branches. The female flowers are generally collected into a cone; but in yew-tree and ſhrubby horſe-tail, they are ſingle, and terminate the branches. The calix of the male flowers is a catkin; of the female, a cone. The petals of this order are wanting; except in the female flowers of juniper, which have three ſharp, rigid, and permanent petals. The ſtamina are in number from 3 to 20 and upwards; united by their filaments into a cylinder or pillar, which riſes out of the centre of the calix. The antheræ are erect, diſtinct, of a roundiſh form, and divided into internal partitions or cells, which, in the different genera, are in number from two to ten. The ſeed-buds are generally numerous, and placed betwixt the ſcales of the cone, which ſerve for a calix. From each ſeed-bud ariſes a very ſhort cylindrical ſtyle, crowned with a ſimple ſtigma of a conic form. Theſe plants have probably no ſeed-veſſel or fruit; the ſeeds being naked, and involved only by the ſcales of the calix. In ſome genera, theſe ſcales are of a bony nature, and almoſt united; in others, they are of a ſubſtance like leather; in juniper, they are united, and become fleſhy and ſucculent like a berry. The ſeeds in this order, being nouriſhed, as in a ſeed-veſſel, by the ſcales of the cone, or common calix, differ in nothing from the germina or ſeed buds. Moſt of the cone bearing plants are reſinous, or gummy; and the gums proceeding from them have a bitter taſte, but generally a very agreeable ſmell.

LII. Coadunatæ, (from *coadunare*, to join or gather together); ſo termed from the general appearance of the ſeed veſſels, which are numerous, and, being ſlightly attached below, form all together a ſingle fruit in the ſhape of a ſphere or cone; the parts of which, however, are eaſily ſeparated from one another. This order, which conſiſts of exotic plants, furniſhes a beautiful and choice collection of ſhrubs and trees, both evergreen and deciduous. The trees are often 60 feet high, and garniſhed from the bottom to the top with ſpreading branches and leaves of a bright green colour, which aſſume a very agreeable conic form. The roots are branching and fibrous. The ſtems are cylindric, and the wood very hard. The buds are conic, flat, and generally without ſcales. The leaves are univerſally ſimple and alternate. The footſtalk is cylindric, without furrows, frequently ſwelled at its origin, and appears jointed at its inſertion into the branch. The flowers are hermaphrodite, and are generally produced either along or at the end of the branches. The calix generally conſiſts of three oblong plain leaves, like petals, which fall off with the flower. The petals are in number from 6 to 18, oblong, concave, and frequently diſpoſed in two or three ſeries or rows, the outermoſt of which are largeſt. The ſtamina are numerous, ſhort, and inſerted into the common receptacle in ſome, and into the ſeed-bud in others. The filaments are very ſhort and ſlender, ſome genera having ſcarce any at all. The antheræ are numerous, ſlender, and placed round the ſeed-bud. The piſtillum generally conſiſts of a number of ſeed-buds diſpoſed in the form of a cone, and ſeated upon a receptacle which riſes like a ſmall pillar above the receptacle of the calix. From each ſeed-bud generally ariſes a cylindric ſtyle, which is very ſhort. The ſtigma is commonly blunt. The ſeed-veſſel is commonly a berry; but in magnolia it is an oval cone, conſiſting of a number of roundiſh capſules laid over each other like tiles. The fruits, or ſeed veſſels, whether of the berry, capſule, or cherry kind, are equal in number to the ſeed-buds, and generally ſlightly attached below. The ſeeds are numerous, hard, roundiſh, and ſometimes cornered. The plants of this order have a ſtrong, agreeable, and aromatic ſmell; the fruits and ſeeds have a pungent taſte like pepper; the bark and wood are bitter.

LIII. **Scabridæ**, (from *ſcaber*, rough, rugged, or briſtly) conſiſting of plants with rough leaves. There ſeems to be ſome impropriety in characterizing theſe plants by a name expreſſive of the roughneſs of their leaves, as that circumſtance had previouſly furniſhed the claſſic character of the *Aſperifoliæ*. The degree of roughneſs, however, is much greater in the plants which make the ſubject of the preſent article. The plants of this order are in general of an aſtringent nature; their taſte is bitter and ſtyptic.

LIV. **Miscellaneæ**, miſcellaneous plants. This order conſiſts of ſuch genera as are not connected together by very numerous relations. They are, datiſca, poterium, reſeda, ſanguiſorba, lemna, piſtia, coriaria, empetrum, achyranthes, amaranthus, celoſia, gomphrena, ireſine, phytolacca, nymphæa, ſarracenia, cedrela, ſwietenia, corrigiola, limeum, telephium.

LV. **Filices**, *Ferns*; conſiſting of plants which bear their flower and fruit on the back of the leaf or ſtalk. Theſe plants, in figure, approach the more perfect vegetables; being furniſhed, like them, with roots and leaves. The roots creep, and extend themſelves horizontally under the earth, throwing out a number of very ſlender fibres on all ſides. The ſtem is not to be diſtinguiſhed from the common footſtalk, or rather middle rib of the leaves: ſo that, in ſtrict propriety, the greater number of ferns may be ſaid to be *acules*; that is, to want the ſtem altogether. In ſome of them, however, the middle rib, or a ſtalk proceeding from the root, overtops the leaves, and forms a ſtem upon which the flowers are ſupported. The leaves proceed either ſingly, or in greater numbers from the extremities of the branches of the main root. They are winged or hand-ſhaped in all the genera, except in adders tongue, pepper graſs, and ſome ſpecies of ſpleen wort. The flowers, whatever be their nature, are, in the greater number of genera, faſtened, and as it were glued, to the back of the leaves; in others, they are ſupported upon a ſtem which riſes above the leaves; but in ſome, are ſupported on a flower ſtalk, as already mentioned. The ſtamina are placed apart from the ſeed-bud, in a genus termed by Mr. Adanſon *palma filix*; in the other ferns, where we have been able to diſcover the ſtamina, they are found within the ſame covers with the ſeed bud. Moſt of the ferns have a heavy diſagreeable ſmell: as to their virtues, they are opening and attenuating.

LVI. **Musci**, *Moſſes*. Theſe plants reſemble the pines, firs, and other evergreens of that claſs, in the form and diſpoſition of their leaves, and manner of growth of the female flowers, which are generally formed into a cone. They frequently creep, and extend themſelves like a carpet upon the ground, trees, and ſtones, being generally collected into bunches and tufts; the ſmalleſt are only one third of an inch in height, and the largeſt do not exceed five or ſix. Few of the moſſes are annual; ſmall as they are, the greater number are perennial and evergreens. Their growth is remarkably ſlow, as may be judged by the time that the antheræ take to ripen. This, reckoning from the firſt appearance of the antheræ, to the diſperſion of its powder or male duſt, is generally four or ſix months. Although preſerved dry for ſeveral years, theſe plants have the ſingular property of reſuming their original vendure, upon being moiſtened. It would be worth while to determine whether they do not alſo reſume their vegetative quality. The roots of plants of this order are fibrous, ſlender, branched, and ſhort. The ſtems are cylindrick and weak, as are alſo the branches; they creep upon the ground, and ſtrike root on every ſide. The leaves are very ſmall and undivided. They differ with reſpect to ſituation; being either alternate, oppoſite, or placed by fours round the ſtalk. They have no perceptible footſtalk nor middle rib, and are ſeated immediately upon the ſtem. The flowers are univerſally male and female: in ſome, the male flowers are produced upon the ſame plants with the female, and ſtand before them; in others, they are produced ſometimes on the ſame, and ſometimes on diſtinct plants. The male flowers conſiſt entirely of antheræ, and their covering; proceed either ſingly, or in cluſters, from the extremity of the branches, or angles of the leaves; and are either ſeated immediately upon the branches, or ſupported by a long footſtalk. The female flowers, which generally reſemcapſules or cones, are all placed immediately upon the ſtem or branches, without any footſtalk; and proceed ſingly, either from the wings of the leaves, or ſummit of the branches; when produced upon the ſame plant with the male, they are always placed under them. The female cones of the moſſes greatly reſemble thoſe of the pines, and evergreen trees of that claſs; the ſcales which form them are true leaves, each containing in its wing or angle a ſingle ſeed. When the ſeeds are ripe, the cones probably open for their diſperſion. When ſhut, they reſemble buds, and have ſometimes been ignorantly miſtaken for ſuch. The calix, in this order, if it can be called ſuch, is that appearance reſembling a veil or monk's cawl, which in the male flowers covers or is ſuſpended over the tops of the ſtamina like an extinguiſher, and is termed by Linnæus *calyptra*. The petals are univerſally wanting. The moſſes in general are almoſt taſteleſs, have few juices, and being once dried do not readily imbibe moiſture from the air. Thoſe which grow in water, being thrown into the fire, grow red and are reduced to aſhes without receiving or communicating any flame; on which account ſome ſuperſtitious people, the Siberians in particular, place water moſs in their chimnies as a preſervative againſt fire. Moſt of the moſſes are purgative; ſome violently ſo, and even emetic. They are all of wonderful efficacy in preſerving dry ſuch bodies as are ſuſceptible of moiſture; and in retaining, for a long time, the humidity of young plants without expoſing them to putrefaction. For this reaſon, ſuch plants as are to be ſent to any conſiderable diſtance, are generally wrapped up in them.

LVII. **Algæ**, *Flags*; conſiſting of plants whoſe root, leaf, and ſtem, are all one. Under this deſcription are comprehended all the ſea weeds, and ſome other aquatic plants.

LVIII. **Fungi**, *Muſhrooms*. Theſe plants are rarely branched, ſometimes creeping, but moſt commonly erect. Such as are furniſhed with branches have them of a light ſpongy ſubſtance like cork. Muſhrooms differ from the fuci, in that thoſe which, like the fuci, have their ſeeds contained in capſules, are not branched, as that numerous claſs of ſea weeds are. The greateſt part of muſhrooms have no roots; ſome, inſtead of roots, have a number of fibres, which, by their inoſculations, frequently form a net with unequal meſhes, ſome of which produce plants ſimilar to their parent vegetable. The ſtamina in theſe plants are ſtill undetermined. The ſeeds are ſpread over the ſurface of the plant, or placed in open holes or cavities, reſembling the open capſules of ſome of the fuci. In muſhrooms which are branched, the ſeeds are frequently viſible by the naked eye, and always to be diſtinctly obſerved by the aſſiſtance of a good microſcope. Theſe plants are very aſtringent, and ſome of them are uſed for ſtopping violent hæmorrhages. As a vegetable food, they are at beſt ſuſpicious: ſome of them are rank poiſon.

LIX. **Dubii Ordinis**. Under this name Linnæus claſſes all the other genera which cannot be reduced to any of the abovementioned orders, and which are near 120 in number.

SECT. VIII.

ANATOMY OF PLANTS.

THE obvious parts of a plant are five, viz. 1 root, 2 ſtem, 3 branches, 4 leaves, 5 flowers.

By the microſcope we diſcover the conſtituent parts to be,

1. A thin membrane, or outer ſkin.
2. An inner rind, thicker than the former.
3. A blea of ſpongy texture.
4. A vaſcular ſeries.
5. A fleſhy ſubſtance.
6. Pyramidal veſſels.
7. A pith.

The root has a deſcending fibre and aſcending ſtalk, which reduces the vegetable to one body compoſed of the above extremities.

Trees, ſhrubs, and herbs, are organized in the ſame manner; the thickneſs and colour of the component parts are the differences.

1. The outer back conſiſts of two membranes, with a ſeries of veſſels between them. The fine meſhes ſerve the purpoſes of inhalent or exhalent pores.

2. The inner bark conſiſts of two membranes, incloſing a ſeries of veſſels that communicate with the blea.

3. The blea lies like cells or beds, and are reſervoirs for the liquid juices.

4. The vaſcular ſeries are greeniſh veſſels lodged between two membranes, and are the venal veſſels for the juices to riſe and fall as circulation requires.

5. The fleſh, is the life of the vegetable, and is made up of ſtrong fibres, through it there are arterial veſſels, and are filled with elaſtic air, which arterial ſyſtem ſupplies the place of a heart, as the alternate changes of heat and cold, verify.

6. Pyramidal veſſels ſpread through the whole ſubſtance of the fleſh, and as they advance upwards their ramnifications inoſculate, ſo as to prevent any poſſible obſtruction of the ſap.

7. The pith occupies the centre, and has a number of veſicles of uniform ſtructure. The veſſels of the fleſh communicate with it, and it forms the receptacle for the fat of the plant.

The fibres of the root are capillary tubes, which abſorb the nutritive juices from the earth, and are analogous to lacteals in animals.

Physiology of Plants.

The analogy that ſubſiſts between plants and animals, has induced many eminent naturaliſts to ſuppoſe a regular circulation of the vegetable juices. Such were the doctrines and opinions of Perrault, Major, Marriotte, Malpighi, and Grew.

Dr. Hales has put it upon the principles of Dr. Harvey's Syſtem, againſt the opinion of every naturaliſt of his time.

The ſtatical experiments of Dr. Hales upon the vine, diſcovers it aſcending with the ſap in the bleeding ſeaſon; and we learn from him that fixed air conſtitutes near one third part of the ſolid contents of the heart of oak; and it is found to bear the ſame proportion in peas, beans, and other vegetable ſubſtances. From the combinations of the nutritive particles thus received, a number of different fluids are prepared in the ſame plant. The univerſal juice of a plant is a limpid ſubacid liquor, which, as it moves through the innumerable ſmall veſſels, becomes more and more concocted, and is the general maſs from which all the juices are derived. It may be called the blood of the plant. By certain modifications it produces high flavoured oils, gums, honey, wax, turpentine, roſin, and even the conſtituent parts of the plant itſelf.

Having conducted the botaniſt to a knowledge of the ſcience, I ſubjoin an approved method of preſerving them, neceſſary to be known by thoſe who travel and wiſh to keep in poſſeſſion the fruits of their labour.

SECT. IX.

METHOD OF DRYING AND PRESERVING PLANTS, FOR THE USE OF BOTANISTS.

MANY methods have been deviſed for the preſervation of plants; I ſhall relate only thoſe that have been found moſt ſucceſsful.

Firſt prepare a preſs, which a workman will make by the following directions. Take two planks, of a wood not liable to warp. The planks muſt be two inches thick, 18 inches long, and 12 inches broad. Get four male and four female ſcrews, ſuch as are commonly uſed for ſecuring ſaſh windows. Let the four female ſcrews be let into the four corner of one of the planks, and correſponding holes made through the four corners of the other plank for the male ſcrews to paſs through, ſo as to allow the two planks to be ſcrewed tightly together. It will not be amiſs to face the bearing of the male ſcrews upon the wood with iron plates; and if the iron plates went acroſs from corner to corner of the wood, it would be a good ſecurity againſt the warping.

Secondly, get half a dozen quires of large ſoft ſpongy paper, ſuch as the ſtationers call bloſſom blotting paper is the beſt, and a few ſheets of ſtrong paſte board.

The plants you wiſh to preſerve ſhould be gathered in a dry day, after the ſun hath exhaled the dew; taking particular care to collect them in that ſtate where in their generic and ſpecific characters are moſt conſpicuous. Carry them home in a tin-box nine inches long, four inches and a half wide, and one inch and a half deep. Get the box made of the thinneſt tinned iron that can be procured; and let the lid open upon hinges. If any thing happens to prevent the immediate uſe of the ſpecimens you have collected, they will be kept freſh two or three days in this box much better than by putting them in water. When you are going to preſerve them, ſuffer them to lie upon a table until they become limber; and then they ſhould be laid upon a paſteboard, as much as poſſible in their natural form, but at the ſame time with a particular view to their generic and ſpecific characters. For this purpoſe it will be adviſeable to ſeparate one of the flowers, and to diſplay the generic character. If the ſpecific character depends upon the flower or upon the root, a particular diſplay of that will be likewiſe neceſſary. When the plant is thus diſpoſed upon the paſteboard, cover it with eight or ten layers of ſpongy paper, and put it into the preſs. Exert only a ſmall degree of preſſure for the firſt two or three days; then examine it, unfold any unnatural plaits, rectify any miſtakes, and, after putting freſh paper over it, ſcrew the preſs harder. In about three days more ſeparate the plant from the paſte board if it is ſufficiently firm to allow of a change of place; put it upon a freſh paſteboard, and, covering it with freſh bloſſom-paper, let it remain in the preſs a few days longer. The preſs ſhould ſtand in the ſhun-ſhine, or within the influence of a fire.

When it is perfectly dry, the uſual method is to faſten it down, with paſte or gum-water, on the right-hand inner page of a ſheet of large ſtrong writing-paper. It requires ſome dexterity to glue the plant neatly down, ſo that none of the gum or paſte may appear to defile the paper. Preſs it gently again for a day or two, with a half ſheet of bloſſom-paper betwixt the folds of the writing-paper. When it is quite dry, write upon the left-hand inner page of the paper the name of the plant; the ſpecific character; the place where, and the time when, it was found; and any other remarks you may think proper. Upon the back of the ſame page, near the fold of the paper, write the name of the plant, and then place it in your cabinet. A ſmall quantity of finely powdered arſenic, or corroſive ſublimate, is uſually mixed with the paſte or gum-water, to prevent the devaſtations of inſects; but the ſeeds of ſtaves acre finely powdered will anſwer the ſame purpoſe, without being liable to corrode or to change the colour of the more delicate plants. Some people put the dried plants into the ſheets of writing-paper, without faſtening them down at all; and others only faſten them by means of ſmall ſlips of paper, paſted acroſs the ſtem or branches. Where the ſpecies of any genus are numerous, and the ſpecimens are ſmall, ſeveral of them may be put into one ſheet of paper.

Another more expeditious method is to take the plants out of the preſs after the firſt or ſecond day; let them remain upon the paſteboard; cover them with five or ſix leaves of bloſſom-paper, and iron them with a hot ſmoothing-iron until they are perfectly dry. If the iron is too hot, it will change the colours; but ſome people, taught by long practice, will ſucceed very happily. This is quite the beſt method to treat the orchis and other ſlimy mucilaginous plants.

Another method is to take the plants when freſh gathered, and inſtead of putting them into the preſs, immediately to faſten them down to the paper with ſtrong gum-water: then dip a camel-hair pencil into ſpirit-varniſh, and varniſh the whole ſurface of the plant two or three times over. This method ſucceeds very well with plants that are readily laid flat, and it preſerves their colours better than any other. The ſpirit varniſh is made thus. To a quart of highly rectified ſpirit of wine, put five ounces of gum ſandarach; two ounces of maſtich in drops; one ounce of pale gum elemi, and one ounce of oil of ſpike-lavender. Let it ſtand in a warm place, and ſhake it frequently to expedite the ſolution of the gums.

Where no better convenience can be made, the ſpecimens may be diſpoſed ſyſtematically in a large folio book; but a vegetable cabinet is upon all accounts more eligible. The drawers muſt have backs and ſides, but no other front than a ſmall ledge. Each drawer will be fourteen inches wide, and ten inches from the back to the front, after allowing half an inch for the thickneſs of the two ſides, and a quarter of an inch for the thickneſs of the back. The ſides of the drawers in the part next the front, muſt be ſloped off in a ſerpentine line, ſomething like what the workmen call an ogee. The bottoms of the drawers muſt be made to ſlide in grooves cut in the uprights, ſo that no ſpace may be loſt betwixt drawer and drawer. After allowing a quarter of an inch for the thickneſs of the bottom of each drawer, the clear perpendicular ſpace in each muſt be as in the following table:

I. Two tenths of an inch.
II. One inch and two tenths.
III. Four inches and ſix tenths.
IV. Two inches and three tenths.
V. Seven inches and eight tenths.
VI. Two inches and two tenths.
VII. Two tenths of an inch.
VIII. One inch and four tenths.
IX. Two tenths of an inch.
X. Two inches and eight tenths.
XI. One inch and two tenths.
XII. Three inches and five tenths.
XIII. Two inches and four tenths.
XIV. Three inches and eight tenths.
XV. Three inches and four tenths.
XVI. One inch and three tenths.
XVII. Two inches and eight tenths.
XVIII. Six tenths of an inch.
XIX. Ten inches.
XX. One inch and nine tenths.
XXI. Four inches and four tenths.
XXII. Two inches and ſix tenths.
XXIII. One inch and two tenths.
XXIV. Seventeen inches.

Conſidering the Science of botany of the utmoſt utility and importance, I have been particularly attentive in collecting every information which men or books could afford, and have carefully arranged my materials in ſuch a manner as appeared the moſt promiſing to conduct the young botaniſt, by eaſy gradations to a complete theoretic knowledge of the ſubject, according to the Linnæan Method.

I have to recommend to thoſe who enter on the ſtudy of botany, to carefully proceed ſtep by ſtep, not to ſeek new matter till they clearly comprehend what laſt engaged the attention; and to take every opportunity to compare the theory with practice, either in the field or garden: the method uſed by Mr. CURTIS, *of* Lambeth, *is perhaps as ready a road to a proficiency as can be inculcated.*

The three firſt Plates which accompany this Syſtem, are taken from the Philoſophia Botanica *of Linnæus, and greatly improved by Mr. Sowerby, of Lambeth, who is evidently the firſt botanic draftſman of the age; the three laſt Plates are taken from J. Miller's Claſſes and Orders; whoſe work is unequalled, both with reſpect to truth of nature, and beauty of drawing. The whole compoſe a full diſplay of the Science, executed in a manner equal, if not ſuperior, to any ſubject of a ſimilar nature.*

The arguments for and againſt the ſexual method, and the natural method of Claſſification, added to this Syſtem, will, I hope, prove entertaining to the reader.

W. H. HALL.

BOTARGO, a kind of ſauſage, made with the eggs and blood of the mullet, a large fiſh common in the Mediterranean. The beſt kind comes from Tunis in Barbary: it muſt be choſen dry and reddiſh. The people of Provence uſe a great deal of it, the common way of eating it being with olive oil and lemon juice. There is alſo a great conſumption of it throughout the Levant; it is an incentive to drink.

BOTE, Sax. ſignifies a recompence, ſatisfaction, or amends: hence comes *manbote*, compenſation or amends for a man ſlain, &c. In king Ina's laws is declared what rate was ordained for expiation of this offence, according to the quality of the perſon ſlain. From hence likewiſe we have our common phraſe, *to-boot*, i. e. *compenſationis gratia*. There are *houſe-bote, plough-bote*, &c. privileges to tenants in cutting of wood, &c.

BOTOTOE, in ornithology, a name given by the people of the Philippine iſlands to a very beautiful bird of the parrot kind; it is ſomewhat ſmaller than the common parrot, and is all over of a fine deep blue colour.

BOTRYITES, in natural hiſtory, a ſtone of the gem kind, reſembling a branch of young grapes.

BOTT, among bone lace weavers, a kind of round cuſhion, of light matter, placed on the knee, whereon they work or weave their lace with bobbins, &c.

BOTTLE, a ſmall veſſel proper for holding liquors.

The word is formed from *butellus*, or *botellus*, uſed in barbarous Latin writers, for a leſſer veſſel of wine; being a diminutive of *buta*, which denoted a butt or caſk of that liquor.

We ſay a glaſs bottle, a ſtone bottle, a leathern bottle, a wooden bottle, a ſucking bottle.

The ancient Jewiſh bottles were cags made of goats or other wild beaſts ſkins, with the hair on the inſide, well ſewed and pitched together; an aperture in one of the animal's paws ſerving for the mouth of the veſſel.

Glaſs bottles are better for all kinds of liquor, than thoſe of ſtone. Foul glaſs bottles are cured by ſhaking ſand or ſmall ſhot in them; muſty bottles, by boiling them.

Dr. Percival cautions againſt the practice of cleaning wine-bottles with leaden ſhot. It frequently happens (he thinks) through inattention, that ſome of the little pellets are left behind; and when wine or beer is again poured into the bottles, this mineral poiſon will ſlowly diſſolve, and impregnate thoſe vinous liquors with its deleterious qualities. The ſweetneſs which is ſometimes perceived in red port wine, may ariſe from this cauſe, when ſuch an adulteration is neither deſigned nor ſuſpected.

BOTTLING, the operation of putting up liquors in bottles corked, to keep, ripen, and improve.

The principal art in bottling liquors is to have the bottles perfectly dry and clean, and well corked with good corks; to be kept in dry vaults ſecluded from the air, laid in ſaw-duſt, ſand, or ſomething ſimilar, in ſuch a manner as the Corks may be always kept moiſt.

BOTTOM, the loweſt part of a thing, as contradiſtinguiſhed from the top.

Hydroſtatical writers ſpeak of the preſſure of fluids, on the bottom of veſſels; in which caſe, the law of gravitation is, that the altitude remaining the ſame, the preſſure will be as the bottom. M. Leibnitz has aſſerted, that a body falling through a fluid, does not preſs on the bottom, that is, does not increaſe the preſſure on it; which is found to be falſe. Philoſ. Tranſ. N°. 351, p. 570.

Bottom, in navigation, is uſed to denote as well the channel of rivers and harbours, as the body or hull of a ſhip. Thus, in the former ſenſe, we ſay, a *gravelly bottom, clayey bottom, ſandy bottom*; and in the latter ſenſe, a *Britiſh bottom*, a *Dutch bottom*, &c. By ſtatute, certain commodities imported in foreign bottoms, pay a duty called *petty cuſtoms*, over and above what they are liable to if imported in Britiſh bottoms.

BOTTOMRY, in navigation and commerce, the act of borrowing money on a ſhip's bottom; that is, by engaging the veſſel for the repayment of it, ſo that if the ſhip ſhould be loſt, the lender loſes the money advanced; but if it arrives ſafe at the end of the voyage, the borrower is to repay the money lent with a certain premium or intereſt agreed on; and this on pain of forfeiting the ſhip.

The rate or intereſt of money, taken on bottomry, follows that of inſurance.

Bottomry, if conſidered only as hiring money, would be illegal, and fall under charge of uſury, on account of the exceſſive intereſt: but it is not a mere hiring of money, ſince the lender likewiſe ſtands to the hazard of the voyage. If money be lent on ſhip-board by a merchant or paſſenger, and before the day of payment the ſhip ſhould be caſt away, the lender only ſhares in what was ſaved; but if the time of payment were paſt when the misfortune happened, the borrower muſt pay the full amount with intereſt.

BOTTONY, in heraldry, is uſed in ſpeaking of a croſs, which terminates at each end in three knots or buttons, reſembling, in ſome meaſure, three-leaved graſs.

BOTTS, in zoology, a ſpecies of worms which can be produced and nouriſhed only in the inteſtines of a horſe. It is there alone they can enjoy the proper temperature of heat, and receive the nouriſhment neceſſary for them.

Beſides the long worms which have been obſerved in the bodies of horſes, there are alſo ſhort ones. By theſe are to be underſtood what we call botts.

All authors, both ancient and modern, who have treated of the diſeaſes of horſes, have taken notice of theſe worms.

The flies from which theſe botts are produced inhabit the country, and do not come near houſes, at leaſt not near thoſe of great towns; and therefore horſes are never liable to have theſe worms in their bodies, if they have been kept in the houſe, eſpecially in a town, during the ſummer and autumn. See Farriery.

BOUCHE *of Court*, the privilege of having meat and drink at court ſcot-free.

This privilege is ſometimes only extended to bread, beer, and wine, and was anciently in uſe as well in the houſes of noblemen as in the king's court.

BOUGIE, in the French language, ſignifies a wax candle, and is applied to a machine which (as the wax candle formerly was) is introduced into the urethra for removing obſtructions there. Monſ. Daran, a French ſurgeon, lately boaſted of his introducing them as an improvement in his art, and acquired conſiderable profit by making and ſelling them. Scultetus, about the middle of the 17th century, uſed bougies in diſeaſes of the urethra, and Monſ. Daran probably took the hint from him. Different compoſitions have been uſed, and generally mercury was a part of them. Riverius made a plaſter as follows: ℞ ol. oliv. ℔ iv. ceræ citrin. ℔ ii. minii & ceruſſ. āā ℔ iſs tereb. venet. & rez. alb. āā ℥ iii m. Whether the bougies are made up of this or any other compoſition, they muſt be of different ſizes, from the bigneſs of a knitting needle, to that of a gooſe quill. They are made of linen rags, ſpread with a proper matter, and then rolled up as follows. Having ſpread any quantity of the linen rag with the compoſition that is choſen for the purpoſe, cut it into ſlips from ſix to ten inches long, and from half an inch to an inch broad: then dextrouſly roll them on a glazed tile into the form of a wax candle; and, as the end of the bougie that is to be entered firſt into the urethra ſhould be ſomewhat ſmaller than the reſt, it would be as well to cut the ſlips a little tapering. It ſhould alſo be obſerved, that when the bougies are rolled up, that ſide muſt be outward on which the plaſter is ſpread.

Monſ. Daran, and ſome others, attributed the action of their bougies to the compoſition they made uſe of in forming them. Mr. Sharp apprehended, that as much of their efficacy was owing to the compreſſion they made on the affected part, as to any other principle; and Mr. Aikin very juſtly ſays, As it is evident that bougies of very different compoſitions ſucceed equally well in curing the ſame diſorders in the urethra, it is plain that they do not act by means of any peculiar qualities in their compoſition, but by means of ſome property common to them all. This muſt be their mechanical form and texture, therefore their mode of action muſt be ſimple compreſſion. We may alſo readily account for the inferior efficacy of metallic and whalebone bougies, from their not having the property of ſwelling with moiſture, and therefore not making ſo equal a compreſſion. As to bougies procuring a diſcharge of matter, there is no doubt but the mechanical ſtimulus of a foreign body in ſuch a tender part, though free from diſeaſe, muſt produce it in ſome degree; and that this will be varied according to the chemically irritating quality of the compoſition, and the irritable ſtate of the urethra.

BOULDER *Walls*, a kind of round walls built of round flints or pebbles, laid in a ſtrong mortar; uſed where the ſea has a beach caſt up, or where there is plenty of flints.

BOULTINE, or Boltel, in architecture, the workman's term for a convex moulding, juſt ¼ of a circle placed next below the plinth, in the Tuſcan and Doric capitals.

BOUNCE, in ichthyology, a name given by the people of the weſtern parts of England to a ſpecies of the *ſqualus*, diſtinguiſhed by Artedi by the name of the reddiſh variegated *ſqualus* with the *pinna ani* in the middle ſpace between the *anus* and tail.

BOUND, in dancing, a ſpring from one foot to the other; by which it differs from a hop, where the ſpring is from one foot to the ſame. It alſo differs from a half *coupée*, as, in the latter, the body always bears on the floor, either on one foot or the other; whereas, in the bound, it is thrown quite from the floor.

Bound *Bailiffs*, are ſheriffs officers for executing of proceſs. The ſheriffs being anſwerable for their miſdemeanors, the bailiffs are uſually bound in a bond for the due execution of their office; and thence are called bound-bailiffs, which the common people have corrupted into a much more homely appellation.

BOUNTY, in commerce, a premium paid by government to the exporters of certain Britiſh commodities, as ſail-cloth, gold and ſilver lace, ſilk-ſtockings, fiſh, corn, &c. The happy influence which bounties have on trade and manufactures is well known: nor can there be a more convincing proof of the good intentions of the government under which we live, than the great care that is taken to give all poſſible encouragement to thoſe who ſhall eſtabliſh, or improve, any hazardous branch of trade.

All undertakings, in reſpect either to mercantile enterprizes, or in the eſtabliſhment of manufactures, are weak and feeble in their beginnings; and if unſucceſsful, either ſink entirely, or at leaſt are ſeldom revived in the ſame age. Accidents of this nature are not only deſtructive to private perſons, but exceedingly detrimental to the public intereſt. On this principle, more eſpecially ſince trade, for which providence deſigned us, hath been attended to, ſuch attempts have been thought deſerving, and have been favoured with, public ſupport.

Queen Ann's Bounty, for augmenting poor livings under 50l. per annum, conſiſts of the produce of the firſt fruits and tenths after the charge and penſions payable out of the ſame are defrayed. A corporation to conduct the buſineſs, was eſtablimed in 1704.

Bounties, as they are paid by the public, ſo they are ſolely calculated for the benefit of the public. They are ſometimes given to encourage induſtry and application, in raiſing a neceſſary commodity; which was intended by the bounty on exporting corn. The intention of this bounty was to encourage agriculture; and the conſequence hath been, that we now grow more than twice as much as we did at the eſtabliſhment of the bounty; we even conſume twice as much bread as we then grew; yet in A. D. 1697, we exported a fifteenth part of what we grew, of late years a twenty-ninth part only. The bounty of the twenty-ninth part amounted to ſomewhat more than 50,000l. and the produce to more than 400,000l. It is evident that all this is ſo much clear gain to the nation.

Sometimes bounties are given with a view to promote manufactures, as in the caſe of thoſe made of ſilk. Many laws are to be found in our ſtatute books in favour of the ſilk manufacture, made with great wiſdom and propriety, for the encouragement and ſupport of many thouſands of induſtrious perſons employed therein.

Sometimes bounties are given to ſupport a new manufacture againſt foreigners already in poſſeſſion of it, as in making linen and ſail cloth. The promoting of the manufacture of Britiſh ſail-cloth was undoubtedly a very important national object, as the conſumption was very large, and of conſequence the purchaſe of it from foreigners an heavy expence on the public.

Theſe aſſiſtances, however, are never beſtowed but on mature deliberation, in virtue of ſtrong proofs, and with a moral certainty of a rational benefit. The great intention of bounties is to place the Britiſh trader on ſuch ground as to render his commerce beneficial to his country.

BOURDONNE', in heraldry, is underſtood of a croſs, whoſe extremities are turned round like the ends of a pilgrim's ſtaff.

BOUSTROPHEDON, in literature, is uſed in ſpeaking of the ancient method of writing among the Greeks, wherein the lines were continued forwards and backwards, like the furrows in ploughing.

The word is compounded of βȣς, *bullock*, and στρεΦω, *I turn.*

Pauſanias mentions ſeveral ancient inſcriptions written in this manner: the laws of Solon are alſo ſaid to have been thus written; which, as the author laſt cited explains it, is when the ſecond line is turned on the contrary ſide, beginning at the end of the former, thus:

ΕΚ ΔΙΟΣ ΑΡ
ꓯΘƸƎMƱX

Potter. Arch. Græc. lib. i. cap. 26. tom i.

BOUTAEL, in ichthyology, the name of an Eaſt Indian fiſh, of the lamprey kind.

BOUTANT, in architecture; an arc boutant is an arch or buttreſs, ſerving to ſuſtain a vault; and which is itſelf ſuſtained by ſome ſtrong wall, or maſſive pile.

BOW, a weapon of offence made of ſteel, wood, horn, or other elaſtic ſubſtances, which after being bent by means of a ſtring faſtened to its two ends, in returning to its natural ſtate, throws out an arrow with prodigious force.

The uſe of the bow is, without all doubt, of the earlieſt antiquity. It has likewiſe been the moſt univerſal of all weapons, having obtained among the moſt barbarous and remote people, who had the leaſt communication with the reſt of mankind.

The figure of the bow is pretty much the ſame in all countries where it has been uſed; for it has generally two inflections or bendings, between which, in the place where the arrow is drawn, is a right line. The Grecian bow was in the figure of a Ʒ, of which form we meet with many, and generally adorned with gold or ſilver. The Scythian bow was diſtinguiſhed from the bows of Greece and other nations, by its incurvation, which was ſo great as to form a half moon or ſemicircle.

Though it does not appear that the Romans made uſe of bows in the infancy of the republic, yet they afterwards admitted them as hoſtile weapons, and employed auxiliary archers in all their wars.

In drawing back the bow, the primitive Grecians did not pull back their hand towards their right ear, according to the faſhion of modern ages, and of the ancient Perſians; but, placing their bow directly before them, returned their hand upon their right breaſt. This was alſo the cuſtom of the Amazons.

The bow is a weapon of offence among the inhabitants of Aſia, Africa, and America, at this day; and in Europe, before the invention of fire-arms, a part of the infantry were armed with bows. Lewis XI. firſt aboliſhed the uſe of them in France, introducing in their place the halbard, pike, and broad-ſword. The long bow was formerly in great vogue in England, and many laws wete made to encourage the uſe of it. The parliament under Henry VII. complained of the diſuſe of long bows, heretofore the ſafeguard and defence of this kingdom, and the dread and terror of its enemies.

The Indians ſtill retain the bow. In the repoſitory of the Royal Society, we ſee a Weſt Indian bow two yards long. For further information, ſee Archery.

Bow, in muſic, a ſmall machine made with hair, which, being drawn over the ſtrings of a muſical inſtrument, makes it reſound. In order that the bow may touch the ſtrings briſkly, it is uſual to rub the hairs with roſin. The ancients do not appear to have been acquainted with bows of hair: in lieu hereof they touched their inſtruments with a plectrum; over which our bows have great advantage, for giving long and ſhort ſounds, and other modifications which a plectrum cannot produce.

Croſs Bow, is alſo called Arbalet.

The arbalet conſiſts of a ſteel-bow, ſet in a ſhaft of wood, furniſhed with a ſtring and a trigger; and is bent with a piece of iron fitted for that purpoſe. It ſerves to throw bullets, arrows, darts, &c. Some perſons uſe this bow with ſuch dexterity as to kill young rooks with ſmall lead bullets 20 times ſucceſſively.

Bow *of a Ship*, in naval architecture, is the rounding part of a ſhips ſide forward, or that part of her which is broadeſt before: it begins at the place where the planks arch inwards, and compaſſing about towards the ſtem, ends where they cloſe at the ſtem or prow.

If a ſhip has a broad round bow, they call it a bold or bluff-bow; if ſhe has a narrow thin bow, they ſay ſhe has a lean bow.

The proportioning of the bow is of great importance to the ſailing of the ſhip; it being this part that firſt breaks off the ſea, and on which is, in a manner, all the bearing of the ſhip. If the bow be too broad, the veſſel will not make her way eaſily through the water, but carry a great load of dead water before her; and if it be too lean or thin, ſhe will pitch or beat much into hollow ſea, for want of breadth to bear her up.

Bonguer obſerves, that a bow which meets with the leaſt reſiſtance in a direct and oblique courſe, has alſo the additional property of driving the leaſt to leeward.

BOWER, in gardening, a ſhady place, under covert of trees or branches interwoven.

Bower, in the ſea language, the name of an anchor carried at the bow of a ſhip. There are generally two bowers, called firſt and ſecond, great and little, or beſt and ſmall bower.

BOWL, either a ball of wood for the uſe of bowling; or a veſſel of capacity for holding liquors.

BOWLDER *Stones*, a ſpecies of ſmall ſtones, of an indeterminate texture and figure, generally roundiſh, found on the ſhores of the ſea and banks of rivers.

BOWLING, or Bow Line, in ſea language, a rope faſtened to the middle of the leech, or perpendicular edge of the ſquare ſails of a ſhip, ſerving to make the ſail ſtand ſharper or cloſer by a wind.

The bow line belongs to all ſails, except the ſprit-ſail, and ſprit-top-ſail; where it is omitted for want of room to hale it forwards by; and thence it is, that thoſe ſails cannot be uſed cloſe by a wind.

Bowling, the name of a game or exerciſe practiſed in alleys, at pins or ſkittles, generally nine in number, or on bowling-greens levelled and kept ſmooth on the ſurface for the purpoſe. On greens, a ſmall bowl called a jack or block is thrown at random, at which the players direct their bowls, endeavouring to place them as near it as poſſible; thoſe who lay them neareſt reckoning ſo many each time towards game.

The terms uſed are, to bowl wide, which is when the bias does not hold, or is not ſtrong enough: narrow, when it is too ſtrong, or holds too much, &c.

BOWSE, a ſea term, ſignifying as much as hale, or pull together.

BOW-SPRIT, or Bolt-sprit, a kind of maſt in a veſſel, ſtanding foremoſt in the prow, and projecting ſlopeways over the ſtern; its lower end is faſtened to the partners of the fore-maſt) and farther ſupported by the fore ſtay: it ſerves to carry the ſprit-ſail, ſprit-top-ſail, and jack ſtaff.

BOWYERS, one of the ancient companies of the city of London. A bowyer dwelling in London, was always to have ready 50 bows of elm, hazle, or aſh, well made and wrought, under the penalty of 10s. for every bow wanting, and to ſell them at certain prices, under the penalty of 40s. And parents and maſters were to provide for their ſons, a bow and two ſhafts, and cauſe them to exerciſe ſhooting, on pain of 6s. 8d. &c. by our ancient ſtatutes.

BOX, in its moſt common acceptation, denotes a ſmall cheſt or coffer for holding things.

Dice Box, a narrow deep cornet, channelled within, wherein the dice are ſhaken and thrown. This anſwers to what the Romans called *fritillus*; whence, *crepitantes fritilli*; and in Seneca, *reſonante fritillo*. The ſame author uſes alſo *concutere fritillum*, figuratively, for playing.

Boxes, in a playhouſe, are little apartments behind and on each ſide of the pit. We ſay, the front boxes, the ſtage boxes, &c.

Box, buxus, in botany, the box-tree; a genus of the monœcia tetandria claſs of plants. There are three ſpecies; the box-tree with oval leaves, the narrow leaved box, and the dwarf or Dutch box.

Culture. The two firſt ſorts may be raiſed from ſeeds; and may be alſo propagated by cuttings, which are to be planted in the autumn in a ſhady border. The ſeaſon for removing theſe trees is in October, or April. The dwarf box is increaſed by parting the roots, or planting the ſlips; but as it makes ſo great an increaſe of itſelf, and ſo eaſily parts, it is hardly worth while to plant the ſlips that have no roots.

In Plantations. The tree or large box is proper to intermix in clumps of evergreens, &c. where it adds to the variety: they are a very great ornament to cold and barren ſoils where few other things will grow. The dwarf kind of box is uſed for bordering flower beds, or other purpoſes of that nature; and for this it far excels any other plant, being ſubject to no injuries from cold or heat. It is of long duration; is eaſily kept handſome; and, by the firmneſs of its rooting, keeps the mould in the borders from waſhing into the gravel walks more effectually than any plant whatever, modern gardeners have underſervedly neglected it. Boxwood is extremely hard and ſmooth, and therefore well adapted to the uſe of the turner. Combs, mathematical inſtruments, knife-handles, and button moulds, are made of it. It may properly enough be ſubſtituted for ebony, the yellow alburnum of which it perfectly reſembles. In the ephemerides of the curious there is the following account of the efficacy of boxwood in making hair grow. "A young woman of Gunberg in Lower Sileſia, having had a malignant dyſentery which occaſioned the falling off of all her hair, was adviſed by a perſon ſometime after her recovery, (as her hair was not likely to grow again of itſelf, her head being then as bare as the hand), to waſh it all over with a decoction of box-wood; which ſhe readily did, without the addition of any other drug. Hair of a cheſnut colour grew on her head, as ſhe was told it would do; but having uſed no precaution to ſecure her neck and face from the lotion, they became covered with red hair to ſuch a degree, that ſhe ſeemed little different from an ape, or a monkey." This decoction has been recommended by ſome as a powerful ſudorific, preferable even to guaiacum; but the taſte readily diſcovers that it wants the qualities of that wood. Neither the wood nor the leaves of the box-tree at preſent are uſed for any other medicinal purpoſe than the diſtillation of an empyreumatic oil; and an oil of nearly the ſame quality is obtained from almoſt every other wood.

BOXING, the exerciſe of fighting with the fiſts, either naked, or with a ſtone, or leaden ball graſped in them.

In which ſenſe boxing coincides with the pugillatus of the Romans, and what, on our amphitheatres is ſometimes called trial of manhood.

When the champions had *σΦαιραι*, or balls, whether of lead or ſtone, it was properly denominated *σΦαιρομαχια*. Potter. Arch. Græc. lib. ii. cap. 21. vol. i.

The ancient boxing differed from the pugna cæſtuum, in which the combatants had leathern thongs on their hands, and balls to offend their antagoniſts; though this diſtinction is frequently overlooked, and fighting with the cæſtus ranked as a part of the buſineſs of pugiles.

We may diſtinguiſh three ſpecies of boxing; viz. where both the head and hands were naked; where the hands were armed and the head naked; and where the head was covered with a kind of cap called amphotides, and the hands alſo furniſhed with the cæſtus.

Boxing is an ancient exerciſe, having been in uſe in the heroic times, before the invention of iron or weapons.

Thoſe who prepared themſelves for it, uſed all the means that could be contrived to render themſelves fat and fleſhy, that they might be better able to endure blows: whence corpulent men or women were uſually called pugiles, according to Terence: *Si qua eſt habitior paulo, pugilem eſſe aiunt.*

Boxers amount to the ſame with what among the Romans were called pugiles. The antient boxers battled with great force and fury, inſomuch as to daſh out each others teeth, break bones, and often kill each other. The ſtrange disfigurements theſe boxers underwent were ſuch that they frequently could not be known, and rendered them the ſubject of many railleries. In the Greek anthology there are four epigrams of the poet Lucilius, and one of Lucian, wherein their disfigurements are pleaſantly enough expoſed. Anthol. Græc. lib. 2.

The Engliſh of the preſent æra decide their quarrels by boxing more than any other nation who boaſt civilization, and on this account are deemed low and vulgar, by their more polite and ceremonious neighbours. If that great law of nature, ſelf-defence, authorizes any mode of manual contention, the uſe of thoſe weapons, with which nature has ſupplied us, ſeem the beſt calculated for that purpoſe; but if cruelly maiming and deſtroying our ſpecies, by the hands of each other, is the pleaſure and deſign of Providence, ſticks, ſwords, or thoſe more deſtructive articles, powder and ball, preſent themſelves as inſtruments of uſe and convenience; under the latter conſideration, the practice of boxing may be deemed barbarous and brutal, when compared with that conciſe method of bringing diſputes to iſſue, duelling. A man of diminutive ſize and feeble ſtrength, certainly has little chance of ſucceſs when oppoſed to the bulky and athletic; in this caſe, he muſt diſregard affronts, or have recourſe to ſuch means as brings them nearer on an equality; for it would be madneſs to perſiſt when a defeat was certain.

Schools are at this time eſtabliſhed to teach the art of boxing, to thoſe we muſt refer the amateur for experience and inſtruction, and diſmiſs the article with the following brief, and, we hope, uſeful precept to the reader: *Be careful never intentionally to give offence; and if unavoidably you are offended, reſent the affront with coolneſs and moderation.*

Boxing, among ſailors, is uſed to denote the rehearſing the ſeveral points of the compaſs in their proper order.

BOYAU, in fortification, a branch of the trenches; or a line or cut, which runs from the trenches to cover ſome ſpot of ground.

BOYER, in navigation, a kind of Flemiſh ſloop, or ſmall veſſel of burden, having a boltſprit, a caſtle at each end, and a tall maſt; chiefly fit for the navigation of rivers, and in many of its parts, reſembling a ſmack.

BOYES, an order of American prieſts, or magicians. They are alſo conſulted with regard to the event of their wars. Each boye has his peculiar duty: who is invoked by certain forms of words, ſung in a quaint tone, accompanied with the fumes of tobacco.

BOYEUPECANGA, in amphibiology, the name of a very large ſerpent, diſtinguiſhed by this name on account of certain prominences on its back. It is a very large and remarkable thick ſerpent, and of very fatal poiſon.

BOYUNA, in amphibiology, the name of an American ſpecies of ſerpent. It is very long and ſlender, and all over a black colour. It has exactly the ſmell of a fox, but ſo ſtrong, that no body can endure to be near it.

BRABEJUM, African almond, in botany, a genus of the tetrandria monogynia claſs of plants.

BRACE is commonly taken for a couple, or pair; and in this ſenſe is applied by huntſmen to ſeveral beaſts of game; as a brace of bucks, foxes, hares, &c. They alſo ſay, a brace of greyhounds.

Brace, in architecture, denotes a piece of timber framed in with bevel joints; ſerving to keep the building from ſwerving either way.

When a brace is framed into a king-piece, or principal rafter, it is called by ſome a ſtrut.

Brace is alſo uſed for a meaſure taken from the length of the arm, when extended; and is uſed in divers cities of Italy, in lieu of the foot or yard. Its length is various.

BRACED, in heraldry, is uſed in ſpeaking of chevronels which are intermingled.

BRACELET, an ornament uſually worn round the wriſt, much uſed among the ancients: it was made of different materials, and in various faſhions according to the age or quality of the wearer. Modern ladies wear bracelets, decorated with the likeneſs or ſome other endearing memento of their favourites.

Bracelets are ſtill worn by the ſavages of Africa, who are ſo exceſſive fond of them, as to give the richeſt commodities, and and even their fathers, wives, and children, in exchange for thoſe made of no richer materials than ſhells, glaſs beads, and the like.

BRACES, in the ſea language, are ropes belonging to all the yards of a ſhip, except the mizen, two to each yard, except thoſe of the top-gallant, and ſprit-ſail, top-ſail yards; being reeved through blocks faſtened to pendants ſeized to the yard arms. See Naval Architecture.

BRACHIÆUS, the name of a muſcle. See Syſtem of Anatomy.

BRACHIONUS, the name of a genus of animalcules of the anthrodia kind, containing all the wheel animals.

BRACHIUM, the arm, in botany, is the tenth degree in the Linnæan ſcale for meaſuring plants, being twenty-four Paris inches.

BRACHMANS, a branch of the ancient gymnoſophiſts, or philoſophers of India, remarkable for the ſeverity of their lives and manners.

The Greeks uſually give them the name gymnoſophiſts; though Clemens, Porphyry, &c. make the brachmans only a branch of the gymnoſophiſts, whom they divide into two ſects, Brachmanes and Samanæi.

There are ſome in the Indies who ſtill bear the name, and live in the ſame manner as the ancient brachmans: the Portugueze call them bramanes, or bramenes; we uſually, bramins. See Bramins.

BRACHURI, a name given by Dr. Hill to a genus of animalcules of the tailed kind.

Theſe animalcules are of a roundiſh figure, with tails ſhorter than their bodies; their ſkin is perfectly ſmooth, thin, and colourleſs. They are frequent in water-ponds, in pepper-water, and many other infuſions of vegetable ſubſtances.

BRACHYGRAPHY, (from βραχυς, *ſhort*, and γραΦω, *ſcribo, I write*) denotes the art of ſhort-hand writing. See Syſtem of Stenography.

BRACHYLOGY, from βραχυς and λογος, *expreſſion*, in rhetoric, brevity, the expreſſing any thing in the moſt conciſe manner. This, ſo far as conſiſtent with perſpicuity, is a virtue and beauty of ſtyle; but if obſcurity be the conſequence, it becomes a blemiſh and inexcuſable defect.

BRACHYTELOSTYLA, in natural hiſtory, the name of a genus of cryſtals.

The bodies of this genus are cryſtals compoſed of a ſhort hexangular column, terminated at each end by an hexangular pyramid. Of this genus there are ſix known ſpecies. Hill's Hiſt. Foſſils, p. 163.

BRACKET, in building, denotes a kind of wooden ſtay, in form of a knee or ſhoulder, ſerving for the ſupport of ſhelves, &c. or a cramping iron, which ſerves as a ſtay in timber-work.

BRACTEARIA, in natural hiſtory, the name of a genus of foſſils, of the talc claſs; the characters of which are, that they are compoſed of ſmall plates in form of ſpangles, and each of theſe, naturally very thin of fiſſile, compoſed of very thin ones.

BRADS, a ſlender kind of nail, uſed in building, having no ſpreading heads as other nails have.

Of theſe, ſome are called joiners brads, and are for hard wainſcots; others batten-brads, for ſoft wainſcot: and ſome bill-brads, or quarter-heads, uſed when a floor is laid in haſte, or for ſhallow joiſts ſubject to warp.

BRADYPUS, in tetrapodology, the name given to a genus of quadrupeds of the order of Linnæus, called Anthropomorpha, otherwiſe termed ignavus, and, in England, the American ſloth. Of this genus there are known two ſpecies; the one is called the American ſloth, with a ſhort tail, and three toes on each foot; the other is named the Ceylon ſloth, with only two toes to each foot, and no tail. It is about the ſize of a ſmall cat The body is covered over with hair of a grey colour; the face is naked; the throat is yellowiſh; the fore feet are longer than the hind feet; the claws, which are three on each foot, are compreſſed, and very ſtrong; and they have no mammæ on the breaſt; they have no external ears, but only two winding holes. It is the moſt ſluggiſh and ſlow of all animals, and ſeems to move with the utmoſt pain. Its food is fruit, or the leaves of trees. If it cannot find fruit on the ground, it looks out for a tree well loaded, and with great pain climbs up: to ſave the trouble of deſcending, it flings off the fruit; and, forming itſelf into a ball, drops from the branches, continues at the foot till it has devoured all, nor ever ſtirs till compelled by hunger. It never drinks, and is terrified at rain.

The following wonderful account of this animal, from Kircher's Muſurgia, is quoted by Mr. Stillingfleet in his miſcellaneous tracts. "The deſcription (ſays Kircher) I had from father Torus, who reſided in America, who had animals of this kind in his poſſeſſion, and made many experiments in relation to their nature and qualities. Its figure is extraordinary; it is about the bigneſs of a cat, of very ugly countenance, and has claws extended like fingers. The hinder part of the head and neck are covered with hair. It ſweeps the ground with its fat belly, never riſes upon its feet, and moves ſo ſlowly, that it would ſcarce go the length of a bow-ſhot in 15 days, though conſtantly moving, and it is therefore called the ſloth. It lives generally upon tops of trees, and employs two days to crawl up, and as many to get down again. Nature has doubly guarded this animal againſt its enemies. Firſt, by giving it ſuch ſtrength in its feet, that whatever it ſeizes, it holds ſo faſt, that it never can be freed from its claws, but muſt there die of hunger. Secondly, in giving it ſuch a moving aſpect, when it looks at any man who ſhould be tempted to hurt it, that it is impoſſible not to be touched with compaſſion; beſides, that at the ſame time it ſheds tears, and upon the whole perſuades one, that a creature ſo defenceleſs, and of ſo unhappy a body, ought not to be tormented. To make an experiment of this, the abovementioned father procured one of theſe animals to be brought to our college at Carthagena. He put a long pole under its feet, which it ſeized upon very firmly, and would not let go again. The animal therefore thus voluntarily ſuſpended was placed between two beams along with the pole, and there it remained without meat, drink, or ſleep, 40 days; its eyes being always fixed on people that looked at it, who were ſo touched, that they could not forbear pitying it. At laſt being taken down, they let looſe a dog on it, which after a little while the ſloth ſeized with his feet, and held him four days, till he died of hunger. This was taken from the mouth of the father. They add, continued Kircher, that this creature makes no noiſe but at night, but that very extraordinary. For by interruptions, that laſt about the length of a ſigh or ſemipauſe, it goes through an octave in muſic, aſcending and deſcending, and theſe perfectly in tune. The Spaniards, when they firſt got poſſeſſion of this coaſt, imagined that ſome people brought up to our muſic were ſinging."

To this account *Linnæus* in his *Syſtima Naturæ* gives credit. He ſays "It utters an aſcending hexachord: its noiſe is horrible; its tears are pitious." He quotes Muſgrave, Cluſius, Geſner, &c.

BRAG, a name given to a game at cards, from the nature of it; the principal ſtake being won by him who brags with moſt confidence and addreſs; i. e. who challenges the other gameſters to produce cards equal to his. In this game a pair of aces is the beſt brag, a pair of kings the next, and ſo on: and a pair of any ſort wins the ſtake from the moſt valuable ſingle card. The knave of clubs pairs with any other card in hand; but a hand of cards of leſs value in this game has ſometimes gained the ſtake from one of ſuperior value, by the confidence and art of bragging: the conteſt being given up on the part of the latter through fear of loſing. One ſtake is gained by the higheſt card, that is turned up in dealing, three cards being dealt round to each perſon and the laſt turned up; the higheſt card is the ace of diamonds: the other ſtake is won by the perſon, who firſt makes up the cards in his hands one and thirty; each dignified card paſſing for ten, and drawing from the pack. Each gameſter depoſits three ſtakes, one for each card.

BRAGGOT, a ſort of drink made in ſome parts of England, of malt, with honey, ſpices, and other ingredients.

BRAIN, in a general ſenſe, is that large, ſoft, whitiſh maſs, incloſed in the cranium, or ſkull. See Part VI. Sect. I. in the Syſtem of ANATOMY.

BRAKE, in the country language, denotes a thicket of briars and brambles; alſo a frame of wood to confine horſes during the time of cutting their tails off; alſo a machine to break the ſtalks of flax or hemp.

BRAMA, ſee BREAM.

BRAMBAS, a peculiar ſpecies of lemon tree, growing in Africa. The leaves of this are of a deep green, and of an admirable fragrancy, when rubbed between the hands. The fruit is very ſmall, and has a remarkable thin ſkin. The juice is uſed in dying. Phil. Tranſ. No. 108.

BRAMBLE, or BRAMBLING, in ornithology, the common Engliſh name of the montifringilla, or oroſpiza, called in ſome places the mountain-finch; a ſmall bird, ſomewhat reſembling the chaffinch.

BRAMBLE, in botany, a ſpecies of the rubus.

BRAMBLE *Net*, otherwiſe called hallier, is a net uſed by bird-catchers, of ſeveral ſizes.

BRAMINS, the name of the prieſts among the gentoo Indians; the ſucceſſors of the ancient Brachmans.

Their name is formed from brama, their particular deity. They are found in Siam, Malabar, China, Coromandel, and moſt other Eaſtern nations anywiſe civilized; but their chief ſeat is in Indoſtan, or the Mogul's country. They have a language peculiar to themſelves; in which they have ſeveral ancient books, written (as is alledged) by their great prophet Brama, and dictated by God himſelf.

There are ſeveral orders of Bramins. We find in their diſputes the very ſame ideas that occur in the writings of our moſt celebrated metaphyſicians. Their religion, which was anciently of the allegorical and moral kind, hath degenerated into extravagant ſuperſtitions, owing to their having realized thoſe fictions which were intended merely as ſo many ſymbols and emblems. Were it poſſible to obtain a ſight of their ſacred books, the only remains there are of the Indian antiquities, we might in ſome meaſure be enabled to remove the veil that envelops thoſe numerous myſteries; but the following ſtory will ſhow how little reaſon there is to hope that we ſhall ever be intruſted with ſuch a communication.

The emperor Mahmoud Akbar had an inclination to make himſelf acquainted with the principles of all the religious ſects throughout his extenſive provinces. Having diſcarded the ſuperſtitious notions with which he had been prepoſſeſſed by his education in the Mahometan faith, he reſolved to judge for himſelf. It was eaſy for him to be acquainted with the nature of thoſe ſyſtems that are formed upon the plan of making proſelytes; but he found himſelf diſappointed in his deſign when he came to treat with the Indians, who will not admit any perſon whatever to the participation of their myſteries. Neither the authority nor promiſes of Akbar could prevail with the Bramins to diſcloſe the tenets of their religion; he was therefore obliged to have recourſe to artifice. The ſtratagem he made uſe of was to cauſe a boy, of the name of Feizi, to be committed to the care of the prieſts, as a poor orphan of the ſacerdotal line, who alone could be initiated into the ſacred rites of their theology. Feizi, having received the proper inſtructions for the part he was to act, was conveyed privately to Benares, the ſeat of knowledge in Indoſtan; he was received into the houſe of a learned Bramin, who educated him with the ſame care as if he had been his own ſon. After the youth had ſpent ten years in ſtudy, Akbar was deſirous of recalling him; but he was ſtruck with the charms of the daughter of his preceptor. The women of the ſacerdotal tribe are looked upon as the greateſt beauties in Indoſtan.

The old Bramin laid no reſtraint upon that growing paſſion of the two lovers: he was fond of Feizi, who had gained his affection by his addreſs and docility; and offered him his daughter in marriage. The young man, divided between love and gratitude, reſolved to conceal the fraud no longer; and falling at the feet of the Bramin, diſcovered the impoſture, and aſked pardon for his offence. The prieſt, without reproaching him in the leaſt, ſeized a poniard which hung at his girdle, and was going to plunge it in his breaſt, if Feizi had not prevented him by taking hold of his arm. The young man uſed every means to pacify him, and declared himſelf ready to do any thing to expiate his treachery. The Bramin, burſting into tears, promiſed to pardon him on condition that he ſhould ſwear never to tranſlate the Bedas, or ſacred volumes, or diſcloſe to any perſon whatever the ſymbol of the Bramin creed. Feizi readily promiſed all that the Bramin required: how far he kept his word is not known; but the ſacred books of the Indians have never been tranſlated by him, or any one elſe, to this day. As the Bramins are the only perſons who underſtand the language of the ſacred book, their comments on the text are the ſame as thoſe that have ever been made on religious books; all the maxims which fancy, intereſt, paſſion, or falſe zeal can ſuggeſt, are to be found in theſe volumes. Raynal's Hiſt. of Ind.

They own a Supreme God, who created Brama, and gave him a power to create the world. They have alſo their ſubaltern deities, their pagods or temples, and idols, whom they fan to defend from flies dancing before them. They alſo hold a feaſt in honour of the ſun, conſidered as the ſource of light and heat, whereby all nature is fecundified.

Their pagods or temples conſiſt of three parts. The firſt is a vaulted roof, ſupported on ſtone columns: it lies open, and all perſons, without diſtinction, are allowed to enter into it. It is adorned with ſymbolical figures, made of wood, as elephants, oxen, and horſes. The ſecond part is open in the day-time, and ſhut at night. It is filled with groteſque and monſtrous figures, as men with many heads and arms. The third, which is a kind of chancel, is kept always ſhut, with a very ſtrong gate. In this is placed the ſtatue of the deity, to whom the pagod is dedicated. A great number of lamps burn day and night before the idol. The Bramins, before they go into the pagod, pull off their ſhoes, and leave them at the door.

BRAN, the ſkins or huſks of corn, eſpecially wheat ground, ſeparated from the flour by a ſieve or boulting mill. It contains, beſides, a ſmall portion of the farinaceous matter; and is of courſe leſs glutinous than the finer flour, and ſuppoſed to have a detergent quality; infuſions of bran are not unfrequently employed in this intention externally, and ſometimes likewiſe taken inwardly, as bran tea.

Among the ancients, bran was uſed as an erotic, to excite love. Bran boiled, purges ſcurf, dandreff, and cleanſes the hands in lieu of ſoap. The dyers reckon it among the not-colouring drugs; and uſe it for making what they call the *four waters*, with which they prepare their ſeveral dyes. Bran is alſo uſed for horſes, ſcalded with water, and is a diluting maſh.

BRANCH, in botany, an arm of a tree, or a part which, ſprouting out from the trunk, helps to form the head or crown thereof. Branches do not ſpring out of the mere ſurface of the trunk, but are profoundly rooted therein, ſo as not only to penetrate the cortical, but alſo the woody ſubſtance, and even the pith.

BRANCHER, among ſportſmen, a young hawk newly taken out of the neſt, that can hop from bough to bough.

BRANDING *in the Face*, or *Hand*, denotes a puniſhment inflicted by law on various offences, by burning with a hot iron, after the offender hath been once admitted to benefit of clergy. Blackſtone's Comm. vol. iv. p. 360. Alſo ſignifies the marking of ſheep or other cattle, either with a pitch mark or hot iron.

BRANDY, a ſpirituous and inflammable liquor, extracted from wine and other liquors by diſtillation. See DISTILLING.

Wine-brandy, made in France, is eſteemed the beſt in Europe. They make it wherever they make wine, and for that purpoſe uſe wine that is pricked rather than good wine. The chief brandies for foreign trade, and thoſe accounted beſt, are the brandies of Bourdeaux, Rochelle, Cogniac, Nantz, and Champaign.

In the iſland of Andros, they make brandies from the fruits of the arbutus and mulberry-trees.

A patent was ſome time ago obtained for making brandy from carrots and parſneps; the latter of which is ſaid to have nearly reſembled French brandy. Of late we meet with frequent advertiſements of raiſin-brandy, which, if really made of that fruit, is neareſt akin to wine-brandy. Apple, or cyder-brandy, is alſo praiſed by ſome. Dr. James Anderſon has lately diſcovered a method of making brandy from potatoes; for the particulars, ſee Syſtem of AGRICULTURE, Sect. XIII.

Cyder is found to yield an eighth part of good ſpirits, and if cloſe kept a year or two in a cool place, much more.

The French method of diſtilling brandies is the ſame with that practiſed by our diſtillers, in working from waſh or wines; only that the former throws a little of the natural lee into the ſtill along with the wine, which gives the ſpirit a flavour, on which a great part of its merit depends.

When brandies prove foul, ſeedy, or retain the taſte of certain weeds, apt to grow among the vines, they draw them over again, in order to cleanſe them of that adventitious flavour: in which operation they leave out the faints, or rather change the receiver, as ſoon as the ſtream begins to run proof. Then mixing together all that run off before, they call it *trois cinque*, that is, *brandy* conſiſting of five parts alcohol, and three of phlegm; beyond which the French *bruleurs*, or common diſtillers, rarely go.

Brandy lying long in the caſk, takes from it that hot, acid, and foul taſte, peculiar to all ſpirits, or brandies, newly diſtilled; and gives them a coolneſs and a ſoftneſs, not eaſily introduced by art. And on theſe properties are founded ſeveral methods of trying their goodneſs, or diſcovering whether they are debaſed or adulterated by the admixture of coarſer ſpirits. Phil. Tranſ. N° 391.

Brandies are rarely adulterated in France, where they have no cheaper ſpirits with which to debaſe them; and the like holds, in great meaſure, in favour of the Dutch, though otherwiſe ſuſpected to be great adulterators. The chief temptations for adulterating are in England, where the duties are high, and where there are various kinds of ſpirits in plenty to mix with them, as malt, molaſſes, cyder, and ſugar ſpirits, with all which they are often ſophiſticated, and ſo dextrouſly, as frequently to eſcape all the ways of detection. Brandy may be imitated, by adding to very pure malt ſpirits, ſome dulcified ſpirit of nitre.

The chief uſe of brandy, is as a drink; eſpecially in the cold northern countries; among the negroes in Guinea, who ſell one another for a few bottles of brandy; and among the ſavages of Canada, and other parts of North America, who are extremely fond of it. It is of ſome uſe too in medicine; being ſaid to ſtrengthen the nerves: and in dying, when raiſed into rectified ſpirit of wine, being one of the dyers non-colouring drugs.

Thoſe who deal in brandy (we ſpeak only of that made with wine), chooſe it white, clear, of a good taſte, and ſuch as will bear the teſt, or proof; i. e. ſuch as in pouring into a glaſs, forms on the top of it a little white lather, which, as it diminiſhes, makes a circle, called by the French *brandy* merchants the *chapelet*, by the Engliſh the *bead*, *bubble*, or *bead*; there being no brandy but that which is well dephlegmated, and which retains no ſuperfluous humidity, wherein the bead will be entirely formed. For various methods of aſcertaining the ſtrength and goodneſs of brandy and other ſpirits. Before we finiſh this article, we ſhall give an account of the manner of extracting brandy from the huſks or ſkins of grapes, after the preſſing; becauſe the benefits that ariſe from this diſtillation, deſerve ſome attention.

After the grapes have been preſſed, what remains in the preſs is coarſely ſeparated into ſmall particles with the hand, and afterward thrown into large tubs, where they preſs it very hard, mix a little water with it, and cover it very cloſely with clay: in that condition they leave it to ferment during four or five weeks, obſerving, however, to ſhut the crevices which might happen to open in the clay, to prevent the evaporation.

After that time they fill a very large copper half full with that mixture, cover it with its head, lute it, and diſtil the whole after the ſame manner as they do brandy. By this work they make a great advantage of a matter which they were uſed to caſt on a dunghill. If this brandy be not ſo palatable as that which is made of wine, it is excellent for making ſpirit of wine. Both theſe liquors are a conſiderable branch of trade.

To try the goodneſs of rectified ſpirit of wine, it muſt be lighted into a blaze: if then it conſumes wholly, without leaving any impurity behind; or, which is ſurer ſtill, if after putting a little gunpowder in the bottom of the ſpirit, the gunpowder take fire when the ſpirit is conſumed; the liquor is good. The brandies uſed in England are all coloured by means of burnt ſugar. Further particulars reſpecting the quality, ſtrength, and uſe of ſpirits, will be given under the article SPIRITUOUS LIQUORS.

BRANK, an inſtrument uſed in ſome parts of Scotland, and in Staffordſhire, for correcting ſcolding women. It is a ſort of head-piece, which opens, and incloſes the head of the impatient, while an iron, ſharp as a chiſſel, enters the mouth, and ſubdues the more dreadful weapon within. Thus harneſſed, the offender is led in triumph through the ſtreets. Dr. Plot, in his Hiſtory of Staffordſhire, has favoured the world with a minute deſcription and figure of the inſtrument, which is there called a *ſcolding-bridle*; and tells us, he looks upon it "as much to be preferred to the ducking-ſtool, which not only endangers the health of the party, but alſo gives the tongue liberty betwixt every dip; to neither of which this is at all liable."

BRANK, the ſame as buck wheat.

BRANLIN, in ichthyology, a ſpecies of ſalmon, with ſeveral tranſverſe black ſtreaks, reſembling the impreſſion of ſo many fingers.

BRASIDA, an anniverſary ſolemnity at Sparta, in memory of Braſidas, a Lacedemonian captain, famous for his atchievements at Methone, Pylos, and Amphipolis. It was celebrated with ſacrifices and games, wherein none were permitted to contend but free-born Spartans. Whoever neglected to be preſent at the ſolemnity was fined.

BRASIL WOOD, or *Brazil Wood*, an American wood of a red colour, and very heavy. It is denominated variouſly, according to the places from whence it is brought: thus we have braſil of Fernambuco, Japan, Lamon, &c.

The brazil tree ordinarily grows in dry barren places, and in the middle of rocks; it is very thick and large, uſually crooked, and knotty: its flowers, which are of a beautiful red, exhale a very agreeable ſmell, which ſtrengthens the brain. Though the tree be very thick, it is covered with ſo groſs a bark, that when the ſavages have taken it off the wood, or trunk, which before was the thickneſs of a man, it is ſcarce left equal to that of his leg.

Brazil wood is very heavy and dry; it crackles much in the fire, and ſcarce raiſes any ſmoke, by reaſon of its extreme dryneſs. None of the ſeveral kinds have any pith, except that of Japan: that of Fernambuc is eſteemed the beſt. It muſt be choſen in thick pieces, cloſe, ſound, without any bark on it; and ſuch as, upon ſplitting, from pale becomes reddiſh; and, when chewed, has a ſaccharine taſte. It is much uſed in turned works, and takes a good poliſh; but its chief uſe is in dying, where it ſerves for a red colour: it is a ſpurious colour, however, which it gives; and eaſily evaporates and fades: nor is the wood to be uſed without alum and tartar. Red ink is made of it, boiled in beer, wine, or vinegar, and the colour fixed with alum.

Hellot has given a remarkable proceſs, by which both the beauty and permanency of the dye are improved. He likewiſe directs to fix the colour of brazil by aſtringents; for this purpoſe the ſtale decoction of brazil is diluted with twice its quantity of water; to which are added, for every pound of cloth, about one ounce of powdered galls, and half an ounce of gum arabic. The cloth, prepared with alum and tartar, and kept moiſt for fifteen days, is boiled in this liquor for an hour or two, as the colour is wanted lighter or deeper, and ſuffered thoroughly to cool before it is waſhed. Dr. Lewis's edit. 4to. of Neumann's Works, p. 136.

From the brazil of Fernambruc is drawn a kind of carmine, by means of acids: there is alſo a liquid lacca made of it for miniature.

Carnation is dyed with brazil, and violets are raiſed with brazil. Acids turn brazil yellow, but by adding an alkali, it becomes purple; ſo that if we put lemon juice, or ſpirit of vinegar, in a decoction of brazil wood, it becomes yellow, and, if we add oil of tartar, violet.

Brazil wood differs very obviouſly from the ſaunders wood; the former gives out its red colour to water, the latter gives no red tinge to any aqueous liquor. Neumann.

Brazil wood is of ſome uſe in medicine; being reputed a ſpecies of the ſaunders, and poſſeſſed of the ſame phyſical virtues, though rarely preſcribed.

BRASS, a factitious metal, compoſed of copper fuſed with *lapis calaminaris*, which gives it a hardneſs and yellowneſs. The manner of making braſs is ſaid to have been kept a ſecret in Germany for many ages. The method of preparation among us is as follows. The *lapis calaminaris* being calcined, and ground as fine as flour, is mixed with a third or fourth part of ground charcoal; and incorporated, by means of water, into a maſs. To this compoſition of calamine and coal, ſome manufacturers add common ſalt, by which the proceſs of making braſs is ſaid to be haſtened: thus prepared, about ſeven pounds of the calamine is put into a melting-pot of about a gallon; and over it, about five pounds of copper, either in plates or grains, which is let down into a wind-furnace eight feet deep, remaining there about eleven hours; in which time it is converted into braſs. After melting, it is caſt into plates, or lumps: forty-five pounds of crude calamine produce thirty pounds burnt, or calcined; and ſixty pounds of copper make, with calamine, an hundred pounds of braſs.

The proportion of calamine, and the increaſe which the copper receives from it, are different in different works; and hence ariſes the deeper or paler colour of braſs. The quantity of braſs obtained by the proceſs for making it, has been conſiderably augmented ſince the introduction of the method now commonly practiſed, of uſing granulated copper.

The uſe of braſs was not known, as is generally believed, (and the Arundelian marbles aſſert) previous to the knowledge of iron. They were both firſt known in the ſame generation, and firſt wrought by the ſame diſcoverer. And the knowledge of them muſt have been equally carried over the world afterwards, with the ſpreading of the colonies of the Noachidæ. An acquaintance with the one or the other was abſolutely neceſſary to the exiſtence of the coloniſts; the clearing away of the woods about their ſettlements, and the erection of houſes for their habitation.

The ancient Britons, though acquainted from the remoteſt periods with the uſe of both theſe metals, remained long ignorant that they were to be obtained in the iſland. Before this diſcovery they imported all their iron and braſs from the continent. And when they had at length detected the former in their own hills, and had ceaſed to introduce it, they continued to receive the latter. Their want of the metal remained, and no mines of it were opened in the iſland. In the earlieſt ages, whoſe manners have been delineated by hiſtory, we find the weapons of their warriors invariably framed of this factitious metal; and the moſt authentic of all the profane records of antiquity, the Arundelian marbles, for that reaſon, miſtakenly date the firſt diſcovery of iron a couple of centuries below the Trojan war. Every military nation, as ſuch, is naturally ſtudious of brightneſs in its arms; and the Britons, particularly, gloried in the neatneſs of theirs. For this reaſon the nations of the world ſtill fabricated their arms of braſs, even long after the Arundelian æra for the diſcovery of iron; and the Britons continued to import it from the continent, though they had found iron to be a native of the country, and could have ſupplied themſelves with a ſufficient quantity of it.

Mr. Whittaker ſuppoſes, that when the Britons derived their iron and braſs from the continent, they purchaſed the latter at an eaſier expence than the former. The Gauls had many large braſs works carried on in the kingdom, but ſeem to have had few iron forges within it. And this would naturally induce the Belgæ to be leſs diligent in their inquiry after the veins of copper and calamine at home, than for the courſes of iron ore; though the one was equally diſcoverable in the iſland as the other, and lay equally within the Belgic regions of it. Braſs being thus cheaper than iron, they neceſſarily formed with it ſome domeſtic as well as military implements.

At this time the Romans entered the iſland; and, ſeeing ſo great a demand among the natives for this article, they ſpeedily inſtructed them to diſcover the materials of it among themſelves. The power of ſurpriſing their new ſubjects with ſo unexpected a diſcovery would naturally ſtimulate the pride of the Roman intellect; and the deſire of obliging themſelves with ſo cheap a ſupply of that uſeful metal, ſtationary as they were in that kingdom, would alſo equally actuate the ſelfiſhneſs of the Roman heart. The veins of copper and calamine would be eaſily found out by an experienced inquirer after them; and the former metal is therefore diſtinguiſhed among the Welſh, only by the Roman appellation of *cyprium*, *koppr*, or kopper. And many founderies of braſs appear to have been eſtabliſhed in the iſland. Some had been erected before, one perhaps within the confines of every kingdom, and probably in the vicinity of every capital. One at leaſt would be neceſſary, in order to ſupply the armory of the principality; and one perhaps was ſufficient for moſt of the Britiſh ſtates. But ſeveral appear now to have been ſettled in every kingdom, and one perhaps near every ſtationary town. Two have been diſcovered in the ſingle county of Eſſex, and within a narrow portion of it at Fifield and Danbury. And a third was placed upon Eaſterly Moor in Yorkſhire, 12 miles to the north-weſt of York, and in the neighbourhood of Iſurium or Aldborough. Whitaker's Hiſt. of Mancheſter.

Corinthian **BRASS**, famous in antiquity, is a mixture of gold, ſilver, and copper. L. Mummius having ſacked and burnt the city of Corinth, 146 years before Chriſt, it is ſaid this metal was formed from the immenſe quantities of gold, ſilver, and copper, wherewith that city abounded, thus melted and run together by the violence of the conflagration.

BRASS, in the glaſs trade. Thrice calcined braſs is a preparation which ſerves the glaſſmen to give many very beautiful colours to their metal. The manner of preparing it is this: Place thin plates of braſs on tiles on the leet of the furnace near the occhis; let it ſtand to be calcined there for four days and it will become a black powder ſticking together in lumps. Powder this, ſift it fine, and recalcine it four or five days more; it will not then ſtick together, but remain a looſe powder, of a ruſſet colour. This is to be calcined a third time in the ſame manner; but great care muſt be taken in the third calcination, that it be not overdone nor underdone; the way to be certain when it is right, is, to try it ſeveral times in glaſs while melting. If it makes it, when well purified, to ſwell, boil, and riſe, it is properly calcined; if not, it requires longer time. This makes, according to the different proportions in which it is uſed, a ſea-green, an emerald green, or a turcoiſe colour.

Braſs, by long calcination alone, and without any mixture, affords a fine blue or green colour for glaſs; but they have a method of calcining it alſo with powdered brimſtone, ſo as to make it afford a red, a yellow, or a chalcedony colour, according to the quantity and other variations in the uſing it. The method of making the calcination is this: Cut thin plates of braſs into ſmall pieces with ſheers, and lay them ſtratum ſuper ſtratum, with alternate beds of powdered ſulphur, in a crucible; calcine this for 24 hours in a ſtrong fire; then powder and ſift the whole; and finally, expoſe this powder upon tiles for 12 days to a reverberating furnace; at the end of this time, powder it fine, and keep it for uſe. The glaſs-makers have alſo a method of procuring a red powder from braſs, by a more ſimple calcination, which ſerves them for many colours. The method of preparing it is this: They put ſmall and thin plates of braſs into the arches of the glaſs furnaces, and leave them there till they are ſufficiently calcined, which the heat in that place, not being enough to melt them, does in great perfection. The calcined matter powdered, is of a duſky red, and requires no farther preparation.

BRASS *Colour*, one prepared by the braziers and colour-men to imitate braſs. There are two ſorts of it; the red braſs, or bronze, and the yellow or gilt braſs: the latter is made only of copper-filings, the ſmalleſt and brighteſt that can be found; with the former they mix ſome red ochre, finely pulverized; they are both uſed with varniſh. In order to make a fine braſs that will not take any ruſt or verdigreaſe, it muſt be dried with a chafing-diſh of coals as ſoon as it is applied. The fineſt braſs colour is made with powder-braſs imported from Germany, diluted into a varniſh, made and uſed after the following manner. The varniſh is compoſed of one pound four ounces of ſpirit of wine, two ounces of gum-lac, and two ounces of ſandarac; theſe two laſt drugs are pulveriſed ſeparately, and afterwards put to diſſolve in ſpirit of wine, taking care to fill the bottle but half full. The varniſh being made, you mix ſuch quantity as you pleaſe of it with the pulveriſed braſs, and apply it with a ſmall bruſh to what you would braſs over. But you muſt not mix too much at once, becauſe the varniſh being very apt to dry, you would not have time to employ it all ſoon enough; it is therefore better to make the mixture at ſeveral times. After this manner they braſs over figures of plaſter, which look as well as if they were of caſt braſs.

Braſs may be cleaned, firſt by rubbing it with a cloth dipped in aqua fortis or ſpirits of vitriol, mixed with an equal quantity of water, then with an oily cloth, and laſtly, with finely powdered and ſifted brick duſt, or other ſimilar powder.

BRASSICA, the cabbage, in botany, a genus of the tetradynamia ſiliquoſa claſs of plants, the characters of which are theſe; the flower is croſs-ſhaped, having four petals, and four oval nectarious glands. It hath ſix ſtamina, which are erect, two of which are oppoſite, and the other four are longer. It hath a taper germen, of the length of the ſtamina, which afterward becomes a long taper pod depreſſed on each ſide, and is terminated by the apex of the intermediate partition, which divides it into two cells filled with round ſeeds. For their agricultural uſes and culture, ſee Syſtem of AGRICULTURE, Sect. XI; and for their general uſes, ſee CABBAGE.

BRAWN, in the culinary art, ſignifies the fleſh of a boar, boned, rolled up, or collared, boiled, and, laſtly, pickled, for the winter's uſe.

Brawn is made only of the flitches, without the legs; the oldeſt boars are choſen for this uſe; it being a rule that the older the boar, the more horny the brawn. Boars are barbarouſly penned up in ſo cloſe a manner, as to render it impoſſible for them to lie down for weeks together, from an idea ſuch treatment makes the ſkin grow thick and horny: cruel as this ſeems, the practice is general.

BRAZIER, an artificer who makes and ſells pans, pots, kettles, and other kitchen utenſils and braſs ware.

Itinerant braziers, who go about with their tools and knapſacks, are called *tinkers*; by the French, *braziers of the whiſtle, chauderoniers au ſifflet*.

BRAZING, the ſoldering or joining two pieces of iron together by means of thin plates of braſs, melted between the pieces that are to be joined. If the work be very fine, as when two leaves of a broken ſaw are to be brazed together, they cover it with pulverized borax, melted with water, that it may incorporate with the braſs powder, which is added to it: The piece is then expoſed to the fire without touching the coals, and heated till the braſs is ſeen to run.

BREACH, in a general ſenſe, denotes a break or rupture in ſome part of a fence or incloſure, whether owing to time or violence. Alſo a breach of promiſe, &c.

BREAD, (Sax. to nouriſh) a name given to the food, which is the chief ſupport of life. A mixture of flour, water, ſalt and yeaſt fermented, and afterwards baked in an oven.

OBSERVATIONS ON THE NATURE AND PROPERTIES OF BREAD.

The grains of moſt vegetables are compoſed of ſubſtances very proper for the nouriſhment of animals; and thoſe which contain a farinaceous matter are the moſt agreeable and nutritive.

Man, who appears to be deſigned by nature to eat of all ſubſtances which are capable of nouriſhing him, and ſtill more of vegetables than animals, has, from time immemorial, and in all parts of the earth, uſed farinaceous grains as the principal baſis of his food: but as theſe grains cannot be without difficulty eaten by men in their natural ſtate, this active and intelligent animal has gradually found means not only to extract the farinaceous part, that is, the only nutritive part of theſe grains, but alſo to prepare it ſo that it becomes a very agreeable and wholeſome aliment, ſuch as the bread we now generally eat.

Nothing appears ſo eaſy at firſt ſight as to grind corn, to make a paſte with the flour and water, and to bake this paſte in an oven. They who are accuſtomed to enjoy the advantages of the fineſt human inventions, without reflecting on the labour it has coſt to complete them, think all theſe operations common and trivial. However, it appears very certain, that for a long time men no otherwiſe prepared their corn than by boiling and forming compact viſcous cakes, not very agreeable to the taſte, and of difficult digeſtion, before they were able to make bread of good taſte and quality, as we have now. It was neceſſary to invent and complete ingenious machines for grinding corn, and ſeparating the pure flour with little trouble and labour; and that inquiries, or rather ſome happy chance, which ſome obſerving perſon availed himſelf of, ſhould diſcover, that flour mixed with a certain quantity of water is ſuſceptible of a fermentation, which almoſt entirely deſtroys its viſcidity, heightens its taſte, and renders it proper to make a light bread, very agreeable to the taſte, and of eaſy digeſtion.

This eſſential operation, on which the good quality of bread depends, is entirely of the province of chemiſtry. It would add to the honour of the ancient cultivators of chemiſtry, to attribute to them ſo uſeful and important a diſcovery; but, unhappily, it is too probable that they had no ſhare in it. The ancient chemiſts were engaged in other purſuits than that of bread and other common objects. They hoped to make gold; and what is bread in compariſon with gold?

However that be, to the fortunate invention of raiſing the paſte before baking we owe the perfection of the art of making bread. This operation may be performed by keeping ſome paſte or dough, till by a peculiar ſpirituous fermentation it ſwells, rarefies, and acquires a ſmell and taſte quick, pungent, ſpirituous, ſomewhat ſour, and rather diſagreeable. This fermented dough is well worked with ſome freſh dough, which is by that mixture, and moderate heat, diſpoſed to a ſimilar but leſs advanced fermentation than that above-mentioned. By this fermentation the dough is attenuated, and divided; air is introduced into it, which, being incapable of diſengaging itſelf from the tenacious and ſolid paſte, forms in it ſmall cavities, raiſes and ſwells it: hence the ſmall quantity of fermented paſte which diſpoſes the reſt to ferment, is called leaven.

When the dough is thus raiſed, and made into proper forms, it is in a ſtate to be put into the oven; and being baked, forms a bread full of eyes or cavities, conſequently light, and entirely different from the heavy, compact, viſcous, and indigeſted maſſes, made by baking unfermented dough.

The invention of beer, or wine of grains, furniſhes a new matter uſeful in the making of bread. This matter is the froth which forms upon the ſurface of theſe liquors during fermentation. When it is mixed with dough, it raiſes it better and more quickly than ordinary leaven. It is called yeaſt or barm. By means of this, the fineſt, lighteſt bread is made. It often happens, that bread made with leaven dough has a ſouriſh and not agreeable taſte; which may proceed from too great a quantity of leaven, or from leaven in which the fermentation has advanced too far. This inconvenience is not ſo liable to happen to bread made with yeaſt.

It may be aſked, Why, ſince dough is capable of fermenting ſpontaneouſly and ſingly, as we ſee from the leaven, a ſubſtance is added to diſpoſe it to ferment? The true reaſon is, that all the parts of a fermenting ſubſtance do not ferment at the ſame time, nor to the ſame degree; ſo that ſome parts of this ſubſtance have finiſhed their fermentation, while others have not yet begun. The fermentable liquors which contain much ſugar, as hydromel, and muſt of wines, give proofs of this truth; for, after theſe liquors have become very vinous, they have ſtill very diſtinctly a ſaccharine taſte: but all ſaccharine matter is ſtill ſuſceptible of fermentation; and, in fact, if vinous hydromel, or muſt, or even new beer, be diſtilled, ſo that all their ardent ſpirit ſhall be ſeparated, and the reſiduums diluted with water, we ſhall ſee a ſecond fermentation take place, and a new quantity of ardent ſpirit formed.

The ſame thing preciſely happens to dough, and ſtill more ſenſibly from its viſcoſity and want of fluidity; that if it be left to ferment alone, and without the help of leaven, as the fermentation proceeds very ſlowly and ſucceſſively, the parts which ferment firſt will become ſour and vapid before the reſt be ſufficiently attenuated and changed, and the bread will acquire a diſagreeable taſte.

A mixture of a ſmall quantity of leaven with dough effectually prevents this inconvenience; becauſe the effect of this leaven, and of all fermenting ſubſtances, is to diſpoſe to a ſimilar fermentation all matters capable of it, with which it is mixed.

Bread well raiſed and baked differs from unfermented bread, not only in being leſs compact, lighter, and of a more agreeable taſte, but alſo in more intimately mixing with water, with which it does not form a viſcous maſs, a circumſtance of great importance in digeſtion. Macquer's Chem. Dict.

It is obſervable, that without bread, or ſomewhat of this form, no nation ſeems to live. Thus the Laplanders, having no corn of their own, make a ſort of bread of their dried fiſhes, and of the inner rind of the pine, which ſeems to be uſed, not ſo much for their nouriſhment, as for ſupplying a dry food. For this mankind ſeem to have an univerſal appetite, rejecting ſlippery, and oily foods. This is not commonly accounted for, but ſeems to depend on very ſimple principles. The preparation of our food depends on the mixture of the animal fluids in every ſtage. Among others the ſaliva is neceſſary, which requires dry food as a neceſſary ſtimulus to draw it forth, as ſlippery, fluid aliments are too inert, and make too ſhort ſtay in the mouth, to produce this effect, or to cauſe a ſufficient degree of chewing to excite that liquor. For this reaſon we commonly uſe dry bread along with animal food, which otherwiſe would be too quickly ſwallowed. For blending the oil and water of our food nothing is ſo fit as bread, aſſiſted by a previous maſtication. For which purpoſe, bread is of like neceſſity in the ſtomach, as it is proper that a ſubſtance of ſolid conſiſtence ſhould be long retained there. Now the animal fluids muſt be mixed with our aliments, in order to effect the changes it undergoes. Liquid foods would not attain this end: bread then appears to be exceedingly proper, being bulky without too much ſolidity, and firm without difficulty of ſolution. Cullen on Mat. Med.

Among the ancients we meet with various denominations of bread; as, 1. *Panis ſiligineus*, called alſo *mundus*, *athleticus*, *iſungia*, *coliphius*, *and robys*, anſwering to our white bread; being made of the pureſt flour of the beſt wheat, and only uſed by the richer ſort. 2. *Panis ſecundus* or *ſecundarius*, called alſo *ſmilaceus* or *ſmilagineus*, the next in purity; being made of fine flour, only all the bran not ſifted out. 3. *Autopirus*, called alſo *ſyncomiſtus* and *confuſaneus*, made of the whole ſubſtance of the wheat, without either retrenching the finer flour or coarſer bran; anſwering to our houſehold bread. 4. *Cacabaceus*, apparently the ſame with what was otherwiſe denominated *ſordidus* as being given to dogs; *furfuraceus*, *furfureus*, or *furfurativus*, becauſe made in great part of bran; and, in the middle age, *biſſus*, on account of its browneſs; ſometimes alſo *leibo*. There were other ſorts of bread, denominated from the manner in which they were made, or the uſes they were applied to; as, 1. The *militaris*, which was prepared by the ſoldiers and officers in camp with their own hands; for which purpoſe ſome had hand-mills others pounded the corn in a mortar, and baked it on the coals. 2. *Clibanites*, that baked in an oven, by way of contradiſtinction from that baked on the hearth or under the embers. 3. That called *ſubcineritius*, or *ſub cinere coctus*; ſometimes alſo *reverſatus*, becauſe it was to be turned in the baking. 4. *Nauticus*, anſwering to our ſea-biſcuit, and denominated accordingly *bis coctus*, becauſe baked ſeveral times over to make it keep the longer. Other kinds of bread were denominated from their qualities and accidents; as, 1. The *panis ſiccus*, that which had been long baked; ſuch as were the *bis coctus*, naval and buccellated bread. 2 *Madidus*, a ſort made of rye, ſometimes alſo made of fine flour, wherewith they ſmeared their faces, by way of a coſmetic, to render them ſmooth. 3. *Acidus*, or ſour bread, which was acidulated with vinegar. 4. *Azimus*, that unleavened or unfermented.

COMMON METHOD OF MAKING BREAD.

To half a buſhel of meal add ſalt, a pint of yeaſt, and ſix quarts of water that has boiled; in warm ſummer weather put the water nearly cold; in winter, when the weather is very cold, as warm as the hand can be endured in it without cauſing pain; and in temperate weather obſerve a mean between thoſe extremes. This is deemed a common proportionate mixture, and the mode of proceeding is as follows: Put the flour into a trough, or other veſſel uſed for the purpoſe, and making a hole in the middle of the flour put the water into it, to which add the barm and ſalt, ſtirring it together; alſo gently mix the flour with it till it becomes of a very thick conſiſtence. Cover the whole up warm to ferment and riſe, particularly in cold weather; this is called laying ſpunge, and on a due management of this part of the proceſs greatly depends the goodneſs of bread, provided the various materials are good. After letting it lie a proper time in this ſtate, an hour and a half, more or leſs, according to the ſtate of the weather, knead it well together; be not ſparing of labour, and afterwards lay the whole thick at one end of the dough trough, and let it lie ſometime longer covered up. During this part of the buſineſs the oven muſt be heated; when that is effected, and properly cleaned from aſhes, cinders, &c. make the bread into loaves, and place them in the oven as expeditious as poſſible; obſerving to make a ſmall fire on one ſide the mouth of the oven to give light while ſetting, and alſo to prevent the external air from cooling it; ſtop the oven cloſe, and pull the bread out when baked.

To this common Method we add the following

Manchet. To every buſhel with a ſufficient quantity of water is poured in about three pints of war male, with barm and ſalt to ſeaſon it. This is kneaded well together, with the hands: after which, having lain an hour to ſwell, it is moulded into manchets; which, being ſcored in the middle, and pricked on the top, to give room to riſe, are baked in the oven by a gentle fire.

Another Kind, ſometimes called *cheat-bread baking*, is thus made: Some leaven (ſaved from a former batch) filled with ſalt, laid up to ſour, and at length diſſolved in water, is ſtrained through a cloth into a hole made in the middle of the heap of meal in the trough; then it is worked with ſome of the flour into a moderate conſiſtence: this is covered up with meal, where it lies all night; and in the morning the whole heap is ſtirred up, and mixed with a little warm water, barm, and ſalt, by which it is ſeaſoned, ſoftened, and brought to an even leaven: it is then kneaded, moulded, and baked, as before.

As a valuable and uſeful Improvement, we next lay before our Readers, the Practice of Mr. James Stone, *of* Amport, Hampshire.

METHOD OF RAISING A BUSHEL OF FLOUR, WITH A TEA SPOONFUL OF BARM.

Suppoſe you want to bake a buſhel of flour, and have but one tea-ſpoonful of barm. Put your flour into your kneading-trough or trendle; then take about three quarters of a pint of warm water, and take the tea-ſpoonful of thick ſteady barm and put it into the water, ſtir it until it is thoroughly mixed with the water: then make a hole in the middle of the flour large enough to contain two gallons of water, pour in your ſmall quantity; then take a ſtick about two feet long, (which you may keep for that purpoſe), and ſtir in ſome of the flour, until it is as thick as you would make batter for a pudding; then ſtrew ſome of the dry flour over it, and go about your uſual buſineſs for about an hour: then take about a quart of warm water more, and pour in; for in one hour you will find that ſmall quantity raiſed ſo, that it will break through the dry flour which you ſhook over it; and when you have poured in the quart of warm water, take your ſtick as before, and ſtir in ſome more flour, until it is as thick as before; then ſhake ſome more dry flour over it, and leave it for two hours more, and then you will find it riſe and break through the dry flour again; then you may add three quarts or a gallon of water more, and ſtir in the flour and make it as thick as at firſt, and cover it with dry flour again; in about three or four hours more you may mix up your dough, and then cover it up warm; and in four or five hours more you may put it into the oven, and you will have as light bread as though you had put a pint of barm. It does not take above a quarter of an hour more time than the uſual way of baking, for there is no time loſt but that of adding water three or four times.

The author of this method aſſures us that he conſtantly bakes this way in the morning about ſix or ſeven o'clock, puts the flour out, and puts this ſmall quantity of barm into the before-mentioned quantity of water, in an hour's time ſome more, in two hours more a greater quantity, about noon makes up the dough, and about ſix in the evening it is put into the oven, and he has always good bread, never heavy nor bitter.

When you find, he ſays, your body of flour ſpunged large enough, before you put in the reſt of your water, you ſhould, with both your hands, mix that which is ſpunged and the dry flour all together, and then add the remainder of warm water, and your dough will riſe the better and eaſier.

The reaſon he aſſigns why people make heavy bread is, not becauſe they have not barm enough, but becauſe they do not know that barm is the ſame to flour as fire is to fuel; that, as a ſpark of fire will kindle a large body by only blowing it up, ſo will a thimble-full of barm, by adding warm water, raiſe or ſpunge any body of flour; for warm water gives freſh life to that which is before at work; and the reaſon of making bread heavy is, becauſe the body ſpunged is not large enough, but was made up and put into the oven before it was ripe, or well fermented.

In regard to the difference of ſeaſons, he preſcribes, that in the ſummer you ſhould put your water blood-warm; and in winter, in cold froſty weather, as warm as you can bear your hand in it without making it ſmart; being ſure you cover up your dough very warm in the winter, and your covering of it with dry flour every time you add warm water will keep in the heat; when you have added ſix or eight quarts of warm water, as before mentioned, in ſuch a gradual way, you will find all that body of flour which is mixed with the warm water, by virtue of that one tea-ſpoonful of barm, brought into great agitation, waxing, or fermenting; for it is to the flour what the ſpirit is to the body, it ſoon fills it with motion.

The French have alſo a great variety of breads; as queen's bread, alamode bread, bread de Segovie, de Gentillay, quality bread, &c. All prepared in peculiar manners by the bakers of Paris. The bread de Goneſſe excels all others, on account of the waters at Goneſſe, a town three leagues from Paris. It is light, and full of eyes, which are the marks of its goodneſs. *Pain de menage*, is that which each family bakes for itſelf. Spice-bread, *pain d' epice*, denotes bread baked and iced over with the ſcum taken off ſugar in refining houſes; it is ſometimes alſo made with honey and other ſorts of ſeaſoning, and anſwers to what the ancients call *panis mellitus*.

Among us, bread is chiefly divided into white, wheaten, and houſehold; differing only in degrees of purity.

In the firſt the bran, and gurgeons or pollard are ſeparated from the flour; in the ſecond the bran and the coarſer part of the gurgeons; and in the third only the coarſe bran. Sometimes, but very rarely, bread is made with the whole ſubſtance of the grain without any ſeparation by bolting.

We alſo meet with ſymnel bread, manchet or roll bread, and French bread: which are only ſo many denominations of the fineſt and whiteſt bread, made of the pureſt flour; except that in roll-bread there is an addition of milk; and in French bread, of eggs and butter alſo. In Lancaſhire, and ſeveral of the northern counties of England, they have ſeveral ſorts of oaten bread; as, 1. The bannock, which is an oat-cake, kneaded only with water, and baked on the embers. 2. Clap-bread, which is made into thin hard cakes. 3. Bitchineſs bread, which is made of thin batter, into thin ſoft oat-cakes. 4. Riddle cakes, which are thick and ſour, have but little leaven, and are kneaded ſtiff. And, 5, Jannock, which is oaten bread made up into loaves. Add to theſe, *peaſe-bread*, much uſed in many parts of Scotland; being bread conſiſting either wholly of the flour of peaſe, or of this and oat-meal mixed: the dough, ſometimes leavened, ſometimes made only with water, is formed either into bannocks or cakes, and baked over the embers; or into what they call *bups*, i. e. a kind of flattiſh rolls and baked in the oven.

In the ſtatute of the aſſize of bread, 51ſt Henry III. mention is made of Waſtel Bread, Cocket Bread, and Bread of Tretes, which ſeems anſwerable to the three kinds of bread at this time called white, wheaten, and houſehold: as a curioſity we preſent our readers with a ſhort extract from that ſtatute, which places in a conſpicuous point of view the great changes that have taken place in the value of proviſion, conſequently of labour, and all the eſſential traffics and occurrencies of mankind.

Extract. “ When a quarter of wheat is ſold for 12 pence, “ then waſtel bread of a farthing ſhall weigh 6 lb. 6 oz. Bread

" cocket of a farthing, of the ſame corn and buſhel, ſhall weigh more than waſtel by 2 oz. Cocket bread made of corn, that is of leſs price, ſhall weigh more than waſtel by 5 oz. A ſimnel of a farthing ſhall weigh 2 oz. leſs than waſtel. Bread made of the whole wheat ſhall weigh a cocket and a half, ſo that a cocket ſhall weigh more than a waſtel by 5 oz. Bread of tretes ſhall weigh 2 waſtels. Bread of common wheat ſhall weigh 2 great cockets. When a quarter of wheat is ſold for 18 pence, then a waſtel loaf of a farthing ſhall weigh 4 lb. 10 oz. 8 dwts. When a quarter of wheat is ſold for 2 ſhillings, then a waſtel loaf of a farthing ſhall weigh 3 lb. 8 oz. &c. &c. And then a baker of every quarter of wheat (as it hath been proved by the king's bakers) may gain 4 pence and the bran, and 2 loaves for advantage for three ſervants."

It is obſervable that in the above table of aſſize, it begins with 1 ſhilling, and ends with 11 ſhillings and 4 pence; from this we may ſuppoſe, 5 or 6 ſhillings were the average prices of wheat per quarter at that period.

In an act of Edward II. of uncertain date, bakers are ſubject to the following penalty, viz.

" A baker, if his bread be found a farthing lacking weight in 2 ſhillings and 6 pence, or under, ſhall be amerced, and if it paſs the ſame number, he ſhall ſuffer puniſhment of pillory; which ſhall not be remitted neither for gold nor ſilver. And every baker ſhall have a mark of his own for his bread."

In theſe linient days, when offenders are permitted to exerciſe cruel extortion with impunity, thoſe laws may be deemed ſevere; but there is certainly more cruelty in unjuſtly oppreſſing the laborious and indigent, than bringing fraudulent treaders to public juſtice.

BARM, or YEAST, is ſaid to have been firſt uſed by the Celtæ in the compoſition of bread. About the time of Agricola's entrance into Lancaſhire, a new ſort of loaf had been introduced at Rome; which was formed only of water and flour, and much eſteemed for its lightneſs: and it was called the water cake from its ſimple compoſition, and the Parthian roll from its original inventors. But even this was not comparable to the French or Spaniſh bread for its lightneſs. The uſe of curmi, and the knowledge of brewing, had acquainted the Celtes with an ingredient for their bread, which was much better calculated to render it light and pleaſing, than the leaven, the eggs, the milk, or the wine and honey, of other nations. This was the ſpume which aroſe on the ſurface of their curw in fermentation, and which the Welch denominate burm, and we barm. The Celtes of Gaul, of Spain, and moſt probably therefore of South-Britain, had long uſed it; and their bread was, in conſequence of this, ſuperior in lightneſs to that of any other nation in the world.

To preſerve YEAST. When yeaſt is plenty take a quantity, and work it well with a whiſk until it becomes thin, then procure a large wooden diſh or platter, clean and dry, and with a ſoft bruſh lay a thin layer of yeaſt on the diſh, and turn the top downwards to keep out the duſt, but not the air to dry it. When the firſt coat is dry lay on another, and let that dry, ſo continue till the quantity is ſufficient; by this means it may be ſoon made two or three inches thick; be always careful to dry one layer well before another is laid on. Preſerve it in a dry place covered from duſt and air.

When you uſe it for baking cut a piece off, lay it in warm water, and diſſolve it, and it will be fit for uſe.

For a curious method of making Yeaſt from potatoes, ſee Syſtem of AGRICULTURE, Sect. XIII.

It is for the intereſt of the community that the food of the poor ſhould be as various as poſſible, that, in times of dearth and ſcarcity of the ordinary kinds, they may not be without ready and cheap reſources. To the diſcovery of ſuch reſources ſeveral benevolent philoſophers having turned their inquiries, we ſhall lay before the reader the reſult of their experiments.

BREAD *from Potatoes by Mr.* Parmentier, *Major of the Invalid Hotel, Paris.* Potatoes, previouſly deprived of their ſkin, cut into thin ſlices, and put between paper, will dry in a heat ſomewhat leſs than 35° of Reaumur's thermometer; and, when thus dried, they will preſerve their white colour. By this proceſs they loſe about two thirds of their weight, and they may then be reduced to a fine powder. A little of this powder thrown upon the fire ſends out a ſmoke, accompanied with a ſmell reſembling burnt bread. The powder of potatoes, obtained in this manner, has the ſmell and taſte of wheat; and, like it, is devoured by rats and mice: but, even when moſt finely powdered, it has not the feel or brightneſs of the flour of wheat; although, on a chemical analyſis, it yields the ſame products. It is alſo nutritious, and keeps well for a long time.

Finding ſo great a ſimilarity between the meal of wheat and what may be called the meal of potatoes, Mr. Parmentier next endeavoured to make bread of them when mixed in different proportions. His trials were made with one fourth, one third, one half, and two thirds, of the potatoe-meal, the remainder being flour from wheat. Theſe proportions, with the addition of a little ſalt and yeaſt, yielded bread which was well taſted, but which had fermented little, was brown, and covered with hard brown cruſts. Bread made from the meal of potatoes alone, with the addition of ſalt and yeaſt, was eatable, but very heavy, unfermented, and exceedingly brown. This bread, from the meal of potatoes alone, was apt to crumble into powder. To give it more adheſion, he mixed with the meal a decoction of bran, or a mixture of honey and water; either of which made it lighter and more fermented: it obtained alſo a cruſt of a golden colour, became well taſted, and ſufficiently adheſive. Mr. Parmentier obtained bread alſo, well fermented, and of a good colour and taſte, from a mixture of raw potatoe-pulp with meal of wheat, or potatoe-meal, with the addition of yeaſt and ſalt.

Potatoes, when uſed for making bread, are not readily diſpoſed to ferment; without which, bread is very inſipid, and not eaſily digeſted. But Mr. Parmentier found, from a variety of experiments, that good bread might be made from equal quantities of flour and potatoe-meal. He concludes, therefore, with recommending the mixture of potatoes, in times of ſcarcity, with the flour of wheat, inſtead of employing rye, barley, or oats, as has frequently been done.

When grain is altogether wanting, he recommends the uſe of bread made from a mixture of the amylaceous powder of potatoes and of their pulp, this mixture being fermented with leaven, or with honey. The meal of this root, when diluted with hot water, acquires a tenacious and gluey conſiſtence. However fair the meal of potatoes may be, it always gives a grey colour to the bread made by mixing it with the flour of wheat: but a mixture of the pulp of potatoes with the flour of wheat does not produce brown-coloured bread.

Mr. Parmentier made bread, very much like that of wheat, by a mixture of the following four ſubſtances, viz. four ounces of amylaceous powder of potatoes, one dram of mucilage extracted from barley, one dram of the bran of rye, and a dram and a half of a glutinous matter dried and powdered.

BREAD *of Potatoes communicated to us by* WILLIAM SANDS, *Eſq. of* GROVE CASTLE *in the County of* WARWICK.

Procure Potatoes of the mealy kind about one third the quantity of bread you intend to make; pare off the ſkin clean, as you do an apple to make pies, put them into a quantity of water leſs than what is neceſſary to make the dough of a ſufficient conſiſtence for baking; boil them till they are reduced to a pulp, and mix the whole with two thirds of the flour in a degree of heat according to the weather; then take the remaining warm water and mixing it well with a proper quantity of yeaſt and ſalt, make a hole in the dough and ſtir the remaining flour and water together in it; cover it up and let it lie and ferment two hours or upwards according to the weather, then knead the whole well together and let it lie again covered up to raiſe; make it into loaves and bake them.

N. B. On a proper fermentation greatly depends the ſucceſs of this method of making bread, which thoſe who are accuſtomed to bake will be attentive to. I have ordered bread made half potatoes but not with equal ſucceſs, as that made one third potatoes was equal to any I would wiſh to eat.

This practice I make no doubt may be greatly improved and a greater quantity of potatoes introduced; the idea attracted my attention; I made the experiment ſeveral times and found it anſwer, and think it capable of great improvement.

BREAD *from different Vegetables not commonly in Uſe.* Although horſe-cheſnut has not hitherto been employed, yet it is certain that wholeſome bread, without any bitterneſs, may be obtained from it. Mr. Parmentier adviſes, that the fruit, after the ſkin is taken off, and the juice preſſed from it, be made into a paſte. This maſs muſt be diluted in water, and then ſtrained through a ſieve. A milky-coloured liquor is thus ſeparated, which, on ſtanding, depoſits a fine powder. This, being dried, is without either ſmell or taſte, and very fit for aliment; the maſs from which it is procured retaining the bitterneſs of the fruit.

The roots of the bryona, when treated in the ſame manner, yielded a ſimilar white powder. By the ſame treatment alſo, fine, white, inſipid, inodorous powders may be procured from the roots of the iris, gladiolus, ranunculus, fumaria, arum, dracunculus, mandragora, colchicum, filipendula, and helleborus; plants which grow ſpontaneouſly, and in great abundance.

Of acorns bread has frequently been made; and to this day, in ſome countries, they are in common uſe. The method of preparation whcih Mr. Parmentier recommends is, that they be deprived of their cover by boiling, then dried and powdered, and afterwards baked in the ſame manner as the flour of wheat. When fully ripe, and made into a paſte, they were deprived of their aſtringency by merely preſſing their juice from them. The maſs remaining after the preſſure, when dried, was eaſily reduced to a fine powder by no means diſagreeable.

Method of making wholeſome BREAD *with Turnips.*

" At the time I tried this method, bread was very dear, inſomuch that the poor people, in the country where I live, could hardly afford themſelves half a meal a day. This put me upon conſidering whether ſome cheaper method might not be found, than making of wheat-meal. Turnips were at that time very plentiful. I had a number of them pulled, waſhed clean, pared, and boiled; when they become ſoft enough to maſh, I had the greateſt part of the water preſſed out of them, and afterwards had them mixed with an equal quantity in weight of coarſe wheat-meal; the dough was then made in the uſual manner, with yeaſt or barm, ſalt, water, &c. It roſe very well in the trough; and after being well kneaded, was formed into loaves, and put into the oven to be baked. I had at the ſame time ſome other bread made with common meal in the ordinary way. I baked my turnip-bread rather longer than the other. When they were drawn from the oven, I cauſed a loaf of each ſort to be cut; and found, on examination, the turnip bread was ſweeter than the other, to the full as light and as white, but had a little taſte (though nowiſe diſagreeable) of the turnip. Twelve hours afterwards I taſted my turnip-bread again, when I found the taſte of the turnip in it ſcarce perceivable, and the ſmell quite gone off. On examining it when it had been baked 24 hours, had I not known that there were turnips in its compoſition, I ſhould not have imagined it: it had, it is true, a peculiar ſweetiſh taſte, but by no means diſagreeable; on the contrary, I rather preferred it to the bread made of wheat-meal alone. After it had been baked 48 hours, it underwent another examination, when it appeared to me to be rather ſuperior to the other; it eat freſher and moiſter, and had not at all abated in its good qualities: to be ſhort, it was ſtill very good after a week; and, as far as I could ſee, kept as well as the bread made of common wheat-meal.

"In my trials of this bread by the taſte, I was not ſatisfied with eating it by itſelf; I had ſome of it ſpread with butter; I taſted it with cheeſe; I eat of it toaſted and buttered, and finally in boiled milk and in ſoup: in all theſe forms it was very palatable and good." *Muſæum Ruſticum.*

Bread *Tree*, the Engliſh name of the artocarpus, a new genus of plants; ſo named from (*panis*) "bread," and (*fructus*) "fruit," and referred to the monoecia monogynia of Linnæus; the fruit of which not only ſerves as a ſubſtitute for bread among the inhabitants of O-Taheite and the neighbouring iſlands, but alſo variouſly dreſſed, compoſes the principal part of their food. It grows on a tree that is about the ſize of a middling oak; its leaves are frequently a foot and an half long, of an oblong ſhape, deeply ſinuated like thoſe of the fig-tree, which they reſemble in colour and conſiſtence, and in the exſuding of a milky juice upon being broken. The fruit is about the ſize and ſhape of a new-born child's head; and the ſurface is reticulated not much unlike a truffle; it is covered with a thin ſkin, and has a core about as big as the handle of a ſmall knife. The eatable part lies between the ſkin and the core; it is as white as ſnow, and of the conſiſtence of bread; it muſt be roaſted before it is eaten, being firſt divided into three or four parts; its taſte is inſipid, with a ſlight ſweetneſs ſomewhat reſembling that of the crumb of wheaten bread mixed with a Jeruſalem artichoke. This fruit is alſo cooked in a kind of oven, which renders it ſoft, and ſomething like a boiled potatoe; not quite ſo farinaceous as a good one, but more ſo than thoſe of the middling ſort. Of the bread-fruit they alſo make three diſhes, by putting either water or the milk of the cocoa nut to it, then beating it to a paſte with a ſtone peſtle, and afterwards mixing it with ripe plaintains, bananas, or the ſour paſte which they call *mahie*.

The mahie, which is likewiſe made to ſerve as a ſuccedaneum for ripe bread-fruit before the ſeaſon comes on, is thus made: The fruit of the bread-tree is gathered juſt before it is perfectly ripe; and being laid in heaps, is cloſely covered with leaves: in this ſtate it undergoes a fermentation, and becomes diſagreeably ſweet; the core is then taken out entire, which is done by gently pulling out the ſtalk, and the reſt of the fruit is thrown into a hole which is dug for that purpoſe generally in the houſes, and neatly lined in the bottom and ſides with graſs: the whole is then covered with leaves and heavy ſtones laid upon them; in this ſtate it undergoes a ſecond fermentation, and becomes ſour, after which it will ſuffer no change for many months. It is taken out of the hole as it is wanted for uſe; and being made into balls, it is wrapped up in leaves and baked: after it is dreſſed, it will keep five or ſix weeks. It is eaten both cold and hot; and the natives ſeldom make a meal without it, though to Europeans the taſte is as diſagreeable as that of a pickled olive generally is the firſt time it is eaten.

To procure this principal article of their food (the bread-fruit), coſts theſe happy people no trouble or labour except climbing up a tree: the tree which produces it does not indeed grow ſpontaneouſly; but if a man plants ten of them in his life-time, which he may do in about an hour, he will as completely fulfil his duty to his and future generations, as the native of our leſs temperate climate can do by ploughing in the cold of winter, and reaping in the ſummer's heat, as often as theſe ſeaſons return: even if, after he has procured bread for his preſent houſehold, he ſhould convert a ſurplus into money, and lay it up for his children. For an Engraving, ſee Plate I. Curious Plants.

Bread, in chemiſtry. The chemiſt's art can extract from ſo mild a ſubject as bread, an acid, which is a powerful menſtruum. It is done in this manner: put two pounds of coarſe bread, cut into ſmall pieces, into a glaſs retort; place this in a ſand heat, and, luting on a receiver, diſtil with a gentle fire, and there will be produced a liquor appearing like water, with a ſmall quantity of oil; ſeparate the oil, and filtre and rectify the liquor by a ſecond diſtillation in *balneo Mariæ*, and afterwards diſtil it again in a ſand-heat, and there will be produced a moderately ſtrong, clear, acid liquor. This is a menſtruum capable of extracting the red colour from coral, and even from garnet. Common bread affords it, but coarſe rye bread yields the greateſt quantity. Shaw's Lect. p. 104. Oil of vitriol, poured upon crums of bread, will excite a ſurpriſing degree of heat.

Bread, in medicine. Beſides the alimentary, bread has alſo medical qualities. Decoctions, creams, and jellies of bread are directed in ſome diſpenſaries. Bread carefully toaſted, and infuſed or lightly boiled in water, imparts a deep colour, and a ſufficiently agreeable reſtringent taſte. This liquor, taken as common drink, has done good ſervice in a weak lax ſtate of the ſtomach and inteſtines; and in bilious vomiting and purging, or the cholera morbus: examples are related in the Edinburgh eſſays of ſeveral caſes of this kind cured by it without the uſe of any other medicine.

Earth **Bread**. "In the lordſhip of Moſcow in the Upper Luſatia, a ſort of white earth is found, of which the poor, urged by the calamities of the wars which raged in thoſe parts, make bread. It is taken out of a hill where they formerly worked at ſaltpetre. When the ſun has ſomewhat warmed this earth it cracks, and ſmall white globules proceed from it as meal; it does not ferment alone, but only when mixed with meal. Mr. Sarlitz, a Saxon gentleman, was pleaſed to inform us, that he has ſeen perſons who in a great meaſure lived upon it for ſome time. He aſſures us that he procured bread to be made of this earth alone, and of different mixtures of earth and meal; and that he even kept ſome of this bread by him upwards of ſix years: he further ſays, a Spaniard told him, that this earth is alſo found near Geronne in Catalonia." *German Ephem.*

Euchariſt or Sacramental **Bread**, in the Proteſtant churches, is common leavened bread, in conformity to the ancient practice.

Horſe **Bread** is made of wheat, oats, and beans; to which ſometimes are added aniſeed, gentian liquorice, fænugreek, eggs, and ale; and ſometimes rye and white are uſed.

For race-horſes three ſorts of bread are uſually given with ſucceſs, for the ſecond, third, and fourth nights feeding: they are all made of beans and wheat worked with barm; the difference conſiſting chiefly in the proportion of the two former. In the firſt kind, three times the quantity of beans is uſed to one of wheat; in the ſecond, equal quantities of both, the third, three times the quantity of wheat to one of beans.

Aſſize of **Bread**. The price and weight of bread is regulated by the magiſtrates according to the price of wheat. If bread want one ounce in 36, the baker formerly was to ſuffer the pillory: now, to forfeit 5s. for every ounce wanting; and for every defect leſs than an ounce, 2s. 6d.; ſuch bread being complained of and weighed before a magiſtrate within 24 hours after it is baked or expoſed to ſale within the bills of mortality, or within three days in any other place.

Bread *Room*, in a ſhip, that deſtined to hold the bread or biſket.

The boards of the bread room ſhould be jointed and caulked, and even lined with tin plates, or mats. It is alſo proper to warm it with charcoal for ſeveral days before the biſket is put into it; ſince nothing is more injurious to bread than moiſture.

BREADTH, in geometry, one of the three dimenſions of bodies, which multiplied into the length conſtitutes the contents of the ſurface.

BREAK, in a general ſenſe, ſignifies to divide a thing into ſeveral parts with violence.

BREAKERS, a name given by ſailors to thoſe billows that break violently over rocks lying under the ſurface of the ſea. They are diſtinguiſhed both by their appearance and ſound, as they cover that part of the ſea with a perpetual foam, and produce a hoarſe and terrible roaring, very different from what the waves uſually have in a deeper bottom. When a ſhip is unhappily driven among breakers, it is hardly poſſible to ſave her, as every billow that heaves her upwards ſerves to daſh her down with additional force when it breaks over the rocks or ſands beneath it.

BREAM, in ichthyology, the Engliſh name of the Cyprinus latus.

This is but a coarſe fiſh for the table, but it affords great ſport to the angler. The beſt time for angling for bream is from St. James's day to Bartholomew tide; as being then exceeding fat; and the moſt proper bait is the largeſt red garden worms that can be got.

BREAST, mamma, in anatomy, a prominent fleſhy part of the human body, on the outſide of the thorax, ſerving to ſeparate the milk. See Syſtem of Anatomy. Part V. Sect. XV.

Breast, applied to the correſpondent parts of other animals, is more properly called udders, dugs, ubera, &c.

Breast alſo denotes that cavity or region of the body, by anatomiſts more frequently called thorax. Though, in propriety, the breaſt is rather reſtrained to the anterior part of the *thorax* where the ribs meet; called alſo *ſternum* and *pectus*; in Engliſh, popularly the boſom.

Breast *Plate*, a piece of defenſive armour, wherewith to cover the breaſt.

In Jewiſh antiquity, one part of the prieſtly veſtment worn by the high prieſt. It was ſet with twelve precious ſtones, on each of which was engraven the name of the tribes.

Breast *Plough*, in agriculture, a ſmall plough ſo conſtructed, that a man may puſh it before him. See Syſtem of Agriculture. Sect. II. It is uſed in the operation called paring and burn baking; for a delineation, ſee Plate I. Husbandry.

BREATH, the air inſpired and expelled again in the action of reſpiration.

The antients were very watchful over the laſt breath of dying perſons, which the neareſt relations, as the mother, father, brother, or the like received in, their mouths.

BREECH *of a Gun*, in artillery, denotes the diſtance from the hind part of the baſe ring to the beginning of the bore, and is always equal to the thickneſs of the metal at the vent.

Breech, the backſide or poſteriors.

BREECHES, a garment worn by males, reaching from the girdle to the knees, and ſerving to cover the hips, thighs, &c.

The antient Romans had nothing in their dreſs anſwering to our breeches and ſtockings; inſtead of which, under their lower tunics and waiſtcoats, they ſometimes bound their thighs and legs round with ſilken ſcarves, or *faſciæ*, called *tibialia* and *femoralia*.

Breeches appear to be a habit peculiar to the barbarous nations, eſpecially thoſe inhabiting the colder countries of the North; whence Tacitus calls them *barbarum tegmen*. We find mention made of them among the antient Getæ, Sarmatæ, Gauls, Germans, and Britons; they alſo obtained among the Medes and Perſians, as being a people of Scythian origin.

The Scotch are an exception to the northern uſe of breeches; for in the year 1783, ſo tenacious were they of their favourite poſterior garment that the Marquis of Graham procured an an act of parliament to authorize the uſe of the filabeg; which was oppoſed by Sir P. Jennings, Clerk, and other ſenators, on the ſcore of indecency.

BREECHINGS, in the ſea-language, thoſe ropes with which the great guns are laſhed, or faſtened to the ſhip's ſide. They prevent the cannon from recoiling too much in time of battle, and are employed for ſecuring it during the courſe of a voyage.

BREEDING is uſed for the care of rearing or bringing up the young of divers animals.

Breeding, in a moral ſenſe, denotes a perſon's deportment or behaviour in the external offices and decorums of ſocial life.

In this ſenſe, we ſay, well-*bred*, ill-*bred*, a man of *breeding*, &c.

Good-*breeding* amounts to much the ſame with what is otherwiſe called *politeneſs*; among the Romans, *urbanity*.

BREEZE, a ſhifting wind, blowing from the ſea and land alternately, during certain hours of the day or night; only ſenſible near the coaſts. Common in Africa and the Eaſt and Weſt-Indies.

The ſea-breeze, Dampier obſerves, commonly riſes in the morning about nine, proceeding ſlowly in a fine ſmall black curl on the water towards the ſhore: it increaſes gradually till twelve, and dies about five.—Upon its ceaſing the land-breeze commences, which increaſes till twelve; and is ſucceeded in the morning by the ſea-breeze again.

They are more conſtant in ſummer than in winter, and more between the tropics than in the temperate zone.

The general cauſe of thoſe alternate breezes which ſet on and off the coaſts in hot countries, is the greater rarefaction of the air by reflected heat, and by fermenting exhalations over the land than over the water: the denſer air from the water becomes a ſea-breeze in the day; but this air condenſed again by the cold of the night, may then occaſion a land-breeze.

Breeze, in brick-making, are ſmall aſhes and cinders ſometimes made uſe of inſtead of coals for the burning of bricks. Aſhes uſually mixed with clay, where they can be procured, greatly improve bricks; are called Breeze.

BREGMA, in anatomy, the ſame with ſinciput. See Anatomy, Part II. Sect. I.

BREHONS, the provincial judges among the antient Iriſh, by whom juſtice was adminiſtered, and controverſies decided.

Theſe ſages were a diſtinct tribe or family, to whom competent lands were allowed in inheritance. In criminal caſes the brehon had the eleventh part of all fines; which could not but be conſiderable, at a time when murders, rapes, robberies, and the like offences, were only ſubject to pecuniary commutations.

Brehon *Laws*, denote the general maxims, or rules of law, obſerved by the Brehons, and having the force of laws throughout all the provinces in Ireland.

Several fragments of the *leges brehonicæ* are ſtill extant in public and private libraries. The moſt complete collection is that belonging to the duke of Chandos, containing twenty-two ſheets and an half, cloſe written, full of abbreviated words, and not very legible. The publication of theſe laws has been much wiſhed for.

BRENT *Gooſe*, a ſpecies of gooſe with a black neck, and a white collar round; uſually confounded with the barnacle, though in reality a diſtinct ſpecies.

BREST-SUMMERS, or **Bressumers**, in building, are pieces of timber deſigned for the ſupport of the brick-work in the front or rear wall of a building.

BRETESSE, in heraldry, a line embattled on both ſides.

BRETOYSE, or **Bretois**, the law of the marches of Wales; in uſe among the ancient Britons.

BREVE, in muſic, is a note or character of time, formed ſquare, without any tail; and equivalent to two meaſures, or ſemibreves; 4 minims and 8 crotchets; it is now generally exploded.

Breve is uſed in common law for a writ or brief. Hence,

Breve *Perquirere*, is to purchaſe a writ or licence of trial in the king's courts by the plaintiff.

BREVET, in the French laws, denotes an act iſſued by a ſecretary of ſtate, importing a grant of ſome favour or donation from the king.

Brevet more particularly denotes the commiſſion of a ſubaltern officer, being only written on parchment, and without ſeal.

BREVIARY, is an epitome, an abridgment, or ſhort ſtate of a thing; among eccleſiaſtical writers, it denotes the office, or ſervice both for day and night, as performed in the Romiſh churches. Alſo it is uſed for a church-book, containing the prayers, and other parts of the ſervice, with the ſeveral variations to be made therein, according to the ſeveral days, canonical hours, feaſts, and the like.

BREVIATOR, an officer under the Eaſtern empire; whoſe buſineſs was to write and tranſcribe briefs. At Rome, thoſe are ſtill called *breviators*, or *abbreviators*, who dictate, and draw up the pope's briefs.

BREVIER, among printers, is the denomination of a ſmall ſpecies of letters between minion and bourgeois. See the Art of Printing.

BREWER, a perſon who profeſſes the art of brewing; in the Eaſt parts of this kingdom common brewers are very general, but in the Weſt and North-weſt it is cuſtomary for all deſcriptions of houſeholders to brew their own beer: the Company of Brewers of the City of London, were incorporated in the year 1427, in the reign of Henry IV.

TREATISE ON THE ART OF BREWING.

Brewing is the operation of preparing ale or beer from water, malt, and hops.

INTRODUCTION.

In the following we intend giving theoretic obſervations on the different proceſſes employed in the Art of Brewing, arranged under their reſpective heads; particularly intended to familiarize the practice in private families, avoiding as much as poſſible all philoſophic abſtruſe ideas.

Common brewers, and thoſe who purſue the buſineſs profeſſionally, may uſe inſtruments and learned phraſes in order to make their trade appear myſterious; but ſuch is not the object of the editor of this treatiſe, he is only ambitious to give ſuch inſtructions as will enable an attentive maſter, miſtreſs, or ſervant, to prepare a wholeſome pleaſant liquor either to enliven the hours of conviviality, or a beverage eſſentially neceſſary for the uſe of the table. From general opinion, home-brewed beer is much more wholeſome than that ſold by brewers and publicans; this gives ſuſpicion that unfair practices or noxious materials are uſed in common brewhouſes, whether ſuch practice is cuſtomary or not we will not pretend to determine; being convinced no perſon of reputation could conſiſtent, with a fair character, ſell poiſon to his fellow creatures: therefore, as we are unacquainted with any baſe adulteration, we certainly have no right to beſtow cenſure. After the theory, we mean to give conciſe practical rules for the proceſs of brewing, and ſubſequent management of different denominations of malt liquor; to conclude with ſome miſcellaneous obſervations on the ſubject.

1ſt. Considerations on the Properties of Water, Malt, and Hops.

2d. Boiling, Worts, and Fermentation.

3d. Brewing Strong Beer.

4th. Mild Ale.

5th. Table Beer.

6th. Oat Ale; and other fermented liquors, for the uſe of the table.

7th. Conclusive Remarks.

Though the art of brewing is undoubtedly a part of chemiſtry, and certainly depends upon fixed and invariable principles as well as every other branch of that ſcience, theſe principles have never yet been thoroughly inveſtigated. For want of a ſettled theory, therefore, the practice of this art is found to be precarious; and to ſucceed ſometimes, and at others to fail under the ſame management. Some ingenious theoretic hints, however, have been thrown out, in order to eſtabliſh a regular theory of brewing; the principal of which we ſhall lay before our readers.

I. Considerations on the Properties of Water, Malt and Hops.

Water. The next conſideration is the quality of the water to be employed in brewing; and here ſoft water is univerſally allowed to be preferable to hard, both for the purpoſes of maſhing and fermentation. Tranſparency is, however, more eaſily obtained by the uſe of hard than ſoft water; firſt, from its inaptitude to extract ſuch an abundance of that light mucilaginous matter, which, floating in the beer for a long time, prevents its fining; ſecondly, from its greater tendency to a ſtate of quietude after the vinous fermentation is finiſhed by which thoſe floating particles are more at liberty to ſubſide, and, laſtly, from the mutual uniting of the earthy particles of the water with thoſe of the materials, which by their greater ſpecific gravity thus united, not only precipitate themſelves, but carry down alſo that lighter mucilage juſt mentioned. For theſe reaſons, hard water is not well adapted to the brewing of porter, and ſuch beers as require a fulneſs of palate, when drawn to the great lengths of the London brewery, and of ſome country ſituations.

The purity of water is determined by its lightneſs; and in this, diſtilled water only can claim any material degree of perfection. Rain water is the pureſt of all naturally produced: but by the perpetual exhalations of vegetables, and other fine ſubſtances floating in the atmoſphere, it does not come down to us entirely free from thoſe qualities which pond and river waters poſſeſs in a greater degree. Theſe, eſpecially of rivers running through fens and moraſſes, from the quantity of graſs and weeds growing therein, imbibe an abundance of vegetable ſolutions which occaſions them to contain more fermentable matter, and conſequently to yield a greater portion of ſpirit; but at the ſame time induces ſuch a tendency to acidity as will not eaſily be conquered. This is more to be apprehended towards the latter end of the ſummer than at any other time; becauſe theſe vegetable ſubſtances are then in a ſtate of decay, and thence more readily impart their pernicious qualities to the water which paſſes over them.

At ſuch an unfavourable time, ſhould the brewer be neceſſitated to purſue his practice, it will behove him to pay the utmoſt attention to the cauſe of this diſpoſition in his liquor, and thence endeavour to prevent the ill conſequences, by conducting his proceſs to the extraction and combination of ſuch parts of the materials as his judgment informs him will beſt counteract its effects.

Where there is the liberty of choice, we would recommend the uſe of that water which, from natural purity, equally free of the auſterity of imbibed earths, and the rankneſs of vegetable ſaturation, has a ſoft fulneſs upon the palate, is totally flavourleſs, inodorous, and colourleſs; whence it is the better prepared for the reception and retention of ſuch qualities as the proceſs of brewing is to communicate and preſerve.

The next thing to be conſidered is the proper degree of heat to be employed in making the infuſion; and here it is evident, that though this muſt be an object of the utmoſt importance to the ſucceſs of the operation, it is extremely difficult, perhaps impoſſible, to fix upon a preciſe ſtandard that ſhall at all times fully anſwer the purpoſe. On this ſubject Mr. Richardſon preſents us with the following obſervations.

Maſhing.—"The quality of the ſaccharine part of malt reſembles that of common ſugar, to which it is practicable to reduce it; its properties are entirely owing to its intimate connection with the other parts of the malt, from which ſuch diſtinguiſhing flavours of beers are derived as are not the immediate reſult of the hop. Were it not for theſe properties, the brewer might adopt the uſe of ſugar, molaſſes, honey, or the ſweet of any vegetable, to equal advantage; which cannot now be done, unleſs an eligible ſuccedaneum be found to anſwer that purpoſe. As we are at preſent circumſtanced, a ſearch on the other ſide would turn more to the brewer's account. We have in malt a ſuperabundance of the groſſer principles; and would government permit the introduction of a foreign addition to the ſaccharine, which is too deficient, many valuable improvements might be made from it; as we could, by a judicious application of ſuch adventitious principle, produce a ſecond and third wort, of quality very little inferior to the firſt.

"But in theſe experiments a very particular attention would be neceſſary to the ſolvent powers of the water at different degrees of heat, and to the inquiry how far a menſtruum ſaturated with one principle may be capable of diſſolving another. Such a conſideration is the more neceſſary on this occaſion to direct us clear of two extremes equally diſagreeable: the firſt is, that of applying the menſtruum pure, and at ſuch a heat as to bring off an over proportion of the oleaginous and earthy principles, which would occaſion in the beer, thus wanting its natural ſhare of ſaccharum, a harſhneſs and auſterity which ſcarce any time the brewer could allow would be able to diſſipate; the other is, that of previouſly loading the menſtruum with the adopted ſweet in ſuch abundance as to deſtroy its ſolvent force upon the characteriſtical qualities we wiſh to unite with it, and thereby leave it a mere ſolution of ſugar. The requiſite mean is that of conſidering what portion of the ſaccharine quality has been extracted in the firſt wort, according to the quantity of water and degree of heat applied; and then to make ſuch a previous addition of artificial ſweet as will juſt ſerve to counterbalance the deficiency, and aſſimilate with that portion of the remaining principles we are taught to expect will be extracted with ſucceeding wort.

From the nature of the conſtituent principles of malt, it is eaſy to conceive, that the former, or ſaccharine or mucilaginous parts, yield moſt readily to the impreſſion of water, and that at ſo low a degree of heat as would have no viſible effect upon the latter. If, therefore, we are to have a certain proportion of every part, it is a rational inference, that the means of obtaining it reſts in a judicious variation of the extracting heat according to the ſeveral proportions required.

"A low degree of heat, acting principally upon the ſaccharum, produces a wort replete with a rich ſoft ſweet, fully impregnated with its attendant mucilage, and in quantity much exceeding that obtainable from increaſed heat; which, by its more powerful inſinuation into the body of the malt acting upon all the parts together, extracts a conſiderable portion of the oleaginous and earthy principles, but falls ſhort in ſoftneſs, fulneſs, ſweetneſs, and quantity. This is occaſioned by the coagulating property of the mucilage, which, partaking of the nature of flour, has a tendency to run into paſte in proportion to the increaſe of heat applied; by which means it not only locks up a conſiderable part of the ſaccharum contained therein, but retains with it a proportionate quantity of the extracting liquor, which would otherwiſe have drawn out the impriſoned ſweet, thence leſſening both the quantity and quality of the worts. And this has ſometimes been known to have had ſo powerful an effect, as to have occaſioned the ſetting of the goods, or the uniting the whole into a paſty maſs; for though heat increaſes the ſolvent powers of water in moſt inſtances, there are ſome in which it totally deſtroys them. Such is the preſence of flour, which it converts into paſte; beſides thoſe of blood, eggs, and ſome other animal ſubſtances, which invariably tends to harden.

"From a knowledge of theſe effects, we form our ideas of the variations neceſſary in the heat of the extracting liquor; which are of more extenſive utility than has been yet intimated, though exceedingly limited in their extent from one extreme to the other.

"The moſt common effects of too low a heat, beſides ſometimes producing immediate acidity, are an inſipidity of the flavour of the beer, and a want of early tranſparency, from the ſuperabundancy of mucilaginous matter extracted by ſuch heats, which, after the utmoſt efforts of fermentation, will leave the beer turbid with ſuch a cloud of its lighter feculencies as will require the ſeparation and precipitation of many months to diſperſe.

"The contrary application, of too much heat, at the ſame time that it leſſens the mucilage, has, as we have ſeen before, the effect of diminiſhing the ſaccharum alſo; whence that lean thin quality obſervable in ſome beers; and by extracting an over proportion of oleaginous and earthy particles, renders the buſineſs of fermentation difficult and precarious, and impreſſes an auſterity on the flavour of the liquor which will not eaſily be effaced.

"Yet the true medium heat for each extract cannot be univerſally aſcertained. An attention not only to the quality of the malt, but to the quantity wetted, is abſolutely neceſſary to the obtaining every due advantage; nor muſt the period at which the beer is intended for uſe be omitted in the account. The quality of the water alſo claims a ſhare in the conſideration, in order to ſupply that deficient thinneſs and want of ſolvent force in hard, and to allow for the natural fulneſs and fermentative quality of ſoft; a particular to which London in a great meaſure owes the peculiar mucilaginous and nutritious quality of its malt liquors.

"Although the variations above alluded to are indiſpenſable, it is eaſy to conceive, from the ſmall extent of the utmoſt variety, that they cannot be far diſtant. If, therefore, we know that a certain degree extracts the firſt principles in a certain proportion, we need not much conſideration to fix upon another degree that ſhall produce the required proportion of the remaining qualities, and effect that equal diſtribution of parts in the extract which it is the buſineſs of fermentation to form into a conſiſtent whole."

Having given the ideas of the ſcientific Mr. Richardſon on Water, and the proper degrees of heat neceſſary to extract the eſſential qualities of the malt, denominated maſhing, we ſhall only notice the properties of malt, referring the proceſs of making it, to the place where it will appear with more conſiſtence and propriety. See Art of MALT MAKING.

Malt is dried brown and pale, or a mean between thoſe extremes; in London called amber; to procure either of theſe the brewer muſt depend on his own judgment, or on the fidelity of his maltſter; either kind, if made properly with good barley, will brew fine beer.

The goodneſs of malt may be known by the following marks. Bite a grain of it aſunder, and if it taſtes mellow and ſweet, breaks ſoft, and is full of flour from one end to the other, it is good. If it has a round body, and upon putting ſome grains of it into water, they ſwim on the ſurface, it is good. Barley ſinks in water, and malt that is not well made will do the ſame: but it is to be obſerved that this is not an invariably proof, becauſe, if the malt be broken, or in the leaſt cracked, it will take in water, and ſink. Malt that is rightly made will not be hard, but of ſo mellow a nature, that if drawn over an oak board, acroſs the grain, it will leave a white line upon the board, like a mark of chalk. Its ſmell alſo may be conſulted; for malt, though otherwiſe good, may have contracted an ill ſcent from the fuel it is dried with, or from the water uſed in the ſteeping.

Before malt is ground, it ſhould be ſcreened or ſifted from the tails and duſt, which would otherwiſe heighten the colour of the wort, render the liquor muddy, and give it a bad taſte, which could not afterwards be got rid of.

The malt muſt be broken, in order to its communicating its virtue to the water. If it be ground too ſmall, its flour will mix too freely with the water, and cauſe the wort to run thick. Many are of opinion that the beſt way is only to crack it, ſo that none of the grains may come out whole: for the intent is, that the water ſhould draw out an extract, but not be mixed with the mealy part, in the manner of a paſte, or gruel. Some think that malt is better ground by a ſtone mill, than by a ſteel one, becauſe the former bruiſes it, and the latter only cuts the grains.

After the malt is ground, it ſhould lie ſome time to mellow, in a cool room, where no ſun comes. The time for this is different, according to its kind. Brown malt may be ground at from three to fourteen days before it is uſed, in order that the corn, which is rendered uncommonly hard by that degree of drying, may be gradually ſoftened by the moiſture in the air; by which means it will become the more ſoluble in water. The pale malts require only one or two days. After lying thus in the air, leſs maſhing ſuffices; the ſtrength of the malt is more perfectly extracted, and the beer will be conſiderably ſtronger than it would be with the ſame quantity of malt taken directly from the kiln. Care muſt be taken that it get no damage in lying.

Hops. On the properties of hops we take the liberty to extract the following from Mr. Richardſon's Theoretic Hints.

In hops, the quantity of oil is abundant; the finer part of an agreeable fragrance and great volatility; the coarſer, from its intimate union with an auſtere ſaline earth, of the alkaline kind, is groſſer in its odour, harſher in its flavour, and leſs ſubject to avolation.

The time of picking, the mode of curing, the care in bagging, the place of keeping, all have their ſhare in the preſervation or deſtruction of the finer qualities of this vegetable. If the hop be plucked too early, the conſequence of immaturity is obvious; if it hang too late, the conſtant avolation of its fine unctuous parts, waſtes its fragrance, deſtroys its colour, and renders it of leſs value and efficacy. An application of too much heat in the curing has ſimilar effects; for by evaporating the aqueous parts of the vegetable too haſtily, the finer parts of the eſſential oil riſe with them and are loſt, whilſt the remainder receives an injury ſomewhat ſimilar to that of malt by the like injudicious treatment. The care in bagging and keeping is equally important, on the ſame principle of excluding, as much as poſſible, the action of the external air upon the hop, which carries off its more valuable qualities in the ſame manner as by a too long continuance on the plant. The cloſer they are preſſed down in the bag, the more effectual is their ſecurity againſt this injury; and the beſt practical method of keeping them, is in a cloſe, but dry room, the bags laid upon each other, and the interſtices well filled with a dry inodorous matter, ſuch as the firſt ſcreenings of malt, &c.

Time, however, will impair their virtues, in ſpite of the utmoſt precaution, and that ſo rapidly, as to render them incompetent to the nicer purpoſes of the pale-ale brewer, after the expiration of the firſt year, in all the ordinary modes of preſerving them.

In theſe virtues of the hop are we to look for the primary principles of flavour and preſervation of malt liquors, which are to be extracted in ſuch manner and proportion, as the judgment of the brewer ſhall ſeem moſt likely to anſwer thoſe intentions. To accompliſh this, with certainty and advantage, particular attention muſt be had to the ſeveral ends of extracting, and the different effects of thoſe extracts upon the reſt of the proceſs, viz. whether the purpoſe of flavour will not defeat that of preſervation, and whether the too anxious purſuit of preſervation will not weaken the powers, and leſſen the effect of fermentation, to the very great loſs of the ſubject; for it is very certain, that every unctuous principle is an enemy to fermentation, and has a direct tendency to impair its action and deſtroy its efficacy.

Hence are we taught by reaſon, what is confirmed by experience, that the ſoluble parts of the hop, extracted ſeverally, anſwer ſeveral different purpoſes in beers, but taken collectively, tend to confound their virtues and pervert their uſes; and that in their extraction, if the means be not nicely proportioned to the end, the order of the proceſs is deſtroyed, and the intention of the brewer defeated.

The flavour and the virtue of the hop is given in the common way, by a great deal of boiling. We have obſerved already, that a very little, with proper management, will anſwer the purpoſe, and the drink will be proportionably better. Therefore, in order to this, the hops ſhould be rubbed to pieces thoroughly between the hands, and then put in a bag into the receiver, for the wort to run gradually upon them. After this gentle wetting and ſoaking, they will give their virtue with a few minutes boiling; and the drink will be not only flavoured with this ingredient, but will be the better alſo in itſelf by ſparing the reſt of the boiling.

Sixty or ſeventy miles round London, Kent hops are preferred, but more particularly thoſe called Farnham hops, from their growing in the vicinity of that place; their reputation is ſo great that they generally bear an extra price of 6d. per pound. In Worceſterſhire, Herefordſhire, and the adjacent counties, hops of the plantation called the Worceſter, are uſed; and if we may judge of the goodneſs of the hop from the quality of the beer, there certainly is not more excellent malt liquor brewed in this kingdom, than in the circuit where the hop of the latter plantation is uſed; particularly in private families. For the cultivation, ſee Agriculture, Sect. XVI.

II. BOILING WORTS AND FERMENTATION.

Boiling Worts. The principal uſe of boiling, as it reſpects the worts particularly, is to ſeparate the groſſer or more palpable parts of the extract, preparatory to that more minute ſeparation which is to be effected in the gyle tun. The eye is a very competent judge of this effect; for the concretions into which the continued action of boiling forms thoſe parts are obvious to the ſlighteſt inſpection, whilſt the perfect tranſparency of the interſtices of the worts points out its utility in promoting that deſirable quality in the beer. Theſe coagulable parts are formed from the ſuperabundant mucilage already mentioned; and hence they are found in greater proportion in the firſt worts than in thoſe that come after; at the ſame time, they are in theſe laſt ſo mingled with a quantity of oleaginous matter, that they become much more difficultly coagulable in the weak worts than in ſuch as are ſtronger, and hence theſe require to be much longer boiled than the others.

During this operation the hops are generally added, which are found to be abſolutely neceſſary for preventing the too great tendency of beer to acidity. The fine eſſential oil of hops being moſt volatile and ſooneſt extracted, we are thence taught the advantage of boiling the firſt wort no longer than is ſufficient to form the extract, without expoſing it to the action of the fire ſo long as to diſſipate the finer parts of this moſt valuable principle, and defeat the purpoſe of obtaining it. To the ſubſequent worts we can afford a larger allowance, and purſue the means of preſervation ſo long as we can keep in view thoſe of flavour; to which no rules can poſitively direct, the proceſs varying with every variety of beer, and differing as eſſentially in the production of porter and pale ale as the modes of producing wine and vinegar.

The conſequence of not allowing a ſufficient time for the due ſeparation of the parts of the wort and extraction of the requiſite qualities of the hop muſt be obvious. If we proceed to the other extreme, we have every thing to apprehend from the introduction of too large a quantity of the groſſer principles of the hop, which are very inimical to fermentation; and from impairing the fermentative quality of the worts themſelves, by ſuffering their too long expoſure to the action of the fire paſſing through them, whereby they are reduced to a more denſe conſiſtence, and their parts too intimately blended to yield to the ſeparating force of fermentation with that eaſe the perfection of the product requires.

Fermentation. The laſt ſtep in the proceſs of brewing is to ferment the liquor properly; for if this is not done, whatever care and pains have been taken in the other parts, they will be found altogether inſufficient to produce the liquor deſired. The firſt thing to be done here is to procure a proper ferment; for though all fermentable liquors would in time begin to ferment of themſelves, yet, being alſo ſuſceptible of putrefaction, the vinous and putrefactive ferments would both take place at the ſame time in ſuch a manner that the product would be entirely ſpoiled. There are only two kinds of artificial ferments procurable in large quantity, and at a low price, viz. beer-yeaſt and wine-lees. A prudent management of theſe might render the buſineſs of the brewery for diſtillation, as in the buſineſs of the malt-diſtiller, &c. much more eaſy and advantageous. Brewers have always found it a conſiderable difficulty to procure theſe ferments in ſufficient quantities, and preſerve them conſtantly ready for uſe; and this has been ſo great a diſcouragement to the buſineſs, that ſome have endeavoured to produce other ferments, or to form mixtures or compounds of particular fermentable ingredients: but this has been attempted without any great ſucceſs, all theſe mixtures falling ſhort even of common baker's leaven in their uſe. Whoever has a turn for making experiments and attempting improvements of this kind, will find it much eaſier and more advantageous to preſerve and raiſe nurſeries of the common ones, than to deviſe mixtures of others. Yeaſt may be preſerved by freeing it from its moiſter parts. This may be done by the ſun's heat, but ſlowly and imperfectly. The beſt method is by gently preſſing it in canvas bags: thus the liquid part, in which there is ſcarce any virtue, will be thrown off, and the ſolid will remain behind in form of a cake, which may be packed in a barrel or box, and will keep for a long time ſweet and fragrant, and fit for the fineſt uſes; and the ſame method may be taken either with wine-lees, or the flowers of wine. The former may be brought from abroad with great eaſe in this manner: the latter may be made with us from the lees, by only diſſolving them in water, and ſtirring them about with a ſtick; by this means, the lighter, more moveable, and more active part of the lees will be thrown up to the top, and may be taken off and preſerved, in the manner above mentioned, in any quantity deſired. By this means, an eaſy method is found of raiſing an inexhauſtible fund; or a perpetual ſupply of the moſt proper ferments may be readily formed in the way of ſucceſſive generation, ſo as to cut off all future occaſion of complaint for want of them in the buſineſs of diſtillation. It muſt be obſerved, that all ferments abound in eſſential oil much more than the liquors which produce them ; whence they very ſtrongly retain the particular flavour and ſcent of the ſubject from whence they were made. It is requiſite, therefore, before the ferment is applied, to conſider what flavour ought to be introduced, and accordingly what ſpecies of ferment is moſt ſuited to the liquor. The alteration thus cauſed by ferments is ſo conſiderable, as to determine or bring over any naturally fermentable liquor of a neutral kind to be of the ſame kind with that which yielded the ferment. The benefit of this, however, does not extend to malt, or to any other matter that does not naturally yield a tolerably pure and taſteleſs ſpirit, as it otherwiſe makes not a ſimple, pure, and uniform flavour, but a compound and mixed one.

The greateſt circumſpection and care are neceſſary in regard to the quality of the ferment. It muſt be choſen perfectly ſweet and freſh : for all ferments are liable to grow muſty and corrupt ; and if in this caſe they are mixed with the fermentable liquor, they will communicate their nauſeous and filthy flavour to it in ſuch a manner as never to be got off. If the ferment is ſour, it muſt by no means be uſed for any liquor ; for it will communicate its flavour to the whole, and even prevent its riſing to a head, and give it an acitous, inſtead of a vinous, tendency. When the proper quantity is got ready, it muſt be put to the liquor in a ſtate barely tepid, or ſcarce luke-warm. The beſt method of putting them together, ſo as to make the fermentation ſtrong and quick, is as follows. When the ferment is ſolid, it muſt be broken to pieces, and gently thinned with ſome of the warm liquor ; but a complete or uniform ſolution of it is not to be expected or deſired, as this would weaken its efficacy for the future buſineſs. The whole intended quantity being thus looſely mixed in ſome of the lukewarm liquor, and kept near the fire or elſewhere in a tepid ſtate, free from too rude commerce with the external air, more of the inſenſibly warm liquor ought at proper intervals to be brought in, till thus by degrees the whole quantity is ſet at work together. When the whole is thus ſet at work, ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external air, it becomes as it were the buſineſs of nature to finiſh the operation.

In the operation of fermentation, however, the degree of heat employed is of the utmoſt conſequence. In forming the extracts of the malt, the variation of a few degrees of heat produces an important difference in the effect. In the heat of fermentation, ſimilar conſequences reſult from ſimilar variety. Under a certain regulation of the proceſs, we can retain in the beer, as far as art is capable, the finer mucilage, and thereby preſerve that fulneſs upon the palate which is by many ſo much admired : on the other hand, by a ſlight alteration we can throw it off, and produce that evenneſs and uniformity of flavour which has ſcarce any characteriſtical property, and is preferred by ſome only for want of that heavineſs which they complain of in full beers. If a more vinous racy ale be required, we can, by collecting and confining the operation within the body of the wort, cauſe the ſeparation and abſorption of ſuch an abundant portion of the oleaginous and earthy principles, as to produce a liquor in a perfect ſtate at the earlieſt period, and ſo highly flavorous as to create a ſuſpicion of an adventitious quality.

Further Obſervations. When the wort is of a proper degree of coolneſs, the yeaſt is generally put into a large bowl, and a little of the wort juſt warm is added to it. The yeaſt ſwims at firſt on the ſurface, but ſoon blends itſelf with the wort, and begins the fermentation. As ſoon as this happens, the whole is mixed with the wort in the working tun.

If the fermentation ſhould not riſe properly, a little of the fineſt wheat flour ſifted over the wort, ſo as to cover the whole ſurface of the liquor, will, by forming a kind of artificial head, confine the air, and ſoon produce the effect deſired. If a greater degree of warmth ſhould be wanted, a ſtone jug filled with boiling water, and put into the wort, will communicate a gentle heat to the whole, and as the liquor warms, the fermentation will come on in a gradual and proper manner.

In the courſe of the fermentation, it may ſometimes be neceſſary, in order to quicken it, to beat in the yeaſt, or rather to ſtir it with a whiſk, which ſhould be perfectly clean, ſcalded in boiling water, and then wiped dry. It will alſo by this means retain ſome degree of warmth, which will likewiſe help to promote the fermentation. Theſe meaſures, with an additional warmth given to the air, and warm coverings laid over the working tun, ſeldom fail to anſwer the end deſired.

If the fermentation proceeds too violently owing to the warmth of the weather, or too great quantity of yeaſt, the beſt way of checking it is, to cool the air, by giving it a more free admiſſion, and to mix a little cold wort with the fermenting liquor. The practice of adding ſome unctuous ſubſtance is bad, and therefore ſhould be rejected.

Care ſhould be taken to have the caſks in good order againſt the time that the fermentation is completed in the tub ; that is, they ſhould be tight and clean, and perfectly free from filth or ſmell ; for if they have either of theſe defects, the whole labour will be loſt, becauſe the excellency and fine flavour of the liquor will be deſtroyed.

The perfection of malt liquors depends not only on the proportion of the oils to the ſalts, and on the proportion of hops uſed in brewing, but alſo on the fermentations being carried on ſlowly and cooly. For this reaſon cool weather is beſt for brewing of beer intended for long keeping. If therefore the liquor be not drawn off before the fermentation has proceeded too far, ſome of the coarſer oils will return into the liquor, and give it a diſagreeable and greaſy taſte. On the contrary, if the fermentation has not been continued its due time, the impurities which would either have ſunk down in the lees, or have been thrown up with the head, will remain in the liquor, and prevent its becoming clear and well taſted.

When the fermentation is at its height, all the dirt or foul yeaſt, which riſes on the ſurface, muſt be carefully ſkimmed off.

When the fermentation begins to ſubſide after the liquor has been drawn off into the caſk, the caſk ſhould be filled up with a reſerve of the ſame liquor taken from another veſſel, but by no means with that which runs over.

When the fermentation has ceaſed, the caſk being filled up, ſhould be bunged cloſe down, leaving the vent-hole open, or but ſlightly covered, till all motion in the liquor is ſubſided ; and after this is over, the vent-hole ſhould be ſtopped quite cloſe. The cuſtom of uſing bungs made of cork is wrong. A wooden bung ſhould be fitted to the bung-hole as exactly as poſſible, and covered with a cloth, ſand or clay.

PRACTICAL BREWING.

Brewhouſe and Utenſils. To treat of the brewhouſe and utenſils, we preſume will be needleſs, as the conſtruction of the one is the entire province of the builder, and the other of the brazier, cooper, and other artificers who are badly qualified for their buſineſs, if they do not know the beſt mode of proceeding : we ſhall now proceed to give an approved eaſy practice, and we hope intelligible, to every reader who will beſtow an attentive peruſal.

Malt Liquors, when we ſpeak of them in general, are of three kinds ; 1. Strong Beer, which is intended for keeping, and is called October, becauſe the beſt is brewed in that month : 2. Ale, which is a ſtrong malt liquor, but not deſigned for long keeping : and, 3. Small Beer, which, when made but of a moderate ſtrength in the way we ſhall direct, will keep a very conſiderable time, and be improving all the while.

III. BREWING STRONG BEER.

If the conveniencies of the brew-houſe will ſerve for brewing three or four hogſheads of October or ſtrong beer at a time, that will be the beſt practice. We will ſuppoſe three hogſheads. Theſe directions will equally ſerve for any larger or ſmaller quantity, only allowing the due proportion of the ingredients. For brewing the three hogſheads, have five quarters of fine ſweet malt, 36 buſhels may be ſufficient, and is in general preferred. Let it be ſuch as has been malted about a quarter of a year, and has lain in a large heap all that time to mellow. See that it be perfectly ſound, fine, tender, and entirely clean from duſt or any other mixture. Let this be ground with care, juſt ſo much, that every grain is fairly broken, and no more : then lay it up in a heap in a cool ſhady place, and let it lie eighteen hours. Thus will you have a perfect fine malt, in the exact right condition for brewing.

Procure a ſweet, clean and well taſted ſoft water, perfectly pure. When the water is got into the copper, put in a quarter of a pound of hops with it, and an ounce of common ſalt ; and, when it begins to heat, ſift over it, through a coarſe ſieve, as much malt as will juſt coat it over to keep in the ſpirit. When this is on, briſk up the fire, and bring the water to ſimmer ; but do not let it boil up : then draw it off at once into the maſh tub, which muſt be placed in a larger tub, as before obſerved, with the coat of malt upon it ; and let it ſtand till the thick vapour ceaſes, and you can conveniently look down into it, and ſee your face. When it is in this condition, pour in the malt, a little at a time, and let ſome other perſon ſtir it about all the while it is running in, that there may be no clodding of it together in any part. When all is in, let the ſtirring be continued a little, that you may be ſure every part of the malt is free and well mixed with the liquor : then fill up the cavity between the outſide of the maſh-tub and the outer veſſel with water of the ſame heat, that in the maſh-tub was when the malt was put in : keep water boiling to ſupply the place of this as it cools : obſerve the temper of it at firſt, and once in ten minutes draw off as much of that which is cool as will be needful to make room for ſo much freſh boiling water as will bring the whole to the ſame heat it had at firſt ; and every time the freſh hot water is put into the ſpace between the two veſſels, give a very ſlow and gentle ſtirring to the malt in the maſh tub.

In theſe double veſſels there is to be always one cock that communicates with the ſpace between the two where the water is to let that out as it cools, and another through the real bottom and falſe bottom of the maſh tub, which goes alſo through the outer veſſel, for diſcharging the clear wort, when the maſhing is done, into the receiver. No maſhing veſſel of any other kind can keep a due heat, or anſwer the purpoſe of opening the ſubſtance of the malt; for if the water be too hot when the malt is put in, it hardens inſtead of diſſolving it; and if it be too cool at firſt, it ſoon grows into full condition of ſervice. The malt is to be kept in the maſh tub in this manner one hour and three quarters; and in that time another copper of water, equal to the firſt, muſt be made ready, covering it with a head of malt, and bringing it juſt to ſimmer.

A little before this ſecond copper of water is ready, the firſt wort is to be begun to be run off; and the hops are to be prepared for ſoaking in it as it runs. This is the improved method of brewing. The whole quantity of hops for the three hogſheads of this beer, which is intended for keeping a conſiderable time before it is uſed, muſt be eighteen pounds, that is, ſix to each hogſhead. Therefore as the quantity of one hogſhead is now in the maſh, take ſix pounds of hops, ſprinkle them over with a very little ſalt, and rub them well to pieces between the hands. Tie them up in a looſe bag of coarſe canvas, and put them into the receiver, that is under the maſh-tub: then let the wort run clear out at the tap in the maſh-tub in a ſmall ſtream, not thicker than a large ſtraw; and let it run upon theſe bruiſed hops. This will ſoak them, ſo that they will readily, and that at once as it were, give their full virtue, when the wort comes to be boiled. The ſalt that is put to the water, and to the hops, is not enough to give the leaſt taſte to the wort; but it will give it a kind of ſpirit that water alone never has; and will make it extract, much better than it otherwiſe would, the virtues both of the malt and of the hops.

As the wort drains from the malt in the maſh-tub, there muſt be a gradual ſupply from the copper of boiling water. The intent is, that a hogſhead of wort be run off; but though ſomething more than a hogſhead of water was uſed, to allow for the quantity that the malt ſoaks up without return; yet this whole quantity muſt not be had from what was firſt in the maſh-tub. There are to be three ſuch maſhings from this quantity of the malt; and one is to follow another, without letting the malt ever grow dry. Therefore, when the liquor is ſo far drained out of the maſh-tub, that the malt begins to look dry, let ſome of the hot water be let out of the copper into the maſh-tub; and ſtir the malt well about in it. This muſt be let in very gradually, cooling it firſt to a due degree; and by this means there is to be a ſupply of water kept to the malt, while the firſt wort runs off: ſo that when there is a copper full run into the receiver, the ſecond copper of water will be all got into the maſh-tub.

The hops having been all this time ſoaking; and the copper being now empty, the wort in the receiver muſt be pumped or ladled into it, and the hops put in with it; then the fire muſt be made up, and the wort muſt be brought to boil briſkly. Let it boil a quarter of an hour, and no longer; then let it be drawn off into the cooling backs; and the copper be filled the third and laſt time with water.

In this proceed exactly as before. The ſecond copper is now maſhing; it muſt be ſtirred gently about, and there muſt be boiling water from time to time added as before to the quantity, between the maſh-tub and the outer veſſel, to keep up an equal degree of heat. This maſhing muſt laſt an hour and three quarters; and in that time the third copper of water muſt be got to a due degree of heat.

When the time is near expired, ſix pounds more of the hops muſt be juſt ſprinkled over with a tea ſpoonful of ſalt, and thoroughly rubbed to pieces in the hands again: then they muſt be tied up in a bag as the former, and put into the receiver. The ſecond maſh having now been kept at a due degree of heat, the appointed time the wort is to be let out in a ſmall ſtream into the receiver, running upon the hops. Manage this exactly as before; and, when ſo much of the wort has run off that the malt begins to be dry, let in ſome of the water again out of the copper. This may be of a degree of heat, ſomewhat greater than the firſt or ſecond; becauſe the grains having already parted with a great deal of their ſtrength, require it, and becauſe being to be maſhed a laſt time, ſomething more in point of heat is neceſſary.

When there is the full quantity of a hogſhead run out of this ſecond wort, ſtop the cock of the maſh tub, let in the remainder of the water from the copper, and immediately put in the wort out of the receiver into the copper, with the bag of hops along with it.

A quantity of malt having been ſaved out for the purpoſes of covering the water and capping the maſh; both theſe articles muſt be duly attended to; in the three ſeveral operations we have thought it therefore beſt, for the ſake of avoiding three repetitions, to name theſe articles here together. The quantity of water in each copper, is to be ſo much as will allow a full hogſhead of wort, beſide what the malt ſoaks up. Upon each copper full of water, there is to be ſpread a thin coat of malt to keep in the ſpirit; and over each maſh there is alſo to be ſpread the quantity of half a buſhel, by way of cap to the whole.

The third copper of water being now in the tub, and therefore the laſt maſh made, put on the cap of freſh malt, which is all that was left, and let it ſtand; keeping the water between the outer tub and the maſh-tub always of a due heat, to keep up the full degree of warmth in the maſh.

A ſmall copper will be neceſſary for the heating the water for this ſervice; becauſe the other will be conſtantly employed in the heating the water, or boiling off the wort, the whole time of the brewing.

The ſecond running of wort being now in the copper, briſk up the fire, and bring it to boil: let it boil twenty-five minutes, and no longer; and then run this off into the coolers.

The buſineſs now becomes eaſy; there is only one maſhing remains, which is to be in the maſh-tub an hour and half, and no longer. Then rub the laſt quantity of hops, which is to be alſo ſix pounds, between the hands, without any ſalt; for the wort is now thinner, and will take effect upon them alone; tie them up in a bag, and put them into the receiver. When the maſh has ſtood its time, turn the cock to run a ſomewhat larger ſtream; and, when the liquor is all come off, pump it, or ladle it into the copper, and put in not only the hops new ſoaked, but alſo the two former parcels. Boil all together the ſame time that the laſt copper was boiled, and then let the wort run off into the coolers.

COOLING.

Theſe three worts being mixed, make one regular and excellent quantity, in which there is all the ſtrength and virtue of the malt very perfectly; and the entire flavour, and due bitter of the hops; without any of the earthy and heavy part of the grain, or of that auſtere and unpleaſant taſte which hops yield when they have undergone a vaſt deal of boiling.

The proof of this is eaſily found; for this beer will keep ever ſo long: and hence it is plain that the hop has given all that was expected or required of it, a fine flavour, and a power of keeping: and as to the other, the fact is ſo evident, that the wort has all the virtue of the malt, that the grains are mere chaff.

If this brewing has been managed exactly according to the orders here laid down, there could not be ſmall beer made of the grains that any one could drink, the full virtue having been taken out by theſe repeated maſhings, with a continued heat.

If any one diſlikes the addition of this ſmall quantity of ſalt, it may be left out; but the beer will neither be ſo ſtrong, ſo briſk, nor ſo clear without it. As to the uſe of the double veſſel for maſhing, with the hot water between, that is eſſential. It is on this depends the entire virtue of the malt being taken into the wort.

One great advantage of the putting the hops into the receiver is, that the beer which is made thus never foxes, as the brewers call it; but the great article is, that being thus ſoaked by degrees, and ſteeped in the water, they will give out their virtue with ſo little boiling, as will not damage the drink; for when the wort is boiled too long, as is the moſt common of all errors in brewing, it becomes too thick to ferment perfectly, and its ſediment can never get clear down; ſo that all the pains that can be beſtowed, and all the judgment that can be employed afterwards, will never make it good and perfectly fine drink.

One thing there is in this method which differs from the common practice, and the uſual opinions: this is the degree of boiling given to the three coppers of worts. It is cuſtomary to boil the ſecond longer than the firſt, and the third longer than the ſecond; and, with the common way of making, this is certainly right: but when the malt is kept up in its proper heat all the time, by the water between the two tubs, leſs and leſs boiling always anſwers for the ſucceeding worts. The time here directed for each, is nearly what does, and perhaps comes as cloſe to a good general rule, as any meaſure of time can; nay, we may add, if the malt be juſt ſuch as is directed, and the whole managed regularly from the beginning, this very time almoſt to a minute will do the buſineſs; but the eye and taſte are the true and certain judges, and they muſt determine whether the worts ſhall be kept in the copper a few minutes longer, or run off a little ſooner than has been here directed.

WORKING.

The worts in common brewing are uſually cooled ſeparate, and let down into the tun one after the other: but this is an injudicious practice; for the buſineſs is to mix them perfectly, without which they will not enter upon the great article of fermentation regularly; and they can never be mixed ſo well as while the ſeveral parcels are all warm. It is therefore we have directed the running off the worts from the copper into the coolers, one to the other. And when there are two backs or coolers, as we have directed, that are large enough, the beſt way of all is this: let all the three worts run into the upper of the two backs or coolers; and when the third is in, let the whole ſtand two hours; then draw it off ſlowly and leiſurely into the under cooler or back, and by this means leave behind any coarſe ſediment that may have come in with it.

In this ſecond cooler let the whole ſtand till it is perfectly cold if the weather be mild: but if the ſeaſon be very cold, let there be a very ſmall degree of heat remain in the wort: then draw it off leiſurely and ſlowly into the working-tun, ſo as not to diſturb the liquor in falling in, and to leave a ſecond ſediment in the cooler.

As in ſeveral points this method differs from the common practice, and from what are called the beſt receipts for this kind of beer, it may be neceſſary, as we go on, to ſay in what the difference conſiſts; that thoſe who chuſe the old way may follow it, and ſuch as prefer this, which is indeed vaſtly preferable, may underſtand the reaſons of the difference. The ſeveral points in which the variation conſiſts, may ſeem little; but it is on theſe little things the excellence of brewing depends.

It is a common direction that the worts are to lie thin for cooling; and the uſual practice, which in theſe caſes is to let the worts, one parcel after another, into the coolers, and thence into the tun, favours it; but experience in this perfect method of brewing ſhews otherwiſe. In this way the whole three hogſheads of wort are to be in the upper cooler together; and this way the whole will cool more ſlowly indeed, but much better, than in the three parcels; for while it cools in this large body, it mellows all the time, and it loſes leſs of the ſpirit; for when the wort is laid thin, as brewers expreſs it, that is, a ſmall quantity in a broad cooler, the air has great power in evaporation; and the wort not only becomes thicker, by what it loſes in the cooling; but what is much more eſſential even than that, this loſs is of the moſt ſpirituous and excellent part.

Theſe are the diſadvantages attending the common practice, and the common rules for ſpreading the wort thin: but beſides the benefit ariſing from the preventing theſe by our method of cooling in a large body, there are ſeveral particular advantages attending this practice. The mellowing of the wort from a perfect mixture of its parts is one; another is the certainty that all the three runnings are perfectly mixed one with the other; and conſequently, every part of the liquor is alike before the working begins: and thirdly, the dropping ſome coarſe matter twice over, namely, once in each cooler, which being the heavieſt part of the ingredients, and, perhaps, ſome accidental foulneſs with it, would have prevented the regular and perfect fermentation. Every one knows how delicate and nice a point the working of beer is, and how ſmall a quantity of any improper ſubſtance is able to check it: therefore this is a very uſeful practice which gives any ſuch matter, that may by accident have got in, time to ſeparate from the wort. The perfect mixing of the ſeveral parcels of wort, is a point as eſſential to the regular fermentation, though it be not ſo well underſtood, for the working never begins regularly, unleſs it begins in the whole liquor at a time; and it never can do that, unleſs the ſeveral portions of it are perfectly mixed. This mixture cannot be ſo well made in the common way of brewing; but in this method it is done compleatly, partly by the time the three parcels ſtand together in the upper cooler, partly by the running of the whole from the upper to the under; and, finally, by the running of the whole in that cool and eaſy manner into the working-tun.

Having now got the wort into the tun, and explained the reaſons of our particular practice in every article, we are to proceed to the fermenting or working of it. We have a fine ſubject to work upon; for this will be a clear, ſtrong, and excellent wort; and nothing is wanted but care to make this fermentation as compleat, in its kind, as any of the other operations.

When the wort is in the tun, immediately get to work upon the yeaſt. Care muſt be taken to get that which is perfectly good, and it muſt be mixed with a little of the wort firſt, in a large bowl. Some of the wort muſt be ſaved for this purpoſe, as it is running into the tun, and a little more than is directly wanted for this ſervice; becauſe if the fermentation runs too high, which is what no body can foreſee whether it will or not, then a little of the cold unfermented wort is of all things the mildeſt and quickeſt method to check it.

The yeaſt muſt be thick, and in perfect good condition; and about three quarts will be ſufficient for the working this quantity of beer. It muſt be mixed very gradually with a ſmall quantity of wort let into the bowl for that purpoſe, and then the wort and yeaſt together gently into the tun. Cover it up cloſe, and watch it from time to time carefully, to ſee that the fermentation goes on as it ſhould. It ought to begin very gently, and encreaſe gradually; and if it proceed in this right manner, there will be firſt a ſmiling flowery head upon the whole liquor, and by degrees this will thicken into a yellowiſh white cruſt; and, upon holding the head a little over it, when uncovered, there will a ſharp penetrating ſcent ariſe. The head will from this time thicken more and more, and the ſcent will become more penetrating, for the ſpace of three days and nights: at the end of this time it will naturally abate, and by degrees ceaſe; and the drink is then to be got into the caſks.

CASKING.

Therefore, when the falling of the head ſhews the fermentation to be declining, let the wort be let out of the tun. This muſt be done by a cock, and that ſhould be let into the tun at five inches above the bottom, for ſo much will be thick, making a kind of ſediment; and this muſt be carefully left behind: only the pure and clear wort being taken off. This ſediment is not altogether uſeleſs, though it muſt not be let into the caſk of the fine beer; it is conſiderably ſtrong, and will be a good addition to ſmall beer, which may be brewed after this, and while it is working. This is a point that has been diſputed; but there is no guide like experience, and that declares in favour of this way of uſing the large ſediment that is thus made from the drawing of the fine wort from the tun.

The caſks ſhould be got in perfect good order by the time the wort will be fit for putting into them; and this is eaſily done, becauſe we know perfectly when they will be wanted. Every thing ſhould be of the beſt kind for this excellent ſort of drink, and conſequently the caſks for keeping it ſhould be of good ſtuff, and well made. No wood is proper but heart of oak: and they ſhould be ſo well made, that the inſide being true and ſmooth, no foulneſs can lodge. If they have been painted ſome time, they will keep the drink the better, for the paint ſtops up the pores moſt perfectly, and by that means confines the ſpirit of the drink much better than plain wood: but this ought to be done in time, and they muſt be very well freed of ſcent, by ſtanding in the air, before they are uſed; for the abominable ſmell of freſh paint would certainly affect the beer while it was in ſo delicate a ſtate as working. Never put this fine beer into a new caſk: the true way to prepare the veſſels for it, is to ſcald them very well, over and over, and then keep one or two brewings of good ſmall beer in them. Theſe will thoroughly ſeaſon the caſk; and after this nothing will be required, but ſuch thorough good cleaning as may be given by boiling water, and a little hard broom. When caſks are painted, this ſhould be at the time of the firſt ſeaſoning, that, if any flavour of the paint ſhould be troubleſome, it may be in the ſmall beer, and not in ſuch as is of this value.

While the beer is put into the caſks, make a reſerve of ſome of it in a ſmall veſſel by itſelf, to fill up the others as they work over. It is the common practice to fill them up with the very beer that has worked out of the veſſel: but this is a coarſe method, and not fit to be uſed for theſe fine kinds of drink.

Let the beer be drawn ſoftly and carefully out of the working tun, not to diſturb the ſediment it has made, and fill up the caſks quite full. The drawing from the tun to the caſk will put the whole in motion; this will affect the languid fermentation; and the working will begin again. They muſt be ſuffered to work out at the bung hole; and, as the quantity is diminiſhed, that way make it up out of what was reſerved in the ſmall caſk for that purpoſe. This muſt be done with great care, not to diſturb the fermentation that is now going on in the liquor; and the beſt method of putting it in is by means of a tin funnel, with a long ſpout: this ſhould be put in ſo far, that the end of the ſpout is two inches and a half buried in the beer, and then the liquor from the reſerved caſk muſt be gradually let into it, by pouring gently into the funnel. This will fill up the veſſel without giving the leaſt diſturbance to the liquor: and thus it ſhould be kept filling up from time to time during the working.

In this manner wait with patience the natural period of this ſlight fermentation: according to the nature of the malt, the water, the degree of boiling, or the ſeaſon of the year, but moſt of all according to the management of it in the working tun, this will be longer or ſhorter; ſo that no time can be fixed when it ſhall be over: but when it is, and all is quiet, ſtop up the caſks cloſe, and let them ſtand till the beginning of the next year; that is, ſuppoſing the beer was brewed in October, which is in general the beſt time of all, it ſhould ſtand perfectly quiet, and without any mixture, till the following ſpring. In this time it will perfectly fine itſelf. The cold of the winter ſtopping all inteſtine motion in the beer will aſſiſt in this, but in the beginning of ſpring the weather will take effect, and there will begin a new fermentation, which will laſt all ſummer. To prepare for this, the vent-hole muſt be opened, and it will be eaſy to ſee whether the fermentation is or is not begun. If it be, the vent-hole muſt be left open; and in that manner it is to continue all the ſummer; if the fermentation is not yet begun, the hole muſt be ſtopped again; and once in a week it muſt be opened to watch the beginning of this new fermentation.

This is a good time for putting thoſe ingredients into the beer, which are ſometimes wanted: but we need not name them farther here, for in beer thus brewed, and managed throughout with this due care, there will be no occaſion for any aſſiſtance more than the beer will get itſelf from time. If the examination of the beer ſhould be omitted, till the fermentation had got any power, and the veſſel all this time pegged faſt down, there would be danger of its burſting: for though a very little communication with the air be ſufficient, as we ſee by opening the vent-hole; yet if the veſſel were every way cloſe, the power of the fermenting liquor would certainly deſtroy it.

The veſſel ſhould ſtand with this opening till autumn. Uſually a week before Michaelmas, or thereabout, is the time when this laſt fermentation naturally ceaſes: it was brought on by the increaſing air in the ſpring, and it goes off as it cools in autumn.

The beer may now be conſidered as completely fermented: the hop will be mellowed in it, and one uniform taſte will prevail in the whole, which will be a mixture of the malt and hop mellowing one another; and neither will be predominant: therefore all this beer can poſſibly want is perfect clearneſs. This is ſo great a recommendation to all malt liquor, that ſuch as has been brewed with this expence and care, certainly ſhould not be deficient in it. If it were now ſtopped up, and to ſtand the winter in quiet, it would of itſelf fine down, by ſettling a ſmall ſediment, and be very clear: but it is eaſy to help nature in this operation, and to cauſe the ſediment to fall more fully and more regularly. The only ingredient that need be uſed is iſinglaſs; and this is ſo perfectly innocent, that there is no need to decline its aſſiſtance. The beſt way of uſing it is thus:

Buy two ounces of beaten iſinglaſs; and take care that it is ſo well beaten that there is no part of it thicker than a piece of thin paper; cut this very ſmall, draw out a gallon of the beer, and put this iſinglaſs to it; ſtir it well about from time to time, and let it ſtand till it is perfectly diſſolved, then ſtrain the ſolution through a coarſe and perfectly clean cloth; take out the bung of the veſſel, and carefully put it in: ſtir this about to mix it with the whole, and then lightly lay over the bung: there will be ſome ſmall motion in the liquor from this, and the bung muſt not be put faſt down till it is over. Then faſten the bung, and only leave a little opening at the vent-hole: then let it ſtand three weeks, and it will then be perfect. It may either be drank from the caſk or bottled, and will be very fine, ſtrong, mellow, well taſted, and wholeſome. Where the intent is to drink it from the caſk, ſtill there ſhould be a reſerve for bottling, and the beſt way is to drink off two thirds by draught, and then bottle the reſt, which in a good cellar will ſoon be in excellent condition.

If the whole be intended to be bottled off, the time is at one year's end; in the ſame manner as for drinking from the caſk. If the beer be brewed in October, it will be ready for bottling the October following: and, to give it full perfection, it ſhould ſtand a year in the bottles; ſo that the beginning of drinking it ſhould be two years old from the brewing.

This is the complete method of brewing the October, or fine beer; and whoever will obſerve the ſeveral rules cannot fail of ſucceſs. As to the degree of ſtrength, what is here directed for the quantity of malt, will make ſuch as ſhall be ſufficiently potent; but it may be varied in this matter, at the pleaſure of the perſon, by increaſing or diminiſhing the quantity of malt. The allowance in this receipt is about thirteen buſhels to the hogſhead. There are ſome who brew with only ten or eleven buſhels for this kind of drink; and others who go as far as twenty buſhels: but this ſeems to be a kind of medium between the ſtronger and the weaker kinds; what we call the ſtrong October being generally brewed with ſixteen buſhels to the hogſhead, for thoſe with twenty are too heady. There is no drink pleaſanter than this kind, with the degree of ſtrength here directed: and none can be more wholeſome.

IV. BREWING MILD ALE.

The liquor called ale, in diſtinction from beer, is uſually of leſs ſtrength; and is leſs tinctured with the hop: being intended for drinking ſoon after it is brewed; not for keeping years as the other. This ſhould be brewed alone, that is, without any ſmall beer to be made from the ſame malt. The method of brewing is in general the ſame in all kinds; but as there are particulars needful to be regarded, in order to ſuit the operation to each particular kind of drink, we ſhall here give the method of brewing this kind, with proper management. With regard to the ſtrength, that is to be according to every one's particular pleaſure; but ſome ſtandard muſt be fixed for the directions to be given here; and therefore we ſhall make the allowance eight buſhels to the hogſhead; which will make a very excellent drink of this kind.

Grind or bruiſe the malt two or three days previous to brewing, in fact malt always brews better for this precaution. Get water, ſuch as is ſoft, no matter how it is in other reſpects. As much muſt be boiled as will allow for the ſoaking up the malt, and afford a clear hogſhead of the wort, with allowance alſo for waſte. Set this on in the copper, put in a table ſpoonful of ſalt, and make the fire briſk, a ſlight ſcum will riſe to the ſurface; take that off, and then ſprinkle on about three quarts of bran: let it remain till the water ſimmers and is going to boil, then ſkim this alſo off, and the water will be perfectly clear and ready; damp the fire and draw off half of the water into the maſh-tub; then let it ſtand till the great ſteam is over, and you can look into it. Then pour in all the malt except half a buſhel: let it ſlowly and gradually into the water, and let ſome perſon ſtir it all the while, that there may not be the leaſt lump of it together: then ſtrew over the half buſhel that was ſaved out; and thus leave it two hours, covering it up carefully to keep in the ſteam, and filling up between the maſh-tub and outer veſſel, with hot water from time to time as it cools.

When the two hours are expired, rub to pieces in the hands three pounds of hops; tie them up in a coarſe canvas bag; put this into the receiver, and then begin to let in the wort from the maſh-tub in a fine ſmall ſtream, running directly upon the hops; and with a whiſk beat the bag in which the hops are lightly, to promote their moiſtening in the liquor. As this ſtream is running, obſerve the other water. We ordered the fire to be damped when the firſt half was drawn off; and by this time the fire being kept low, this water will be about as hot as the water in the maſh-tub was when the malt was put in. Briſk up the fire by one ſtirring, to make it a little hotter, and then run it off by degrees upon the grains; as the firſt wort is run off into the receiver. Thus, when the quantity of one maſhing is got into the receiver, the ſecond quantity or water will be in the tub. Let this ſtand two hours as the firſt did, keeping up a regular heat, and covring it; only take care to ſtir it very well together, but without beating when it is firſt put together; and in the ſame manner to take off the covering, and ſtir them once more at the end of the firſt half hour. All this while the firſt wort will ſtand upon the hops; and, when the two hours are expired, this ſecond wort is to be let off from the maſh-tub to the firſt in the receiver in a large ſtream. The grains will be very well exhauſted by this management; and the worts will be ſtrong, with all the virtue of malt.

Let the worts ſtand in the receiver one hour, in which time they will let fall a ſmall but coarſe ſediment. Then the whole, except this ſediment, muſt be got into the copper, together with the bag of hops; for though there have been two maſhings, there need be but one boiling. As this drink will not have time for ſettling in the caſk like the October or ſtrong beer, all poſſible care is to be taken to clear it in the wort. For this reaſon the wort is not to be pumped out of this receiver into the copper, as was directed in the brewing of October; but care ſhould be taken in time to raiſe the receiver upon a foot, ſo that the wort can be drawn out of it by a cock placed an inch from the bottom.

The clear wort muſt be put into the copper with the hops, and boiled about eighteen minutes; the exact time muſt be known from the eye and taſte, becauſe it varies conſiderably in different brewings from the weather, the nature of the malt, and other cauſes.

It muſt be then let into the upper cooler; and after ſtanding an hour, it muſt be drawn from that into the lower; leaving the ſettlement carefully behind. In this ſecond cooler it muſt ſtand till it is perfectly cold, if the brewing be in ſummer; otherwiſe it need only ſtand till it is milk-warm.

Then it muſt be let off into the working tun, ſtill leaving the ſettlement behind; and the clear wort will be then in perfect good order for working.

Theſe ſeveral ſettlements of the wort will be a vaſt advantage to the ale, making it nearly as clear as old ſtrong beer: and the quantity that is loſt will be very trifling. However, it will be proper to make allowance for it at the firſt proportioning of the water; becauſe the brewing is intended to yield a full hogſhead, and there can be no making up of the deficiencies, without greatly hurting the drink. Therefore, in the firſt allowance, there muſt be three gallons of water for each buſhel of malt, allowed for what will be ſoaked up in the grains; and if a half gallon to the buſhel, that is, four gallons for this quantity, be allowed farther for this article, it will make up the loſs of all the three ſediments.

The wort being thus got into the tun, the manner of working it is to be in all reſpects the ſame with what we have directed for the other kinds. A quart of yeaſt will be ſufficient, if it is good in its kind; and this is to be firſt put into a little of the drink in a bowl, and then mixed with the whole. The tun is then to be covered up, and kept to the right degree of working, by the methods before directed. After this the drink is to be got into the caſk, by drawing it clear out of the working-tun, and leaving the full ſediment behind: a ſmall quantity is to be ſaved to ſupply what is loſt in the working in the barrel: after this, when the working is thoroughly over, it is to be ſtopped down, and will in a little time be fit to tap. If the materials were good, this will be excellent wholeſome liquor.

V. BREWING TABLE BEER.

Moſt families have got into ſo regular a way of brewing their table beer after their ale, that it will be not eaſy to perſuade them out of it: but they may be aſſured, that if they have any value for that kind of drink, it is their intereſt to brew it alone: for the trouble and expence is very little more than the other way, and the drink is incomparably better. The method is very little different from the brewing of any other kind. As to the quantity of malt, or ſtrength of the beer, that is at the pleaſure of the perſon; but, however it is intended in point of ſtrength, the brewing ſhould be performed at once; and all that is made ſhould be of one kind, not a ſtronger firſt and a weaker afterwards. We ſhall give directions at the rate of two buſhels and a half to the hogſhead, which will make a very excellent kind. Grind the malt as uſual a day or two before brewing to cool and mellow. Boil half a hogſhead and two or three pails of water: this is the proper quantity for the firſt copper, as it will yield a clear half hogſhead of wort. Put into the copper a handful of hops, as much ſalt as will lie on a ſhilling, and a race of whole ginger; ſift over a little malt to keep in the ſpirit, and juſt make it boil: let it out into the maſh-tub, and let it ſtand to be ſomewhat cooler than for the ſtronger kinds of beer: then pour in the malt, except about a peck; and ſtir it a good while very carefully together, not beating it about haſtily to break it, but mixing it very well with the liquor: then ſift on the malt that was ſaved out, through a coarſe ſieve, and cover it up; let it ſtand two hours, then rub to pieces a pound and a half of hops, and tie them up in a coarſe bag: put them into the receiver, and let the wort run out upon them, in a ſmall ſtream. While this maſh is ſtanding, the ſame quantity of water muſt be brought to a due degree of heat. It ſhould be ſomewhat hotter than the firſt; and when the maſh-tub is drained pretty near dry, this muſt be let in. It is to ſtand two hours as the other did, and then to be run off to the reſt in the receiver.

When the grains are well drained, the liquor is to be put into the copper with the hops; and it ſhould boil about half an hour: for more boiling is neceſſary, for theſe ſmall worts, than for the ſtrong; nor does it do them ſuch miſchief. After this the working is to be managed as in other caſes; and the beer will be capable of keeping to a perfect fineneſs; and will far exceed that ordinary and poor kind, which it is poſſible to make after other drinks. When ſuch ſmall beer has ſtood to a due fineneſs, there is no wholeſomer liquor. If the cellar is good, and the ſeaſon for brewing neither too warm nor cold, this beer will keep ſound two or three months.

VI. OAT ALE, &c.

We meet with very poor liquor often under the name of oat ale; and, indeed, very little is really brewed from the grain from whence it has its name. Bottled ſmall beer is what we commonly get when we call for this liquor; and even that is ſeldom brewed on purpoſe: but real oat ale is a very different liquor. It differs from all others in two moſt eſſential articles, for it is made from a different grain, and is brewed cold. When thus made it is briſker than any thing that is ſold under its name, and has a great many other good qualities. No malt-liquor is ſo agreeable at meals, and nothing is more wholeſome. We ſhall give the reader an exact knowledge of what it is, that he may know how far from the deſcription every thing is that he meets with at public-houſes under that name: and ſhall then give the true method of brewing it; which is ſo eaſy, that I ſhould think none who had a brewhouſe would omit to make this particular liquor.

Oat ale, when genuine and well brewed, is a fine, ſpirited and balſamic liquor; it is very pale in colour, briſk, and yet extremely ſoft to the taſte; it ſparkles in the glaſs, and riſes to a fine creamy head; it is perfectly clear, and free from all ill flavour. By this deſcription we ſhall eaſily ſee, that what is commonly ſold is not genuine. The true way to make it is this:

The malt muſt be made of the fineſt white oats, without any mixture; and the water muſt be clean, and yet not hard; that of a fine running brook is beſt: but, if ſuch cannot be had, the ſofteſt water that can be got, muſt be uſed, and it muſt have time to ſettle. With ſuch malt and ſuch water, the fineſt oat ale may be brewed; but the quantity ſhould be no more than can be uſed in about two months, for when it is the fineſt that can be it will keep no longer.

Take eight buſhels of this oat malt, perfectly clean and ſweet; let it be ground very lightly, juſt to crack the corns, and no more; then lay it in a heap, in a cool, but dry, airy room, for two days and nights; then put it into a large maſh-tub, and pour upon it fifty gallons of cold water, ſuch as has been juſt directed; ſtir it about juſt enough to prevent the malt from ſticking together in lumps, and then cover it up. Open the maſh-tub after one hour, and ſtir it all together again; then cover it up as before; repeat this afterwards once in two hours, till the whole has been maſhing, without any heat, thirteen hours. Then tie a piece of flannel looſely over the cock of the maſh-tub, and prepare the hops. Chuſe the fineſt and freſheſt hops; two pounds and a quarter are the proper quantity for this brewing. Rub them to pieces in the hands, and tie them up in a piece of coarſe canvas; lay them in the receiver, under the maſh-tub, and let the wort out of the tub run upon them in a ſmall ſtream through the flannel. Give it time to drain thoroughly; and, after it is all in, let it ſtand four hours; then pour the wort through a flannel, faſtened to a hoop, into the working-tun; and put to it a pint and half of fine thickiſh yeaſt. Mix this firſt with a little of the wort, and then with the whole; cover the working-tub very carefully, and a fermentation will preſently come on: let the head riſe fairly, and let it work briſkly for two days. Then ſkim off the head, and draw it off out of the tun into the caſk, by a cock placed five inches above the bottom of the tun; and let it this time alſo run through flannel. Thus will the drink be got quite clear and fine into the caſk; there it will have a new, but very ſlight fermentation; and this alſo muſt be allowed its regular time, the veſſel being kept filled up with ſome of the wort ſaved for that purpoſe. When this ſlight working is thoroughly over, the veſſel is to be ſtopped down faſt, and the drink muſt be allowed a fortnight to mellow and ſettle perfectly. In that time the hop and wort will be thoroughly blended together, ſo as to make but one united taſte, and the drink will be as clear as the pureſt water, and very lightly coloured.

Let the bottles be perfectly clean, and thoroughly dry; draw off the drink ſlowly and gradually into them; and while one fills, let another cork. All this muſt be done with as little motion as is poſſible; and the corks ſhould not now be thruſt down perfectly faſt. The bottles ſhould be held as little as can be in the hand, and moved gently without ſhaking: as they are corked they ſhould be ſet regularly upon the floor; and it will be beſt if this be in a place where cold water can be thrown over them and run off freely. As ſoon as the whole is bottled off, throw ſeveral pails of cold water upon the bottles: this will check any tendency to heat or fermentation which the operation of bottling might have occaſioned. The next day drive in the corks faſt, and once more throw cold water over them, and as ſoon as it is run off ſet them in a cold dry cellar or other regularly temperate ſituation.

Beer without Malt. A cheap and wholeſome beer without malt much uſed in Staffordſhire, and the adjacent counties; it has alſo this further advantage, that it will be fit for uſe in three or four days.

The method is this: Take of water ſixteen gallons, and boil one half of it. Put the water thus boiled, while in full heat, to the reſerved cold part, which ſhould be previouſly put into a barrel or other veſſel; then add twelve or ſixteen pounds, more or leſs, of treacle, ſtirring the whole well together; add half a pint of yeaſt, and keep it in a temperate ſituation, with the bung hole open, for two days till the fermentation is abated, then cloſe it up and it will be fit to drink in a day or two afterwards, or you may bottle it off. With the addition of a few table ſpoonfuls of the eſſence of ſpruce to the above at the the time you put in the treacle, the celebrated Spruce Beer is made. Thoſe beers muſt be drank before the fixed air with which they abound is exhauſted, otherwiſe its good medical qualities and the pleaſantneſs of the taſte will be loſt.

VII. CONCLUSIVE REMARKS.

The common brewers uſe many ingredients, beſide thoſe we have named, in making of their beers: and when they grow foul, or become ſtale, or otherwiſe faulty, they have a long liſt of remedy to recover them. Thoſe who will follow the directions we have given, will need no other expedients than malt, hops, and water, to make the moſt excellent of malt-drinks; nor will they be apt to fail or become faulty: we utterly diſcommend the uſe of jalap, opium, and all pernicious drugs in brewing; yet, as by ſome accident or over-ſight, the beſt brewer may ſometimes have his beer turn bad, we ſhall not omit the methods of prevention, when the danger is foreſeen; or the remedies that may be innocently and ſafely uſed, when it has happened.

As it is better to prevent the miſchief than to ſuffer it, and and then try an uncertain remedy, we ſhall firſt give the way of preparing what is called the feeding paſte: this is a compoſition, the ingredients of which are all innocent, and all tend to the purpoſe; therefore it is effectual.

We know the brewers mean by food, ſomething that is to remain at the bottom of the caſk, and upon which the drink lies and mellows. Often the fineſt part of its natural ſediment anſwers this purpoſe; but when that is deficient, or more is required than will naturally reſult from its effect, the feeding-paſte is very proper. It is thus made:

Diſſolve two ounces of the fineſt iſinglaſs in as much good ſtrong beer as will thoroughly melt it; then add to this a pound and half of good lump-ſugar. Let them ſtand till the ſugar alſo is melted. Powder very fine three pounds of clean ſoft chalk, and one pound of white oyſter-ſhells, ſuch as are ſold at the druggiſts; add to this, of the flour of malt, ſifted fine, one pound and a quarter, and powder of hops two ounces: grind theſe well together; then put in the ſyrup of iſinglaſs, and beat up the whole in a marble mortar, to a good paſte; ſpread this upon a piece of paper, on the back of a large ſieve, and lay it in the air to dry. When it is hard and dry, put it up for uſe. Two pounds of this is the proper quantity to put into a hogſhead of drink; and it muſt be uſed in a like proportion for any leſſer or greater quantity. If any ſmall over-ſight has happened in the brewing; or if the ſeaſon of the year has been unfavourable, or there be any other cauſe to fear the drink may grow ſour, or come to other harm; this, being put in at the faſtening down the bung, will prevent the miſchief. The beer will be fine, clear, ſoft, and well taſted; and will keep without danger.

If from any omiſſion of this aſſiſtance, when it was neceſſary, or from any other cauſe, a caſk of beer grows unexpectedly foul and thick, and taſtes, as it always will in that caſe, dead and muddy; the proper remedy is by a ſyrup of the hop, made with iſinglaſs. The way to prepare it is this: and for a hogſhead, the following quantity. Rub to pieces a pound of fine freſh hops; put them into a ſtone jar, and pour upon them as much boiling water as will cover them, without preſſing them down: ſtop up the jar, and ſet it in a large pan of boiling water: pour away this as often as it cools, and put freſh boiling water in its place: in this manner keep the hops ſtewing, in the cloſe jar, 12 hours, then let them ſtand 12 hours longer in the cold. After this ſtrain the liquor, without preſſing the hops; diſſolve in this two ounces and a half of beaten iſinglaſs; and then, to every pint of the liquor put a pound of lump ſugar, and ſtrain it through a flannel bag. When this is ready, clean and ſweeten a freſh caſk. Burn two or three brimſtone matches in it, then put in this ſyrup, draw off the beer, out of the hogſhead it was in, carefully into this, and leave all the ſettlement behind. Bung it up, but leave the vent-hole open a little for three or four days, then ſtop it up entirely, and let it ſtand three weeks, after which it will be perfectly fine.

It is found by experience, that the paler malt is dried, the ſhorter time beer will take in fining, and be fit for uſe; in fact, very brown or high-dried malt will not fine, although the ſtrongeſt acid menſtruums are uſed for the purpoſe.

Foreigners conjecture variouſly to account for the excellency of the Britiſh beer, and its ſuperiority to that of other countries, even of Bremen, Mons, and Roſtoch. It has been pretended, our brewers throw dead dogs flea'd into their wort, and boil them till the fleſh is all conſumed. Others, more equitable, attribute the excellency of our beer to the ſuperior quality of our malt and water, and the ſkill of our brewers in preparing it.

Sour Beer. Various receipts are given to reſtore ſour beer, which we lay before the reader for choice and experiment. Salt made of the aſhes of barley-ſtraw, put into the veſſel, and ſtirred; or by three or four handfuls of beech-aſhes thrown into the veſſel, and ſtirred; or, where the liquor is not very ſour, by a little put in a bag, without ſtirring: chalk calcined, oyſter-ſhells, egg-ſhells burnt, ſea-ſhells, crabs eyes, alcalized coral, &c. do the ſame, as they imbibe the acidity, and unite with it into a ſweetneſs. Beer, it is ſaid, may be kept from turning ſour in ſummer, by hanging into the veſſel a bag containing a new-laid egg, pricked full of pin-holes, ſome laurel-berries, and a few barley-grains; or by a new-laid egg and walnut-tree leaves. Glauber commends his ſal mirabile and fixed nitre, put in a linen bag, and hung on the top of the caſk ſo as to reach the liquor, not only for recovering ſour beer, but preſerving and ſtrengthening it.

Laurel-berries, their ſkin being peeled off, will keep beer from deadneſs; and beer already dead may be reſtored by impregnating it with fixed air.

Beer taſting of the caſk may be freed from it by putting a handful of wheat in a bag, and hanging it in the veſſel.

Cellarage. A cellar ſhould be deep beneath the ſurface of the earth, the bottom laid on a proper deſcent to permit all water to run off clear; as much ſecluded from the air as poſſible. The roof of all cellars ſhould be arched or vaulted, and ſhould be ſituate underneath the northern aſpect of buildings. A ready communication between the brewhouſe and cellar greatly facilitates the concluſive operations of brewing; and pipes or ſpouts for the purpoſe of pouring the liquor, are very convenient; but in cold weather may, perhaps, chill it too much.

Brewing, with diſtillers, is uſed to extract the more ſoluble parts of vegetables, or farinaceous ſubſtances, with hot water, and thus procuring a ſolution or decoction fitted for vinous fermentation. In which ſenſe brewing is a neceſſary ſtep towards diſtillation. See Art of DISTILLING.

BRIAR, in botany, a name given to many kinds of the roſe, more commonly applied to that ſpecies which grows wild in this country, and is undoubtedly a native, producing the blackberry.

BRIBE, to corrupt with gifts, by rewards, or doceurs given, to pervert the intention or judgment.

Officers of the cuſtoms taking any bribe, whereby the crown may be defrauded, forfeit 100l. and are rendered incapable of any office. Candidates that bribe electors, after the date or teſte of the writ, or after the vacancy, are diſabled to ſerve in parliament; and he that takes, as well as he that offers a bribe, forfeits 500l. and is diſabled from voting, and holding any office in any corporation; unleſs, before conviction, he diſcovers ſome other offender of the ſame kind, whereby he is indemnified for his own offence. Blackſtone's Com. vol. i. p. 179. vol. iv. p. 139.

BRIBERY, the act of bribing. Authorizing bribery is calculated for the genius of deſpotic countries; where the true principles of government are never underſtood, and it is imagined that there is no relative duty owing from the governor to the governed. The Roman law, though it contained many ſevere injunctions againſt bribery, as well for ſelling a man's vote in the ſenate or other public aſſembly, as for the bartering of common juſtice; yet, by a ſtrange indulgence in one inſtance, it tacitly encouraged this practice; allowing the magiſtrate to receive ſmall preſents, provided they did not on the whole exceed 100 crowns a-year; not conſidering the inſinuating nature and gigantic progreſs of this vice, when once admitted. Plato, therefore, in his ideal republic, orders thoſe who take preſents for doing their duty to be puniſhed in the ſevereſt manner: and by the laws of Athens, he that offered a bribe was alſo proſecuted, as well as he that received the bribe.

BRICIANI, *Knights of St. Bridget*, a military order, reſembling that of Malta, eſtabliſhed by St. Bridget, princeſs of Sweden, in 1366, and approved of by pope Urban V. who gave it the rule of St. Auguſtine. Their office was to fight againſt heretics, bury the dead, aſſiſt widows, orphans, &c.

BRICK, an unctuous kind of earth, generally formed into an oblong figure, 4 inches broad, 9 long, and 2½ thick, by means of a mould, then dried in the air, and afterwards burnt, or calcined by fire in a kiln; they are uſually red, and ſerve for the purpoſe of building.

There are alſo bricks of a whitiſh colour. Wulpit, in Suffolk, is famed for this ſort.

Bricks appear to be of a very ancient ſtanding. The walls of Babylon were built of brick, as appears from the remains ſtill in being. Under the firſt kings of Rome, they built with maſſive ſquared ſtones, which they learnt from the Tuſcans: towards the latter time of the republic, they began to uſe brick; borrowing the practice from the Greeks; the greateſt, as well as the moſt durable buildings of the ſucceeding emperors, as the Pantheon, &c. were built therewith. In the time of Gallienus, the buildings were compoſed of a row of ſoft gritty ſtone, and brick alternately. After him they laid aſide the uſe of bricks, and reſumed that of flints.

In the Eaſt they baked their bricks in the ſun: the Romans uſed them crude; only leaving them to dry in the air a long ſpace of time, viz. four or five years.

Bricks, among us, acquire various names, according to their forms, dimenſions, uſes, method of making, place, &c. The principal are; Compaſs bricks, of a circular form, uſed in ſteening of walls. Concave, or hollow bricks, on one ſide flat, like a common brick, on the other hollowed, about three quarters of an inch deep, and half an inch broad; uſed for conveying water under ground: they are uſually a foot long, four inches and a half broad, and two and a quarter thick. Cogging bricks, uſed for making the indented work, under the coping of walls built with great bricks: they are about ten inches long, four broad, and two and a quarter thick. Coping bricks, formed on purpoſe for coping of walls, are about twelve inches ſquare, and four thick, flat underneath, one third above ſemicircular, and the two ends flat. Dutch or Flemiſh bricks, uſed to pave yards and ſtables, and for ſoap-boilers vats, and ciſterns. Brique de Chantignole, or Demibrique, is that only an inch thick, but otherwiſe of the ſame dimenſions as the whole brick; uſed in paving between borders of ſtones, and alſo for the making of hearths and chimney backs. Clinkers, ſuch bricks as are glazed by the heat of the fire in making: theſe lie in the middle of the kiln of clamps; and are the moſt durable. Feather-edged bricks, are made like the common ſtatute bricks, only thinner on one edge than on the other, and uſed to pen up the brick pannels in timber buildings. Samel, or ſandal-bricks, are ſuch as lie outmoſt in a kiln or clamp, and conſequently are ſoft and liable to moulder; as not being thoroughly burnt. Great bricks, are thoſe which are twelve inches long, ſix broad, and three thick: the weight of one being about fifteen pounds: ſo that 100 weigh 1500, and 1000 of them 15000 pounds: their uſe is to build fence-walls; together with, pilaſter, or buttreſs bricks, which are of the ſame dimenſions with the great bricks, only they have a notch at one end, half the breadth of the brick: their uſe is to bind the work at the pilaſters of fence-walls, which are built of great bricks. Paving bricks, or tyles, are of ſeveral ſizes in ſeveral counties and places, from ſix to twelve inches ſquare, and one and a quarter, more or leſs, thick.

Statute, or ſmall common bricks, when burnt, by ſtat. 10 Geo. III. c. 49, ought to be eight inches and a half long, four broad, and two and a half thick: 100 of theſe uſually weigh about 550 pounds; and 1000, 5500 pounds; about 407 in number, make a ton weight. Theſe are commonly uſed in paving cellars, hearths, ſinks, &c. Thirty or thirty-two, if true meaſure, will pave a yard ſquare, and 330 will pave a ſquare of 100 feet laid flat; but if laid edgeways, there muſt be near double the number. Stock-bricks are to be of the ſame dimenſions; only one eighth of an inch thicker; and they are either marle or grey ſtocks. Theſe and the ſamel bricks are moſt uſed in building: rubbing bricks are for gauged work; clinkers for paving; Windſor and Welſh bricks for furnaces, as being the fitteſt to bear intenſe heat, for this the white bricks made at Stourbridge in Worceſterſhire, are unequalled.

MAKING AND MANAGEMENT OF BRICKS.

Worlidge, and others after him, have endeavoured to excite brickmakers to try their ſkill in making a new kind of brick, or a compoſition of clay and ſand, whereof to form window-frames, chimney-pieces, door-caſes, and the like. It is to be made in pieces faſhioned in moulds, which, when burnt, may be ſet together with a fine red cement, and ſeem as one entire piece, by which may be imitated all manner of ſtone-work. If chimney-pieces thus made in moulds, and dried and burnt, were not found ſmooth enough, they might be poliſhed with ſand and water; or were care taken, when they were half dry in the air, to have them poliſhed with an inſtrument of copper or iron, then leave them till they were dry enough to burn, it is evident they would not want much poliſhing afterwards. The work might even be glazed, as potters do their fine earthen ware, either white, or of any other colour; or it might be veined in imitation of marble, or be painted with figures of various colours, which would be much cheaper, perhaps equally durable, and as beautiful, as marble itſelf.

Bricks may be made of any earth that is clear of ſtones, even ſea-ouſe; but all will not burn red, a property peculiar to earths which contain ferruginous particles. In England, bricks are chiefly made of a hazely, yellowiſh-coloured, fatty earth, ſomewhat reddiſh, called loam. The earth, according to Leibourn, ought to be dug before winter, but not made into bricks before ſpring. In general, the earth whereof bricks are made ought not to be too ſandy, which would render them heavy and brittle; nor too fat, which would make them crack in drying.

The firſt ſtep in the proceſs of brickmaking is digging the clay, or earth. The next ſtep is to tread or temper it, which ought to be performed doubly of what is uſually done; ſince the goodneſs of the bricks depends chiefly upon this firſt preparation. The earth itſelf, before it is wrought, is generally brittle and duſty; but adding ſmall quantities of water gradually to it, and working and incorporating it together, it opens its body, and tinges the whole with a tough, gluey band or ſubſtance. If, in the tempering, you overwater them, as the uſual method is, they become dry and brittle, almoſt as the earth they are made of; whereas, if duly tempered, they become ſmooth and ſolid, hard and durable. A brick of this laſt ſort takes up near as much earth as a brick and a half made the contrary way; in which the bricks are ſpongy, light, and full of cracks, partly through want of due working, and partly by mixing of aſhes and light ſandy earth to make it work eaſy and with greater diſpatch; as alſo to ſave culm or coals in the burning. We may add, that for bricks made of good earth, and well tempered, as they become ſolid and ponderous, ſo they take up a longer time in drying and burning than the common ones; and thae the well drying of bricks before they are burned, prevents their cracking and crumbling in the burning.

Bricks are burnt either in a kiln or clamp. Thoſe that are burnt in a kiln, are firſt ſet or placed in it; and then the kiln being covered with pieces of bricks, they put in ſome wood to dry them with a gentle fire; and this they continue till the bricks are pretty dry, which is known by the ſmoke's turning from a darkiſh colour to tranſparent ſmoke: they then leave off putting in wood, and proceed to make ready for burning; which is performed by putting in bruſh, furze, ſpray, heath, brake, or fern-faggots: but before they put in any faggots, they dam up the mouth or mouths of the kiln with pieces of bricks (which they call *ſhinlog*) piled up one upon another, and cloſe it up with wet brick-earth inſtead of mortar. The ſhinlog they make ſo high, that there is but juſt room above it to thruſt in a faggot: then they proceed to put in more faggots, till the kiln and its arches look white, and the fire appears at the top of the kiln; upon which they ſlacken the fire for an hour, and let all cool by degrees. This they continue to do, alternately heating and ſlacking, till the ware be thoroughly burnt.

About London they chiefly burn in clamps, built of the bricks themſelves, after the manner of arches in kilns, with a vacancy between each brick, for the fire to play through; but with this difference, that inſtead of arching, they ſpan it over by making the bricks project one over another on both ſides of the place, for the wood and coals to lie in till they meet, and are bounded by the bricks at the top, which cloſe all up. The place for the fuel is carried up ſtraight on both ſides, till about three feet high; then they almoſt fill it with wood, and over that lay a covering of ſea-coal, and then overſpan the arch; but they ſtrew ſea-coal alſo over the clamp, betwixt all the rows of bricks; laſtly, they kindle the wood, which gives fire to the coal; and when all is conſumed, then they conclude the bricks are ſufficiently burnt.

In burning bricks, much depends on the alternate raiſing and abating of the fire. Brick burners, who continue the heat without intermiſſion, uſually make their lower ware extremely hard and good, but the upper bad: and beſides, the lower ones will ſometimes run ſo with the exceſſive heat as alſo to unite into one body. Then for cooling kilns of ware, ſome unwiſe burners, as ſoon as the bricks are burnt, immediately ſtop up the reſt of the mouth of the kiln, which was left open above the ſhinlog, by which means the air being ſhut out, it is long in cooling; ſo that ſuch burners are commonly a fortnight, or almoſt three weeks, in ſetting, burning, and drawing off a kiln of ware; all which may be done in one week.

By ſtat. 12 Geo. I. cap. 35. earth or clay, deſigned for making bricks for ſale, ſhall be dug, and turned at leaſt once between the firſt of November and the firſt of February, and not made into bricks till after the firſt of March: and no bricks be made for ſale, but between the firſt of March and twenty-ninth of September. But by ſtat. 10 George. III. cap 49. earth may be dug for making bricks, at any time in the year; provided ſuch earth be turned once before it be made into bricks. And by the former ſtatute, no Spaniſh is to be mixed with the earth; or breeze uſed in burning of bricks. And all bricks are to be burnt either in kilns or diſtinct clamps, each ſort by itſelf.

By ſtat. 3 Geo. II. cap. 22. there may be mixed with the brick earth any quantity of ſea-coal aſhes, ſifted or ſcreened through a ſieve, or ſcreen half an inch wide, and not exceeding twenty loads, to the making of one hundred thouſand bricks; each load not exceeding thirty-ſix buſhels. And breeze may be mixed with coal in the burning of bricks in clamps for ſale, &c. Stock-bricks and place-bricks may be burnt in one and the ſame clamp, ſo that the ſtock-bricks be ſet in one diſtinct parcel, and ſurrounded with place-bricks.

By ſtat. 17 Geo. III. cap. 42. all bricks made for ſale ſhall, when burned, be not leſs than 8½ inches long, 2½ inches thick, and 4 inches wide.

By ſtat. 24th Geo. III. bricks and tiles are charged with the following duties:

Bricks, 2s. 6d. per thouſand.
Plain tiles, 3s. per thouſand.
Pan or ridge tiles, 8s. per thouſand.
Paving tiles 10 inches ſquare, 1s. 6d. per hundred.
Ditto more than 10 inches ſquare, 3s. per hundred.
Upon all other ſorts of bricks and tiles, 3s. per thouſand, 10 in every 100 allowed for waſte.

Penalties. Makers of bricks and tiles to give in their names and places of abode before they begin making, or forfeit 100l.
Obſtructing officers, 50l.
Concealing, in order to defraud, 20l.

Goldman obſerves, that bricks will have double the ſtrength, if, after one burning, they be ſteeped in water, and burnt afreſh. If the brick earth be too fat, it muſt be tempered with ſand. Bricks made of common earth, melt, nay vitrify, by too much heat, for which reaſon, the kilns are made of ſtones, that will themſelves calcine, that the vehemence of the fire may be broken by them: beſides which, they uſually place other bricks, made of an argillous earth, which will melt next the fire.

Danger of uſing BRICKS *as Reſceptacles for Water*, &c.

In Dr. Percival's eſſays, we have the following experiment of the effects of bricks on water. "Two or three pieces of common brick were ſteeped four days in a baſon full of diſtilled water. The water was then decanted off, and examined by various chemical teſts. It was immiſcible with ſoap, ſtruck a lively green with ſyrup of violets, was rendered ſlightly lacteſcent by the volatile alcali, and quite milky by the fixed alcali, and by a ſolution of ſaccharum ſaturni. The infuſion of tormentil root produced no change in it." This experiment, he obſerves, affords a ſtriking proof of the impropriety of lining wells with brick, a practice very common in many places, and which cannot fail of rendering the water hard and unwholeſome. Clay generally contains a variety of hetorogeneous matters. The coloured loams often participate of bitumen, and the ochre of iron. Sand and calcareous earth are ſtill more common ingredients in their compoſition; and the experiments of Mr. Geoffry and Mr. Pott prove, that the earth of alum alſo may in large quantity be extracted from clay.

Now as clay is expoſed to the open air for a long ſpace of time, is then moulded into bricks, and burnt; this proceſs reſembles in many reſpects that by which the alum-ſtone is prepared.

The ſulphureous exhalations of coal uſed in burning brick, together with the bituminous vapours which ariſes from the heated clay, accounts for the combination of a vitriolic acid with the earth of alum.

Oil of BRICKS, is oil of olive, imbibed by the ſubſtance of bricks, and afterwards diſtilled from it. The pieces of bricks, being heated red-hot in live-coals, are extinguiſhed in a trough half filled with oil of olives: being then ſeparated, and the brick thus ſaturated with oil, and groſsly pounded, it is put into a retort, and placed in a reverberatory furnace; and thus is drawn an oil of reputed efficacy in reſolving tumors, &c. at this time almoſt out of uſe.

Some extol it as a ſpecific, excellent for taking away calluſes, cleanſing, and removing ulcers, &c. It is now fallen much into diſuſe. Juncker. Conſp. Chirurg.

BRICK *Duſt.* It is a cuſtom with ſome perſons to reduce this ſubſtance to a very fine powder, and give it in the heart-burn. Many of the lozenges, ſo much famed for the cure of this diſorder, and ſold under the pompous name of coral lozenges, are only made of a mixture of this uncouth medicine, and ſugar, made into the conſiſtence of a paſte, with gum tragacanth reduced to a mucilage with roſe-water. But it is to be obſerved, that this, as well as chalk, is a very dangerous remedy. It is very doubtful whether brick duſt is of any medical uſe, we therefore can only recommend it as an excellent poliſher of metals and other ſubſtances.

BRICK *Layer*, an artificer whoſe buſineſs is to build with bricks, or make brick work.

Bricklayers work or buſineſs, in London, includes tyling, walling, chimney work, and paving with bricks and tyles. In the country, it alſo includes the maſon's and plaiſterer's buſineſs.

The London bricklayers and tylers make a regular company, which was incorporated in 1568, and conſiſts of a maſter, two wardens, twenty-eight aſſiſtants, and one hundred and eight on the livery.

Great care is to be taken, that bricks be laid joint on joint in the middle of the walls as ſeldom as may be; and that there be good bond made there, as well as on the outſides. Some bricklayers, in working a brick and half wall, lay the header on one ſide of the wall perpendicular on the header on the other ſide, and ſo all along the whole courſe; whereas, if the header on one ſide of the wall were toothed as much as the ſtretcher on the other ſide, it would be a ſtronger toothing, and the joints of the headers of one ſide would be in the middle of the headers of the courſe they lie upon of the other ſide. If bricks be laid in winter, let them be kept as dry as poſſible; if in ſummer, it will quit coſt to employ boys to wet them, for that they will then unite with the mortar better than if dry, and will make the work ſtronger. In large buildings, or where it is thought too much trouble to dip all the bricks ſeparately, water may be thrown on each courſe after they are laid, as was done at the building the phyſician's college, by order of Dr. Hooke. If bricks are laid in ſummer, they are to be covered from the intenſe heat of the ſun; for if the mortar dries too haſtily, it will not bind ſo firmly to the bricks as when left to dry more gradually. If the bricks be laid in winter, they ſhould alſo be covered well, to protect them from rain, ſnow, and froſt; which laſt is a mortal enemy to mortar, eſpecially to all ſuch as have been wetted juſt before the froſt aſſaults it.

BRIDE, a woman juſt married, or a wife in the firſt days of her matrimonial ſtate.

Among the Romans, the maid eſpouſed remained a bride, till ſhe entered the huſband's houſe; from which time ſhe commenced a wife.

The bridegroom was attended by a brideman; the bride by a bridemaid, or more properly a matron, whoſe buſineſs was to inſtruct her young miſtreſs in the duties of the genial bed, and to prepare every thing for a proſperous enjoyment.

The ancient ceremonies practiſed in reſpect of a bride were numerous; moſt of them emblematical, or ſignificant of ſome part of her duty: as dreſſing her hair after a peculiar manner, and parting it with a ſpear; girding her with a girdle, which the bridegroom was to looſen; putting a yoke on her neck, and other ridiculous ceremonies. She was to ſeem to be raviſhed or torn by force from her mother, in memory of the rape of the Sabines under Romulus: ſhe was to be carried home in the night-time to the bridegroom's houſe, accompanied by three boys, one of whom carried a torch, and the other two, led the bride, a ſpindle and a diſtaff being carried with her, as emblems of induſtry.

Fire and water being ſet on the threſhold, ſhe touched both; but ſtarting back from the door, refuſed to enter, till at length ſhe paſt the threſhold, being careful to ſtep over, without touching it: here the keys were given her; a nuptial ſupper was prepared for her, and minſtrels to divert her; ſhe was ſeated in the figure of a Priapus, and here the boys reſigned her to the bridemaid, who brought her into the nuptial chamber, and put her into the genial bed. When the bridegroom was brought to her, to drown the cries to be apprehended from a coy maid on ſuch an occaſion, epithalamia were ſung by the women.

Modern ceremonies of this kind are too well known to need deſcription.

BRIDEGROOM, a man newly married, the ſpouſe or mate of a bride.

Among the Romans, the bridegroom was decked to receive his bride; his hair was combed and cut in a peculiar form; he had a coronet or chaplet on his head, and was dreſſed in a white garment.

By the ancient canons, the bridegroom was to forbear the enjoyment of his bride the firſt night, in honour of the nuptial benediction given by the prieſt on that day.

In Scotland, and perhaps alſo ſome parts of England, a cuſtom called marchet, obtained, by which the lord of the manor was entitled to the firſt night's habitation with his tenant's brides.

BRIDEMIF, in the Perſian tables, the conſtellation lupus, or the wolf.

BRIDEWELL, denotes a work-houſe, for the correction and labour of whores, rogues, and vagrants.

Bridewell, near Fleet-ſtreet, is a foundation of a mixt and ſingular nature, partaking of the hoſpital, the priſon, and work-houſe; it was founded in 1553, by Edward VI. who gave the place where king John had formerly kept his court, and which had been repaired by Henry VIII. to the city of London, with 700 marks of land, bedding, and other furniture.

Several youths are ſent to this hoſpital as apprentices to manufacturers, who reſide there; they are clothed in blue doublets and breeches, with white hats. Having faithfully ſerved their time of ſeven years, they have their freedom, and a donation of ten pounds each, for carrying on their reſpective trades.

BRIDGE, an edifice either of ſtone or timber, erected over a river, canal, or the like, for the conveniency of croſſing, or paſſing over from one ſide to the other.

A bridge may be conſidered as a road over water. See Syſtem of Architecture.

Among the bridges of antiquity, that built by Trajan over the Danube is allowed to be the moſt magnificent.

Among modern bridges, that of Weſtminſter, built over the river Thames, may be accounted one of the fineſt in the world: it is 44 feet wide, a commodious foot-way being allowed for paſſengers, on each ſide, of about ſeven feet broad, raiſed above the road allowed for carriages, and paved with broad moor-ſtones, while the ſpace left between them is ſufficient to admit three carriages and two horſes to go a-breaſt, without any danger. Its extent from wharf to wharf is 1220 or 1223 feet, being full 300 feet longer than London-bridge. The free water-way under the arches of this bridge is 870 feet, being four times as much as the free water-way left between the ſterlings of London-bridge. It conſiſts of 13 large and 2 ſmall arches, together with 14 intermediate piers.

All the arches of this bridge are ſemicircular; they all ſpring from about two feet above low-water mark; the middle arch is 76 feet wide, and the others decreaſe in breadth equally on each ſide by 4 feet.

London bridge conſiſts of 20 locks or arches, 19 of which are open, and one filled up or obſcured. It is 900 feet long, 60 high, and 74 broad, having a draw-bridge in the middle, and almoſt 20 feet aperture in each arch. It is ſupported by 18 piers, from 25 to 34 feet thick; ſo that the greateſt water-way when the tide is above the ſterlings is 450 feet, ſcarce half the width of the river; and below the ſterlings, the water-way is reduced to 194 feet. Thus a river 900 feet wide is here forced through a channel of 194 feet. London bridge was firſt built of timber, ſome time before the year 994, by a college of prieſts, to whom the profits of the ferry of St. Mary Overy's had deſcended; it was repaired, or rather new built of timber, in 1163. The ſtone-bridge was begun by king Henry in 1176, and finiſhed by king John in 1209. The architect was Peter of Colechurch, a prieſt.

Blackfriars bridge, ſituated near the centre of the city, and built according to a plan drawn by Mr. Robert Mylne. The arches are only 9 in number; but very large, and of an elliptical form. The centre-arch is 100 feet wide; thoſe on the ſides decreaſe in a regular gradation; and the width of that near the abutment at each end is 70 feet. It has an open balluſtrade at the top, and a foot-way on each ſide, with room for three carriages abreaſt in the middle. It has alſo receſſes on the ſides for the foot paſſengers, each ſupported by two lofty Ionic columns. The materials this bridge is built with, prove of a very periſhable nature: although it has not been finiſhed twenty years and coſt the immenſe ſum of 152,840*l.* architects are apprehenſive it muſt be rebuilt in a few years; this event muſt be left to the determination of futurity; but, certain it is, that a very large ſum is annually expended to keep this edifice in repair.

The longeſt bridge in England is that over the Trent at Burton, built by Bernard abbot of Burton, in the 12th century; it is all of ſquared free ſtone, ſtrong and lofty, 1545 feet in length, and conſiſting of 34 arches.

But the moſt ſingular bridge in Europe is that built over the river Tave in Glamorganſhire. It conſiſts of one ſtupendous arch, the diameter of which is 175 feet, the chord 140, the altitude 35, and the abutments 32. This magnificent arch was built by William Edward, a poor country maſon, in the year 1756.

The famous bridge of Venice, called the Rialto, conſiſts of but a ſingle arch, and that a flat or low one, and paſſed for a maſterpiece of art. It was built in 1591, on the deſign of Michael Angelo; the ſpan of the arch is 98½ feet, and its height above the water only 23. Poulet mentions a bridge of a ſingle arch in the city of Munſter in Bothnia, much bolder than that of the Rialto at Venice. But theſe are nothing to a bridge in China, built from one mountain to another, conſiſting of a ſingle arch 400 cubits long, and 500 in height, whence it is called the flying-bridge: a figure of it is given in the Philoſophical Tranſactions. Kircher alſo ſpeaks of a bridge in the ſame country 360 perches long, ſupported by 300 pillars.

Bridges are either built of ſtone or timber, as is judged moſt convenient. See Syſtem of Architecture.

Pendent or Hanging **Bridges**, called alſo Philoſophical Bridges, are thoſe not ſupported either by poſts or pillars, but hung at large in the air, only ſupported at the two ends or butments. Inſtances of ſuch bridges are given by Palladio and others. Dr. Wallis gives the deſign of a timber bridge 70 feet long, without any pillars, which may be uſed in ſome places where pillars cannot be conveniently erected. Dr. Plot aſſures us, that there was formerly a large bridge over the caſtleditch at Tutbury in Staffordſhire, made of pieces of timber, none much above a yard long, and yet not ſupported underneath either with pillars or arch-work, or any ſort of prop whatever.

Draw **Bridge**, one that is faſtened with hinges at one end only, ſo that the other may be drawn up; in which caſe, the bridge ſtands upright, to hinder the paſſage of a ditch or moat.

Flying **Bridge**, or *Pons ductorius*, an appellation given to a bridge made of pontoons, leather boats, hollow beams, caſks, or the like, laid on a river, and covered with planks, for the paſſage of an army.

Flying Bridge (*pont volant*) more particularly denotes a bridge compoſed of one or two boats joined together by a ſort of flooring, and ſurrounded with a rail or balluſtrade; having alſo one or more maſts, to which is faſtened a cable, ſupported, at proper diſtances, by boats, and extended to an anchor, to which the other end is faſtened, in the middle of the water: by which contrivance, the bridge becomes moveable, like a pendulum from one ſide of the river to the other, without any other help than the rudder. Such bridges ſometimes alſo conſiſt of two ſtories, for the quicker paſſage of a great number of men, or that both infantry and cavalry may paſs at the ſame time.

Bridges *of Boats* are either made of copper or wooden boats, faſtened with ſtakes, or anchors, and laid over with planks. One of the moſt notable exploits of Julius Cæſar was the expeditious making a bridge over the Rhine. Modern armies carry copper or tin boats, called *pontoons*, to be in readineſs for making bridges;

ſeveral of theſe being joined ſide by ſide till they reach acroſs the river, and planks laid over them, make a plane for the men to march on.

Floating Bridge, is ordinarily made of two ſmall bridges, laid one over the other, in ſuch manner, as the uppermoſt ſtretches and runs out, by the help of certain cords running through pullies placed along the ſide of the under bridge, which puſh it forwards till the end of it joins the place it is deſigned to be fixed on. When theſe two bridges are ſtretched out to their full length, ſo that the two middle ends meet, they are not to be above four or five fathoms long; becauſe, if longer, they will break. Their chief uſe is for ſurpriſing out works, or poſts that have but narrow moats. In the memoirs of the royal academy of ſciences we find an ingenious contrivance of a floating bridge, which lays itſelf on the other ſide of the river.

Bridge, in gunnery, the two pieces of timber which go between the two tranſums of a gun-carriage, on which the bed reſts.

Bridge, in muſic, a term for that part of a ſtringid inſtrument over which the ſtrings are ſtretched. The bridge of a violin is about one inch and a quarter high, and near an inch and a half long.

BRIDLE, a contrivance made of ſtraps or thongs of leather, and pieces of iron, in order to keep a horſe in ſubjection and obedience.

The ſeveral parts of a bridle are, the bit or ſnaffle, the head-ſtall, or leather from the top of the head to the rings of the bit; the fillet, over the forehead and under the foretop; the throat-band, which buckles from the head-band under the throat; the noſe-bands, going through the loops at the back of the head-ſtall, and buckled under the cheeks; the reins or long thongs of leather that come from the rings of the bit, and being caſt over the horſe's neck, the rider holds in his hand.

Pliny aſſures us that one Pelethronius firſt invented the bridle and ſaddle; though Virgil aſcribes the invention to the Lapithæ, to whom he gives the epithet *Pelethronii*, from a mountain in Theſſaly named *Pelethronium*, where horſes were firſt begun to be broken.

The firſt horſemen, not being acquainted with the art of governing horſes with bridles, managed them only with a rope or a ſwitch, and the accent of the voice. This was the practice of the Numidians, Getulians, Lybians, and Maſſilians. The Roman youth alſo learned the art of fighting without bridles, which was an exerciſe or leſſon in the menage; and hence it is, that on the Trajan column, ſoldiers are repreſented riding at full ſpeed without any bridles on.

BRIEF, in law, an abridgment of the client's caſe, made out by the attorney, for the inſtruction of council on a trial at law; wherein the caſe of the plaintiff, &c. is to be briefly but fully ſtated: the proofs muſt be placed in due order, and proper anſwers made to whatever may be objected to the client's cauſe by the oppoſite ſide; and herein great care is requiſite, that nothing be omitted to endanger the cauſe.

Brief, in Scots law, a writ iſſued from the chancery, directed to any judge-ordinary, commanding and authoriſing that judge to call a jury to inquire into the caſe mentioned in the brief, and upon their verdict to pronounce ſentence.

Apoſtolical Briefs, letters which the pope diſpatches to princes, or other magiſtrates, relating to any public affair.

BRIG, or Brigantine, a merchant ſhip with two maſts. This term is not univerſally confined to veſſels of a particular conſtruction, or which are maſted and rigged in a manner different from all others. It is variouſly applied, by the mariners of different European nations, to a peculiar ſort of veſſel of their own marine. Among Britiſh ſeamen, this veſſel is diſtinguiſhed by having her mainſail ſet nearly in the plane of her keel; in a brig, the foremoſt edge of the mainſail is faſtened in different places to hoops which encircle the mainmaſt, and ſlide up and down it as the ſail is hoiſted or lowered: it is extended by a gaff above, and a boom below.

BRIGADE, in the military art, a party or diviſion of a body of ſoldiers, whether horſe or foot, under the command of a brigadier. An army is divided into brigades of horſe and brigades of foot: a brigade of horſe is a body of eight or ten ſquadrons: a brigade of foot conſiſts of four, five, or ſix battalions. The eldeſt brigade has the right of the firſt line, and the ſecond the right of the ſecond; the two next take the left of the two lines, and the youngeſt ſtand in the centre.

Brigade *Major*, is an officer appointed by the brigadier, to aſſiſt him in the management and ordering of his brigade.

BRIGANDINE, a coat of mail; a kind of ancient defenſive armour, conſiſting of thin jointed ſcales or plates, pliant and eaſy to the body.

Some confound it with habergeon; and others with brigantine, a low long veſſel.

BRIGANDINI, Brigantini, Brigandinarii, or Brigancii, in middle age writers, military thieves, or highwaymen, who infeſted France and the Netherlands.

BRIGITTINS, a religious order, denominated from their founder St. Bridgit or Birgit, a Swediſh lady in the 14th century, famous for her revelations.

BRILLIANT, in a general ſenſe, ſomething that has a bright and lucid appearance.

Brilliants, a name given to diamonds of the fineſt cut.

BRIM, denotes the outmoſt verge or edge, eſpecially of round things. The brims of veſſels are made to project a little over, to hinder liquors, in pouring out, from running down the ſide of the veſſel. The brimming of veſſels was contrived by the ancient potters, in imitation of the ſupercilium or drip of the cornices of columns: it is done by turning over ſome of the double matter when the work is on the wheel.

Brim, in country affairs. A ſow is ſaid to brim or to go to brim, when ſhe is ready to take boar.

BRIMSTONE. See Sulphur.

Brimstone *Medals, Figures, &c.* may be caſt in the following manner. Melt half a pound of brimſtone over a gentle fire: with this mix half a pound of fine vermillion; and when you have cleared the top, take it off the fire, ſtir it well together, and it will diſſolve like oil; then caſt it into the mould, which ſhould be firſt anointed with oil. When cool, the figure may be taken out; and in caſe it ſhould change to a yellowiſh colour, you need only wipe it over with aqua fortis, and it will look like the fineſt coral.

BRINE, or Pickle; water replete with ſaline particles.

Brine *Water*, a ſalt water, which, being boiled, turns into ſalt: for the proceſs, &c. ſee Salt.

Brine taken out of brine-pits, or brine-pans, uſed by ſome for curing or pickling of fiſh, without boiling the ſame into ſalt; and rock ſalt, without refining it into white ſalt; are prohibited by 1 Ann. cap. xxi.

Brine *Springs*, are fountains which flow with ſalt water inſtead of freſh. Of theſe there are a good number in England, but though not peculiar to this iſland, are far from being common in the countries on the continent. There are ſome of them in ſeveral different counties; and perhaps, on a due ſearch, others might be diſcovered. The moſt remarkable of theſe already known is at Droitwich in Worceſterſhire, where the officers to protect and collect the revenue which ariſes from ſalt amount to near 100; the brine is of a quality ſuperior to any other in the kingdom; alſo at Eaſt Chennock in Somerſetſhire, about 20 miles from the ſea. Another at Leamington in Warwickſhire, very near the river Learn; which, however, is but weak. Such a ſpring likewiſe runs into the river Cherwell in Oxfordſhire, and ſeveral more in Weſtmoreland and Yorkſhire; but as they are but poor, and the fuel in moſt of thoſe countries ſcarce and dear, no ſalt is prepared from them. At Barrowdale near Grange, three miles from Keſwick in Cumberland, a pretty ſtrong ſpring riſes in a level near a moſs, 16 gallons of the water of which yield one of pure ſalt; which is the more remarkable, when it is conſidered that the ſame quantity of ſalt cannot be obtained from leſs than 22 gallons of the waters of the German ocean. At a place called Salt-water-haugh near Butterpy, in the biſhopric of Durham, there are a multitude of ſalt ſprings which riſe in the middle of the river Weare, for the ſpace of about 40 yards in length, and 10 in breadth; but particularly one out of a rock, which is ſo ſtrong that in a hot ſummer's day the ſurface will be covered with a pure white ſalt. At Weſton, in Staffordſhire, there are brine pits which afford about a ninth part of very fine white ſalt. There are others at Enſon, St. Thomas, and in the pariſh of Ingeſtre, but ſo weak that they are not wrought; though it is believed, that by boring, ſtronger ſprings might be found in the neighbourhood. In Lancaſhire there are ſeveral ſalt ſprings, but (if we except that at Barton, which is as rich as the ſpring at Norwich) by no means ſo famous as thoſe of Cheſhire, called in general by the name of the *wiches*. Namptwich on the river Weever, has a noble ſpring not far from the river, which is ſo rich as to yield one ſixth part of pure white ſalt. At ſix miles diſtance ſtands Norwich, at the confluence of the Weever and the Dan; where the brine is ſtill richer, ſince they obtain ſix ounces of ſalt from 16 of water. In 1670, a rock of ſalt was diſcovered at a ſmall diſtance from Northwich, which has been wrought to a great depth, and to a a vaſt extent, ſo as to be juſtly eſteemed one of the greateſt curioſities in England; and it is highly probable, that there is an immenſe body of foſſile ſalt in the bowels of the earth, under this whole county; ſince, upon boring, brine-pits have been found in many places on both ſides the river Weever. This is the more likely, ſince, at Middlewich, which ſtands at the confluence of the Croke and the Dan, there are ſalt-ſprings with a freſh brook running between them. The brines from theſe pits are of unequal ſtrength; but, when mixed, they commonly obtain four ounces of ſalt from a pound of brine. Experience ſhews, that in theſe ſprings the water is ſtrongeſt neareſt the bottom, richer in dry weather than in wet, and when long drawn than when firſt wrought. But theſe are no rules in reſpect to other ſalt-ſprings, ſince in thoſe of Franche Comte the brine is ſtrongeſt in wet weather.

Brine *Worms*, are red-coloured inſects, which breed both in ſummer and in winter, and in the ſtrong brine of the ſalt-pans. They never become flies, but are of the claſs of apteræ, or unwinged inſects.

BRINEK, or Brineti, in aſtronomy, the bright ſtar in the conſtellation Lyra; more frequently called *Lucida Lyræ*.

BRINGERS-UP, in a battalion, are the whole laſt rank of men in it, or the hindmoſt man in every file.

BRING-TOO, in ſea-language, ſignifies to check the courſe of a ſhip when ſhe is advancing, by arranging the ſails in ſuch a manner, as that they ſhall counteract each other, and prevent her either from retreating or moving forward. In this ſituation the ſhip is ſaid to lie-by, or to lie-to.

BRINING *of Corn*, an operation performed on the wheat ſeed, in order to prevent the ſmut. See Syſtem of Agriculture, Sect. III.

Brining *of Hay-ricks*, a practice common in America, of mixing ſalt with the hay as it is ſtacked.

A correſpondent of the editors of the Muſeum Ruſticum recommends this practice greatly, declaring that hay which has to all appearance been ſpoiled by the rain, will ſpend as well as that made and ricked in the fineſt weather.

"Juſt before I left America, ſays he, I had a crop of hay, which was in a manner ſpoiled by the rain, being almoſt rotted in the field: yet did this hay ſpend as well as if it had been got in ever ſo favourably.

"When my ſervants were making up the ſtack, I had it managed in the following manner; as ſoon as the bed of hay was laid about ſix inches thick, I had the whole ſprinkled over with ſalt; then another bed of hay was laid, which was again ſprinkled in the ſame manner; and this method was followed till all the hay was ſtacked.

"When the ſeaſon came for cutting this hay, and giving it to my cattle, I found that ſo far from refuſing it, they eat it with ſurprizing appetite; always preferring it to the ſweeteſt hay, that had not been in this manner ſprinkled with ſalt."

BRISKET, that part of quadrupedes extended from the two ſhoulders to the bottom of the cheſt.

BRISSOIDES, in foſſilogy, the name of one of the genera of the *echini marini*; the diſtinguiſhing characters of theſe are, that they are of an oval figure, and have their backs ſtriated, not furrowed, and their rays ſmooth, not marked with ridges.

BRISTLE, a thick gloſſy kind of hair, wherewith the ſwine kind more eſpecially are covered.

The name is ſometime alſo applied to the quills of porcupines, and the muſtaches or whiſkers of cats.

Hogs briſtles are hard, tranſparent, horny ſubſtances, of a priſmatical figure, without any appearance of cavities or pores in them, diſcoverable even by the microſcope.

Cats briſtles have a large ſolid pith in the middle.

BRITTLENESS, in natural philoſophy, that quality of bodies by which they are ſoon and eaſily broken by preſſure or percuſſion. It ſtands oppoſed to tenacity.

Brittle bodies are extremely hard; the leaſt percuſſion exerts a force on them equivalent to the greateſt preſſure, and may conſequently eaſily break them. This effect is particularly remarkable in glaſs ſuddenly cooled, the brittleneſs of which is thereby much increaſed.

Tin, though in itſelf tough, gives a brittleneſs to all the other metals when mixed therewith.

The brittleneſs of glaſs ſeems to ariſe from the heterogeneity of the parts whereof it is compoſed, ſalt and ſand, which can never bind intimately together.

In timber, brittleneſs ſeems to be connected with durability; the more brittle any ſort of wood is, the more laſting it is found. Thus, it is, oak is of ſo long duration, while willow and birch, being tough, preſently rot, and are of little ſervice for building.

BRIZA, the name of that kind of graſs called the tremula, or quaking-graſs.

BROACH, a ſteal inſtrument to open holes in metals. It is ſometimes alſo applied to a ſtick on which thread or yarn is wound; and, in the North, to a ſort of wooden needles uſed in knitting certain coarſe things.

In Scotland, *broach*, *broche*, or *brotche*, is the name of an utenſil which the Highlanders uſe, like the *fibula* of the Romans, to faſten their veſt. They are uſually made of ſilver; of a round figure; with a tongue croſſing its diameter, to faſten the folds of the garment; ſometimes with two tongues, one on each ſide of a croſs-bar in the middle. There are preſerved in ſeveral families, ancient brotches of very elegant workmanſhip, and richly ornamented. Some of them are inſcribed with names, to which particular virtues uſed to be attributed; others are furniſhed with receptacles for relics, ſuppoſed to preſerve from harm. So that theſe brotches ſeem to have been wore not only for uſe, but as amulets. One or two of this ſort are figured and deſcribed by Mr. Pennant.

BROAD Cast, in huſbandry, the method of diſtributing or ſowing ſeeds and grain with the hand. See Syſtem of Agriculture. Sect. XXX.

Broad Side, in the ſea-language, a diſcharge of all the guns on one ſide of a ſhip at the ſame time.

BROCADE, a ſort of ſtuff, or cloth of gold, ſilver, or ſilk, raiſed and enriched with flowers, foliages, or other figures, according to the fancy of the manufacturer. Formerly the term was reſtrained to cloths woven either wholly of gold, both of woof and warp, or of ſilver, or of both together: but by degrees it came likewiſe to paſs for ſuch as had ſilk intermixed, to fill up, and terminate the flowers of gold and ſilver.

At preſent, any ſtuff of ſilk, ſatin, or even ſimple taffety, when wrought, and enriched with the flowers, &c. obtains the denomination of brocade.

Rich brocades may be cleaned, and the luſtre of them recovered, by waſhing them with a ſoft bruſh dipped in warm ſpirit of wine.

This ſeems to be the only material adapted to this intention, and probably the boaſted ſecret of certain artiſts is no other than this ſpirit diſguiſed. As to powders, however fine, and however cautiouſly uſed, they ſcratch and wear the gold.

In manufacturing brocades, the flatted gilt wire is ſpun on threads of yellow ſilk approaching as near as may be to the colour of gold itſelf. The wire, winding off from a bobbin, twiſts about the thread as it ſpins round; and, by means of curious machinery, too complex to be deſcribed here, a number of threads are thus twiſted at once by the turning of one wheel. The principal art conſiſts in ſo regulating the motion, that the ſeveral circumvolutions of the flatted wire on each ſide may juſt touch one another, and form, as it were, one continued covering.

BROCCOLI, gardening, a ſpecies of cabbage. There are ſeveral ſorts of it, as the Roman, the Neapolitan, and the black; but the Roman is far the beſt, and is therefore the only ſort now in uſe. For its cultivation, ſee Syſtem of Gardening.

BROCK, among ſportſmen, denotes a badger. An animal about the ſize of a terrier dog, and in many reſpects reſembles the pig; it is ſlow in motion, but of prodigious ſtrength, and always in the day time repoſes in the earth. Its food is roots and inſects, and the fleſh is ſweet and wholeſome not unlike pork or bacon. The fat of the badger is peculiarly efficacious, applied to ſtrains or tumours in cattle, alſo to the human ſpecie.

BROKEN Wind, a diſeaſe incident to horſes, ſee Farriery.

BROKER, a name given to perſons of ſeveral and very different profeſſions; the chief of which are exchange-brokers, ſtock-brokers, pawn-brokers, and brokers who ſell houſehold-furniture and ſecond-hand apparel, alſo piece brokers.

Exchange Brokers, are a kind of agents, or negociators, who contrive, propoſe, and conclude bargains between merchants, and between merchants and tradeſmen, in matters of bills of exchange, or merchandiſe, for which they have ſo much commiſſion. Theſe, by the ſtatute of 8 and 9 William III. are to be licenſed in London by the lord mayor, who gives them an oath, and takes bond for the faithful execution of their offices. If any perſon ſhall act as broker without being thus licenſed and admitted, he ſhall forfeit the ſum of 500l.; and perſons employing him, 5l.; and brokers are to regiſter contracts, &c. under the like penalty: alſo brokers ſhall not deal for themſelves, on pain of forfeiting 200l. They are to carry about with them a ſilver medal, having the king's arms and the arms of the city, and pay 40s. a year to the chamber of the city. The exchange brokers make it their buſineſs to know the alteration of the courſe of exchange, to inform merchants how it goes, and to give notice to thoſe who have money to receive or pay beyond ſea: they are the proper perſons for negotiating the exchange; and when the matter is accompliſhed, that is, when the money for the bill is paid, and the bill delivered, they have for brockerage 2s. for 100l. ſterling.

Stock Brokers, are thoſe who are employed to buy and ſell ſhares in the joint ſtock of a company or corporation. As the practice of ſtock-jobbing has been carried to ſuch an exceſs as became not only ruinous to a great number of private families, but even affected, or at leaſt might ſoon affect, the public credit of the nation, the legiſlature thought fit to put a ſtop to it, or at leaſt to bring it within certain bounds, and under ſome regulation, by ſtatute 7 George II. c. viii. Sect. I.

Pawn Brokers, perſons who keep ſhops, and lend money upon pledges to neceſſitous perſons, and moſt commonly at an exorbitant intereſt. They are allowed 20 per cent. by act of parliament, beſides from one halfpenny to four pence for duplicates, this notorious profeſſion cries aloud for regulation, at leaſt the neceſſities of the indigent require ſome further reſtraint ſhould be put upon thoſe harpies.

By act 24, George III. All diſputes relating to ſmall ſums, under 40s. are to be ſettled by a juſtice of peace, by examination upon oath of the parties, or witneſſes, and no trial at law ſhall be allowed, nor fee or gratuity taken for any proceeding before any juſtice or juſtices of the peace.

All goods, on which any ſum exceeding 10s. and not exceeding 10l. ſhall have been lent, may be ſold by public auction, but not otherwiſe, (by the perſon having the ſame in pawn) at and after the expiration of one whole year, but not before, and the overplus of principal and intereſt to be paid to the owner of the goods.

In the cities of Italy, there are companies eſtabliſhed by authority for the letting out money on pawns, called *mounts of piety*; in Holland alſo there are ſimilar eſtabliſhments; a hint for our legiſlature; by this means the poor might be ſerved and the ſtate benefited.

Piece BROKERS, a ſort of petty dealers in drapery, who ſell fragments or remnants of cloths, ſtuffs, ſilks, and the like, at under price.

BRONCHIAL, in anatomy, the little tubes into which the trachea is branched, at its entrance into the lungs; and which are diſtributed through every part thereof, ſerving for the conveyance of the air in reſpiration. See Syſtem of ANATOMY, Part IV. Sect. I.

BRONCHOCELE, a pendent tumor, with a large round neck, riſing on the bronchial part of the trachea.

The bronchocele is common in Lombardy, Savoy, and about the Alps.

It is commonly ſuppoſed to derive its origin from the Alpine waters, which being impregnated and chilled with ice and ſnow, cauſes a lentor of the lympha, about the muſcles of the throat, whereby the veſſels are contracted, and the circulating humours thickened, whence an obſtruction, &c. though there are ſome ſpecies of it ſuppoſed alſo to ariſe from ſtrains, bruiſes, and other accidents. Thoſe perſons lately exhibited in London, under the appellation of the two monſtrous craws, were natives of Italy near the Alps, unqueſtionably afflicted with this diſeaſe.

The Engliſh bronchocele, as Mr. Proſſer has termed it, or as it is otherwiſe called, the Derby neck, becauſe many of the women in the hills of Derbyſhire are ſubject to it, alſo called a wen; is a tumor ariſing on the fore-part of the neck, ſeated in the body of the neck, between the ſkin and wind-pipe, in the thyroid gland; and thus differs from the former, or Alpine bronchocele, which commonly hangs under the chin like dew-laps. Mr. Proſſer diſtinguiſhes it alſo from the ſimilar diſeaſe, which is cauſed by loud crying, coughing, or other means of ſtraining the neck; this, he ſays, is incurable; whereas the other, called the natural or ſpontaneous bronchocele, is eaſily cured by proper and timely application. Dr. Hunter has obſerved, that this diſeaſe appears two or three years before or after menſtruating. When the menſtruation approaches kindly, it ſometimes ſpontaneouſly diſappears. This diſeaſe is almoſt peculiar to women; it is ſoft, or rather flabby to the touch, and moveable; but when it has continued for ſome years after the time of its growing, it becomes more firm. It is attended with a conſiderable difficulty of breathing, in ſome caſes, to ſuch a degree as to occaſion a bad wheezing. The ſituation of this tumor is ſuch, that all attempts to extirpate it are extremely dangerous, and therefore the only method of cure is by diſcuſſion. The moſt celebrated remedy is prepared and ſold at Coventry, which Mr. Proſſer believes conſiſts of equal parts of ſponge, cork and pumice-ſtone, calcined; half a dram of this is mixed with ſugar, and made into a bolus, and laid under the tongue every night. Mr. Proſſer recommends the following powders:

℞ Cinnab. Antimon. opt. levig. ℈j.
Milleped. pp. & pulv.
Spong. calcin. āā gr. xv. m. f. pulvis.

One of theſe is to be taken an hour or two before breakfaſt, for two or three weeks; and after the interval of about a fortnight, they are to be again renewed; and three of the following pills are to be taken at bed-time, during the ſecond courſe of the powders:

℞ Pil. Mercurial. ph. nov. ʒ ß.
Pil. N° 48. æquales.

The doſe is to be adjuſted to the age and conſtitution of the patient, who ſhould be prepared for this courſe by two or three previous purges, and avoid taking cold. If theſe means are uſed for about a month or ſix weeks, without any external application, he has no doubt of ſucceſs. However, the patient ſhould be under twenty-five years of age. At this age the cure is uncertain; but at a more advanced period of life much more improbable, and ſeldom or ever ſucceeds.

BRONCHOTOMY, in chirurgery, the operation of cutting into the wind-pipe, to prevent ſuffocation, in the quinſy, or from other cauſes. See SURGERY.

BRONTIÆ, among naturaliſts, a kind of figured ſtones, commonly hemiſpherical, and divided by five pointed zones, called alſo thunder bolts; whether theſe were formed by nature or art is conteſted by naturaliſts.

BRONZE, a metal, compounded of copper and tin, to which ſometimes other metallic ſubſtances are added, particularly zinc. It is brittle, hard, and ſonorous.

Bronze is employed for various uſes, as for making bells, cannon, and ſtatues; and the proportions of the component metals are varied, to ſuit the ſeveral uſes to which it is applied.

The Egyptians, who are ſaid by ſome to have invented the art of making it, uſe two thirds of braſs, and one third of copper. This compound, like ſome others, is ſpecifically heavier than either of the metals taken ſeparately. A metallic maſs, compoſed of four fifths of copper and one fifth part of tin, weighs in water $7\frac{1}{10}$ grains more than the ſame quantities of theſe two metals would together weigh in water if not allayed. This proves, that in the union of copper and tin there is a penetration of parts, the one metal entering into the pores of the other; and this is further confirmed by an obſervation of Mr. Tillet, member of the royal academy of Sciences. In his memoir concerning the ductility of metals, he takes notice, that when the mixture of copper and tin is made in the proportions abovementioned, the colour of the copper is entirely annulled and covered by that of the tin, although the quantity of the firſt be four times greater; and this ſingular effect cannot be underſtood without admitting a total change in the ſize and diſpoſition of the pores of the compound metal.

Tin being leſs ſubject to ruſt than copper, bronze is alſo found to be leſs liable to be covered with verdigreaſe than pure copper is; and this is one reaſon why it is uſed for cannons, ſtatues, and works expoſed to the air and weather. The greater fuſibility of bronze than copper is alſo an advantageous property, and much facilitates the caſting of large works.

BRONZE, alſo denotes a colour prepared by the colourmen of Paris, wherewith to imitate bronze. There are two ſorts, the red bronze, and the yellow or golden. The latter is made ſolely of copper-duſt, the fineſt and brighteſt that can be got: the former is made of the ſame, with the addition of a little quantity of red oker well pulverized. They are both applied with varniſh. To prevent their turning greeniſh, the work muſt be dried over a chafing-diſh as ſoon as bronzed.

BRONZES, a name given by antiquarians to figures either of men or beaſts, to urns, and, in general, to every piece of ſculpture which the ancients made of that metal. We likewiſe give the name of bronzes to ſtatues or buſts caſt of bronze, whether theſe pieces be copies of antiques, or original ſubjects. Among medalliſts, all copper medals bear the name of bronze.

BRONZING, the art or act of imitating bronze, which is done by means of copper duſt or leaf, faſtened on the outſide, as gold leaves are in gilding.

BROOD, the young of fiſh and fowl.

BROOKLIME, in botany, a ſpecies of ſpeedwell.

Brooklime bears a reſemblance in its flowers to the Paul's betony, though its leaves are larger, and the ridges entire.

Its chief uſe is to abrade and clear away thoſe little viſcoſities which obſtruct the capillaries, and occaſion ſcabs and blotches, though it has alſo a diuretic virtue, and ſerves as a cleanſer of all the viſcera; whence it is a valuable ingredient in antiſcorbutic and deobſtruent compoſitions. Quincy. Diſp.

BROOM, ſingle-ſeeded, Geniſta, in botany, a genus of the diadelphia decandria claſs of plants. For its character, ſee BOTANY.

Among huſbandmen, broom is conſidered as a weed very pernicious to the culture of lands; and, on that account, to be grubbed up and deſtroyed.

It roots deep, and, ſhedding no leaves, is continually ſucking the moiſture from the earth. Good cultivation and treading the land with cattle very ſoon deſtroys broom.

Some pickle the yellow buds with vinegar and ſalt, &c. after the manner of capers, from which they are then ſcarce to be diſtinguiſhed.

Broom is an attenuant, abſtergent, and aperient. The juice of the green ſhoots of broom, or a ſtrong infuſion of them in wine, is an excellent diuretic, and cleanſes the ureters and kidneys. If taken in large doſes it purges by ſtool, and therefore is doubly proper in dropſical caſes. The ſeed of broom is alſo a purge, and that of no weak kind, a dram and a half of it being a ſufficient doſe. The lixivium of broom with white wine is a powerful diuretic, but muſt be taken with caution. There is alſo African broom, Spaniſh broom, Scotch broom, and others.

BROOM is alſo a well known houſhold implement wherewith to ſweep away dirt, duſt, and the like.

We ſay, a birch broom, a hair broom, a ruſh broom, a heath broom. The primitive kind of brooms, from whence the denomination is given to all the reſt, were made of the geniſta, or wild groom.

BROOM *Gall*, in natural hiſtory, a name given by authors to a remarkable ſpecies of galls found on the geniſta vulgaris, or common broom. This is occaſioned, like all other galls, by the puncture and eating of an inſect, and, when opened, is found to contain a ſmall oblong worm, of a red colour, but whoſe ſize requires the uſe of a glaſs in order to ſee it diſtinctly.

BROTHEL HOUSES, the common habitations of proſtitutes. King Henry VIII. by proclamation, in the 37th year of his reign, ſuppreſſed all the ſtews or brothel-houſes which had long continued on the bank ſide in Southwark.

BROTHER, a term of relation between male children, ſprung from the ſame parents, or from the ſame father, or the ſame mother.

The ancients uſed the term brother, indifferently, to almoſt all who ſtood related in the collateral line; as uncles and nephews, couſins-german, &c.

According to the law of Moſes, the brother of a man, who died without children, was obliged to marry the widow of the deceaſed, in order to raiſe up children to him, that his name and memory might not be extinct.

Among us, it is cuſtomary for kings and counſellors at law to give the title brother to each other.

In the civil law, brothers, *fratres*, in the plural number, ſometimes comprehends ſiſters.

BROTHER is alſo a cuſtomary term for prieſts of the ſame perſuaſion to addreſs one another by: but it is more particularly uſed to denote the relation between monks of the ſame convent; as, brother Zachary: in Engliſh, we more uſually ſay, Friar Zachary, from the French word *frere*, brother. Preachers alſo call their hearers, *my brethren*, or *my dear brethren*. This appellation is borrowed from the primitive Chriſtians, who all called each other *brothers*. But it is now principally uſed for ſuch of the religious as are not prieſts; thoſe in orders are generally honoured with the title of *father*, whereas the reſt are only ſimply brothers.

BROWN, among dyers, painters, &c. a duſky colour, inclining towards redneſs. Of this colour there are various ſhades or degrees, diſtinguiſhed by different appellations; for inſtance, Spaniſh brown, a ſad brown, a tawney brown, the London brown, a clove brown, &c.

Spaniſh brown is a dark dull red, of a horſe-fleſh colour. It is an earth; and is of great uſe among painters, being generally uſed as the firſt and priming colour that they lay upon any kind of timber work in houſe-painting intended to be painted dark. That which is of the deepeſt colour, and freeſt from ſtones, is the beſt. Though this is of a dirty brown colour, yet it is much uſed, not to colour drapery, unleſs it be an old man's gown; but to ſhadow vermilion, to lay upon any dark ground behind a picture, or to ſhadow yellow berries in the darkeſt places, when you want lake, &c. It is beſt and brighteſt when burnt in the fire till it be red hot; although, if you would colour any hare, horſe, dog, or the like, it ſhould not be burnt: but, for other uſes, it is beſt when it is burnt; as for colouring wood, poſts, bodies of trees, or any thing elſe of wood, or any dark ground of a picture.

BROWNISTS, in church hiſtory, a religious ſect, which ſprung up in England towards the end of the 16th century. Their leader was one Robert Brown, born at Northampton. They ſeparated from the eſtabliſhed church, and equally diſliked epiſcopacy and preſbyterianiſm. They condemned the ſolemn celebration of marriages in churches; maintaining, that matrimony being a political contract, the confirmation of it ought to proceed from the civil magiſtrate. They rejected all forms of prayer; and held, that the Lord's prayer was not to be recited as a prayer, being given only as a model upon which to form our prayers.

BROWNY, the name of a ſerviceable kind of ſprite, according to a ſuperſtitious notion formerly prevalent in the Hebrides and Highlands of Scotland, (as well as among the country people in England, where he had the name of Robin Goodfellow). He was the very counter part of Milton's Lubber Fiend, who

> Tells how the drudging gobling ſwet,
> To earn his cream-bowl duly ſet,
> When in one night, ere glimpſe of morn,
> His ſhadowy flail hath threſh'd the corn,
> That ten day-lab'rers could not end;
> Then lies him down the Lubber Fiend,
> And, ſtretch'd along the chimney's length,
> Baſks at the fire his hairy ſtrength.

BROWSE, (French *breſſe*, a twig). The ends of the branches of trees, which being young and tender, cattle delight to feed on them; thus we ſay, "the cattle browſe on the trees and hedges, and damage them greatly."

BRUCHUS, in entomology, a genus of inſects belonging to the order of coleoptera. The feelers are filiform, and gradually increaſe in thickneſs. There are ſeven ſpecies, viz.

1. The Piſi, native of America.
2. The Theobromæ of the Eaſt Indies.
3. The Gleditſiæ of America.
4. The Bractis of Jamaica.
5. The Granarius Europe.
6. The Seminarius Europe.
7. The Picticornis Barbary and China.

They all feed on, and are deſtructive to vegetation.

BRUMALES PLANTÆ, in botany, (from *bruma*, winter); plants which flower in our winter: common about the Cape.

BRUMALIA, in Roman antiquity, feſtivals of Bacchus celebrated twice a year; the firſt on the 12th of the kalends of March, and the other on the 18th of the kalends of November. They were inſtituted by Romulus, who during theſe feaſts uſed to entertain the ſenate.

BRUNSFELSIA, a genus of the monogynia order, belonging to the pentandria claſs of plants; of which there is only one ſpecies, viz. the americana.

BRUSH, hairs, or hogs briſtles, faſtened in the holes of a wooden handle or board, pierced for that purpoſe, ſerving to cleanſe divers bodies by rubbing therewith. The manner of making bruſhes is by folding the hair or briſtle in two; and bringing it by means of a packthread, or wire, which is engaged in the fold, through the holes with which the wood is pierced all over, being afterwards faſtened therein with glue. When the holes are thus filled, the ends of the hair is cut with a machine to make the ſurface even.

Shearmens BRUSH, is made of wild boars briſtles; and ſerves to lay the wool or nap of cloth, after ſhearing it for the laſt time.

BRUSH, among painters, a larger and coarſer kind of a pencil made of hair, wherewith to lay the colours on their large pieces. The Chineſe painters bruſh conſiſts of the ſtalk of a plant; whoſe fibres being fretted at both ends, and tied again, ſerve for a bruſh.

Wire BRUSHES, are uſed by ſilver ſmiths and gilders, for ſcrubbing ſilver, copper, or braſs pieces, in order to the gilding of them.

BRUTE, a general name for all animals, except mankind.

Among brutes, the monkey kind bear the neareſt reſemblance to man; both in the external ſhape and internal ſtructure, but more in the former than in the latter. See ANATOMY, Plate I. and *Comparative* ANATOMY, Plate I.

In the monkey kind, the higheſt, and the neareſt approach to the likeneſs of man is the Oran Outang, or Homo Silveſtris. The ſtructure and œconomy of brutes make the objects of what is called *Comparative* ANATOMY. See that Syſtem.

Philoſophers have been much puzzled about the eſſential characteriſtics of brutes, by which they may be diſtinguiſhed from man. Some define a brute to be an animal not riſible, or a living creature incapable of laughter; others call them mute animals. The peripatetics allowed them a ſenſitive power, but denied them a rational one. The Platoniſts allowed them reaſon and underſtanding, though in a degree leſs pure and refined than that of men. Deſcartes maintained that brutes are mere inanimate machines, abſoſutely deſtitute not only of reaſon, but of all thought and perception, and that all their actions were only conſequences of the exquiſite mechaniſm of their bodies. This ſyſtem, however, is much older than Deſcartes; it was borrowed by him from Gomez Pereira, a Spaniſh phyſician, who employed 30 years in compoſing a treatiſe which he entitled *Antoniana Margarita*, from the Chriſtian names of his father and mother. It was publiſhed in 1554: but his opinion had not the honour of gaining partizans, or even of being refuted; ſo that it died with him. Even Pereira ſeems not to have been the inventor of this notion; ſomething like it having been held by ſome of the antients, as we find from Plutarch and St. Auguſtin. Others, who rejected what is now called the Carteſian hypotheſes, have maintained that brutes are endowed with a ſoul eſſentially inferior to that of men; and to this ſoul ſome have allowed immortality, others not.

The opinion of Deſcartes was probably invented, or at leaſt adopted, by him to defeat two objections: one againſt the immortality of the ſouls of brutes, if they were allowed to have any; the other againſt the goodneſs of God, in ſuffering creatures who had never ſinned, to be ſubjected to ſo many miſeries. 1. It is certain, that a number of human actions are merely mechanical; becauſe they are done imperceptibly to the agent, and without any direction from the will; which are to be aſcribed to the impreſſion of objects and the primordial diſpoſition of the machine, wherein the influence of the ſoul has no ſhare; of which number are all habits of the body acquired from the reiteration of certain actions. In all ſuch circumſtances, human beings are no better than automata. 2. The natural liking for, and antipathy againſt, certain objects, which in children precede the power of knowing and diſcriminating them, and which ſometimes in grown perſons triumph over all the efforts of reaſon, are all phenomena to be accounted for from the wonderful mechaniſm of the body, and are ſo many cogent proofs of that irriſiſtible influence of which objects have on the human frame. 3. Every one knows how much our paſſions depend on the degree of motion, into which the blood is put, and the reciprocal impreſſions cauſed by the animal ſpirits between the heart and brain, that are ſo cloſely connected by their nerves; and if ſuch effects may be produced by ſuch ſimple mechanical means as the mere increaſe of motion in the blood, without any direction of the will, we are not to wonder at the actions of brutes being the effects only of a refined mechaniſm, without thought, or perception.

The above is a ſhort abſtract of the arguments that are brought in favour of the Carteſian ſyſtem: but they are evidently very far from being concluſive.

The moſt rational oppoſers of this ſcheme maintain, that brutes are endowed with a principle of ſenſation as well as we, though of an inferior nature to ours. Great diſputes, however, have ariſen on this ſubject; ſome maintaining, that the ſoul of brutes is merely ſenſitive, and that they are altogether deſtitute of reflection and underſtanding; others, that they not only reaſon, but make a better uſe of it than men do. That the brutes are only endowed with ſenſation, and totally deſtitute of all power of reflection, or even reaſoning, is what can by no means be maintained on good grounds: neither can it be aſſerted that they act entirely from inſtinct, or a blind propenſity to certain things without knowing why or wherefore. In numberleſs inſtances, needleſs to be mentioned here, but which will readily occur to every reader, that education will get the better of many of the natural inſtincts of brutes; which could never be the caſe were they abſolutely incapable of reaſoning. On the other hand, it is equally certain, that they are by no means capable of education in the ſame degree that men are; neither are the rational exertions of beaſts at all to be compared even with thoſe of the meaneſt ſavages. One remarkable inſtance of this is in the uſe of the element of fire. The moſt ſavage nations have known how to make this element ſubſervient to their purpoſes; or if ſome have been found who have been entirely ignorant of its exiſtence, they have quickly learned its uſes on ſeeing it made uſe of by others: but though many of the brute creatures are delighted with warmth, and have opportunities every day of ſeeing how fire is ſupplied with fuel, and by that means preſerved, it never was known that one of them attempted to preſerve a fire by this means. This ſhews a ſtrange defect of rationality, unaccountable upon any other ſuppoſition than that the ſoul or ſentient principle of brutes is ſomehow or other inferior in its nature to that of man; but ſtill, it is a ſentient principle, capable of perceptions as quick, and in many inſtances much more ſo than our own.

The celebrated Doctor WOOLASTON, author of the Religion of Nature delineated, thus gives his opinion on the ſubject. The ſufferings of brutes are not like the ſufferings of the human ſpecies; they perceive by moments without reflection upon paſt or future, upon cauſes, circumſtances, or events. Time and life without thinking are next neighbours to nothing: to no time, and no life. And therefore to kill a brute is to deprive him of life, or a remainder of time, that is equal to little more than nothing: this may perhaps be more applicable to ſome of the brute creation than to others. That which is chiefly to be taken care of in the killing brutes is, not to deſtroy them unneceſſarily and through wantonneſs; and when they are killed that they may have as few moments of pain as poſſible.

Language of Brutes. It has been much diſputed whether the brutes have any language whereby they can expreſs their minds to each other; or whether all the noiſe they make conſiſts only of cries inarticulate, and unintelligible even to themſelves. We are, however, too little acquainted with the intellectual faculties of theſe creatures to be able to determine this point. Certain it is, that their paſſions, when excited, are generally productive of ſome peculiar cry; but whether this is deſigned as an expreſſion of the paſſion to others, or only a mechanical motion of the muſcles of the larynx occaſioned by the paſſion, is what we have no means of knowing. We may indeed, from analogy, conclude, with great reaſon, that ſome of the cries of beaſts are really expreſſions of their ſentiments; but whether one beaſt is capable of forming a deſign, and communicating that deſign by any kind of language to others, is what we ſubmit to the judgment of the reader, after giving the following inſtance which among others is brought as a proof of it by father Bougeant, a jeſuit. "A ſparrow finding a neſt that a martin had juſt built, ſtanding very conveniently for him, poſſeſſed himſelf of it. The martin, ſeeing the uſurper in her houſe, called for help to expel him. A thouſand martins came full ſpeed, and attacked the ſparrow; but the latter being covered on every ſide, and preſenting only his large beak at the entrance of the neſt, was invulnerable, and made the boldeſt of them who durſt approach him repent of their temerity. After a quarter of an hour's combat, all the martins diſappeared. The ſparrow thought he had got the better, and the ſpectators judged that the martins had abandoned their undertaking. Not in the leaſt. Immediately they returned to the charge; and each of them having procured a little of that tempered earth with which they make their neſts, they all at once fell upon the ſparrow, and incloſed him in the neſt to periſh there, though they could not drive him thence. Can it be imagined that the martins could have been able to hatch and concert this deſign all of them together, without ſpeaking to each other?"

BRYGMUS, among phyſicians, a grating noiſe made by the gnaſhing of the teeth.

BRYONY, *Bryonia*, a genus of the ſyngeneſia order, belonging to the monœcia claſs of plants.

Species. 1. The alba, rough or white byrony with red flowers, is a native of dry banks under hedges in many parts of Britain. The roots of this plant have by impoſtors been brought into human ſhape, and ſhewn for mandrakes. The method practiſed by theſe people was to find a young thriving plant of bryony; then they opened the earth all round, being careful not to diſturb the lower fibres; and being provided with ſuch a mould as is uſed for making plaſter figures, they fixed the mould cloſe to the root, faſtening it with wire to keep it in its proper ſituation: then they filled the earth about the root, leaving it to grow to the ſhape of the mould; which in one ſummer it will do; ſo that if this is done in March, by September it will have the ſhape. The leaves of this plant are alſo impoſed on people for mandrake-leaves; although there is no reſemblance between them, nor any agreement in quality.

There are five other ſpecies natives of warm climates, conſequently muſt be inhabitants of the green-houſe and hot-houſe, but for their beauty, when in bloſſom, merit cultivation.

Medicinal Uſes, &c. The roots of the firſt ſpecies are uſed in medicine. Theſe are very large, ſometimes as thick as a man's thigh: their ſmell, when freſh, is ſtrong and diſagreeable; the taſte nauſeouſly bitter, acrid, and biting; the juice is ſo ſharp, as in a little time to excoriate the ſkin; in drying, they loſe great part of their acrimony, and almoſt their whole ſcent. Bryony root is a ſtrong irritating cathartic; and as ſuch has ſometimes been ſucceſsfully exhibited in maniacal caſes, in ſome kinds of dropſies, and in ſeveral chronical diſorders, where a quick ſolution of viſcid juices, and a ſudden ſtimulus on the ſolids, were required.

BRYUM, in botany, a genus of the cryptogamia muſci claſs. There are 41 ſpecies, moſt of them natives of Britain.

BUBBLE, in philoſophy, ſmall drops or veſicles of any fluid filled with air; and formed either on its ſurface by an addition of more of the fluid, as in raining, &c. or in its ſubſtance, by an inteſtine motion of its component particles. Bubbles are dilatable or compreſſible, *i. e.* they take up more or leſs room as the included air is more or leſs heated, or more or leſs preſſed from without; and are round, becauſe the included air acts equally from within all around.

Bubble, a cant term given to a kind of project for raiſing money on imaginary grounds, much practiſed in France and England in the years 1719, 1720, and 1721, as the South-Sea ſcheme and others.

BUBO, or **Buboe**, in ſurgery, a tumour which forms in the groin, underneath the arm, and in other parts, proceeding from various cauſes. See Syſtem of SURGERY.

BUBONOCELE, or **Hernia Inguinalis**, in ſurgery, a tumour in the inguen, formed by a prolapſus of the inteſtines, omentum, or both, through the proceſſes of the peritonæum and rings of the abdominal muſcles. See SURGERY.

BUCANEER, one who dries and ſmokes fleſh, or fiſh, after the manner of the Indians. The name was particularly given to the firſt French ſettlers on the iſland of St. Domingo, whoſe ſole employment conſiſted in hunting bulls or wild boars, in order to ſell their hides and fleſh. The name has alſo been applied to thoſe famous piratical adventurers, chiefly Engliſh and French, who joined together to make depredations on the Spaniards in South America. The intrepidity of thoſe people is ſurpriſing. See Raynal's Hiſt. of Ind.

BUCCINA, an ancient muſical and military inſtrument. It is uſually taken for a kind of trumpet; which opinion is confirmed by Feſtus, by his defining it a crooked horn, played on like a trumpet. Vegetius obſerves, that the buccina bent in a ſemicircle, in which reſpect it differed from the tuba or trumpet. In Scripture, the like inſtrument, uſed both in war and in the temple was called ***rams-horns***, ***kiren-jobel***, and ***ſopheroth hagi-jobelim***.

This inſtrument was in uſe among the Jews to proclaim their feaſt-days, new-moons, jubilees, ſabbatic years, and the like. At Lacedæmon, notice was given by the buccina, when it was ſupper-time; and the like was done at Rome, where the grandees had a buccina blown both before and after they ſat down to table. The ſound of the buccina was called ***buccinus***, or ***bucinus***; and the muſician who played on it was called ***buccinator***.

BUCCINUM, or **Whelk**, a genus of ſhell-fiſh belonging to the order of vermes teſtaceæ. This animal is one of the ſnail kind. The ſhell is univalve, ſpiral, and gibbous. The aperture is oval, ending in a ſmall ſtrait canal. Linnæus enumerates about 60 ſpecies, moſt of them from the ſouthern ſeas. Six of which are found in the Britiſh ſeas.

BUCCO, in ornithology, a genus belonging to the order of picæ. See Syſtem of ORNITHOLOGY.

BUCENTAUR, a galeas, or large galley of the doge of Venice, adorned with fine pillars on both ſides, and gilt over from the prow to the ſtern. This veſſel is covered over head with a kind of tent, made of purple ſilk. In it the doge receives the great lords and perſons of quality that go to Venice, accompanied with the ambaſſadors and counſellors of ſtate, and all the ſenators ſeated on benches by him. The ſame veſſel ſerves alſo in the magnificent ceremony of aſcenſion-day, on which the duke of Venice throws a ring into the ſea to eſpouſe it, and to denote his dominion over the gulph of Venice.

Bucentaur, is alſo the name of a ſhip, as great and as magnificent as that of the Venetians, built by order of the elector of Bavaria.

BUCEROS, in ornithology, a genus belonging to the order of picæ. See Syſtem of ORNITHOLOGY.

BUCIOCHE, in commerce, a ſort of woollen cloth, manufactured in Provence in France, which the French ſhips carry to Alexandria and Cairo.

BUCK, in tetrapodology, a male horned beaſt of venery or chaſe, whoſe female is denominated a doe.

Buck is alſo applied to the males of the hare and rabbit kind.

Buck *Bean*, in botany, menyanthes, a plant with large oval leaves pointed at the end like the garden bean; it is perennial, grows wild in marſhy places, and flowers in May. Buck bean is ſometimes called marſh trefoil: ſheep when in health avoid eating buck bean, but when they are attacked by the rot, they devour it greedily as by inſtinct, againſt which diſeaſe it is deemed an antidote. If this be true, the idea merits the farmers ſerious conſideration.

Buck *Wheat*, in botany, polyganum; for its culture and uſe, ſee Syſtem of AGRICULTURE, SECT. VII.

BUCKET, a ſmall portable veſſel to hold water, often made of leather for its lightneſs and eaſy uſe in caſes of fire. It is alſo the veſſel let down into a well, or the ſides of ſhips, to fetch up water. Alſo for domeſtic uſe, but then frequently called a pail.

BUCKING, the firſt operation in the whitening of linen yarn or cloth; and in waſhing if ley made of aſhes is uſed.

BUCKLE, a well known article of dreſs and convenience uſed as a faſtening, conſiſting of a rim, cheap, and tongue.

In heraldry, the buckle may be conſidered, as a token of the ſurety, the faith, and ſervice of the bearer.

BUCKLER, a piece of defenſive armour uſed by the antients. It was worn on the left arm; and compoſed of wickers woven together, or wood of the lighteſt ſort, covered with hides, and fortified with plates of braſs or other metal. The figure was ſometimes round, ſometimes oval, and ſometimes almoſt ſquare. Moſt of the bucklers were curiouſly adorned with all ſorts of figures of birds and beaſts.

The ſcutum, or Roman buckler, was of wood, the parts being joined together with little plates of iron, and the whole covered with a bull's hide. An iron plate went about it without, to keep off blows; and another within, to hinder it from taking any damage by lying on the ground. In the middle was an iron boſs or umbo jutting out, very ſerviceable to glance off ſtones and darts; and ſometimes to preſs violently upon the enemy, and drive all before them.

BUCKRAM, in commerce, a ſort of coarſe cloth made of hemp, gummed, calendered, and dyed ſeveral colours. It is put into thoſe places of the lining of a garment, which one would have ſtiff, and to keep their form. It is alſo uſed in the bodies of womens gowns; and it often ſerves to make wrappers to cover cloths, ſerges, and ſuch other merchandiſes, in order to preſerve them and keep them from the duſt, and their colours from fading. Buckrams are ſold wholeſale by the dozen of ſmall pieces or remnants, each about four ells long, and broad according to the piece from which they are cut. Sometimes they uſe new pieces of linen cloth to make buckrams, but moſt commonly old ſheets and old pieces of ſails.

BUCKSTALL, a toil to take deer, which muſt not be kept by any body that has not a park of his own, under penalties.

BUCOLIC, in ancient poetry, a kind of poem relating to ſhepherds and country affairs, which, according to the moſt generally received opinion, took its riſe in Sicily. The hexameter verſe is the moſt proper for bucolics in the Greek and Latin tongues. Moſchus, Bion, Theocritus, and Virgil, are the moſt renowned of the ancient bucolic poets.

BUD, that part of the ſeed which firſt begins to ſprout, or rather the leaves which firſt appear.

Bud alſo ſignifies the ſprout from whence the branch ariſes. Theſe buds in ſome meaſure reſemble ſeeds, as under a number of ſcaly coverings the rudiments of the young branch are ſeen: but neither the lobes nor the young root are met with; becauſe this tender ſtem is connected with a tree, which ſupplies it with the neceſſary food.

Bud is likewiſe uſed in ſome counties of England for a weaned calf of the firſt year; becauſe the horns are then in the bud.

BUDDING. See Art of Grafting.

BUDDLEIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; of which there are two ſpecies, viz. the americana, and occidentalis. The firſt is a native of Jamaica and moſt of the other American iſlands; where it riſes to the height of ten or twelve feet, with a thick woody ſtem covered with a grey bark. The ſecond grows naturally at Carthagena; and riſes much higher than the other, dividing into a great number of ſlender branches covered with a ruſſet hairy bark, garniſhed with long ſpear-ſhaped leaves ending in ſharp points; they both require the hot houſe, and are raiſed from ſeeds.

BUDGE Barrels, among engineers, ſmall barrels well hooped, with only one head; on the other end is nailed a piece of leather, to draw together upon ſtrings like a purſe. Their uſe is for carrying powder along with a gun or mortar; being leſs dangerous, and eaſier carried, than whole barrels. They are likewiſe uſed upon a battery of mortars, for holding meal-powder.

BUFF, a ſort of leather prepared from the ſkin of the buffalo; which dreſſed with oil, after the manner of ſhammy, makes what we call buff-ſkin. This makes a very conſiderable article in the French, Engliſh, and Dutch commerce at Conſtantinople, Smyrna, and all along the coaſt of Africa. The ſkins of elks, oxen, and other like animals, when prepared after the ſame manner as that of the buffalo, are likewiſe called buffs.

Of buff ſkin, or buff leather, are made a ſort of coats for the horſe or *gens d'armes* of France, bandaliers, belts, &c.

BUFFALO, in tetrapodology, the bubalis, has large black horns bent backward and inward, and plain before. The hair on the back is very hard, but thinly ſcattered over the body. It is a native of Aſia. But they are tamed in Italy, and uſed for the ſame purpoſes as black cattle in other countries. They draw carriages, and are guided by a rope tied to a ſtring thruſt through their noſes. The buffalo is larger than an ox, has a thicker body, and a very hard hide. His pace is ſlow; but he will carry a great burden. They feed in herds like cows; and yield plenty of milk, of which very good butter and cheeſe is made. Their fleſh is pretty good, but not to be compared to beef. The wild buffalo is a very fierce and dangerous animal; he often attacks travellers, and tears them in pieces. However, they are not ſo much to be feared in woods as in plains, becauſe their horns, which are ſometimes ten feet long, are apt to be entangled in the branches of trees, which gives thoſe who are ſurpriſed by them time to eſcape. They are excellent ſwimmers, and will croſs the largeſt rivers without any difficulty. They run wild in great troops on the coaſt of Malabar; for which reaſon ſtrangers are allowed to hunt and kill them at pleaſure.

The little Indian Buffalo, or *Indicus*, has horns ſhorter than its ears, a bunch on its back, and no mane. It is about the ſize of a calf ſix months old, and uſed in the Eaſt Indies for drawing coaches.

BUFFET, or Beaufet, is a little apartment, ſeparated from the reſt of the room, for the diſpoſing of china, glaſs-ware, *&c.*

In houſes of perſons of diſtinction in France, the buffet is a detached room, decorated with pictures, fountains, ciſterns, and vaſes. It is commonly faced with marble or bronze.

BUFFOON, a droll or mimic, who diverts the public by his pleaſantries and follies.

BUG, or Bugg, in entomology, the Engliſh name of a ſpecies of cimex.

Cheap, eaſy, and clean mixture for effectually deſtroying Bugs. Take of the higheſt rectified ſpirit of wine, (viz. lamp-ſpirits) that will burn all away dry, and leave not the leaſt moiſture behind it, half a pint; new diſtilled oil, or ſpirit of turpentine, half a pint; mix them together; and break into it, in ſmall bits, half an ounce of camphire, which will diſſolve it in a few minutes: ſhake them well together; and with a piece of ſpunge, or a bruſh dipt in ſome of it, wet very well the bed or furniture wherein thoſe vermin harbour and breed, and it will infallibly kill and deſtroy both them and their nits, although they ſwarm ever ſo much. But then the bed and furniture muſt be well and thoroughly wet with it (the duſt upon them being firſt bruſhed and ſhook off,) by which means it will neither ſoil, ſtain, nor in the leaſt hurt, the fineſt ſilk or damaſk bed that is. The quantity here ordered of this mixture (that coſts but about a ſhilling) will rid any bed whatever, though it ſwarms with bugs. If any bugs ſhould happen to appear after once uſing it, it will only be for want of well wetting the lacing, &c. of the bed, or the folding of the linens or curtains near the rings, or the joints or holes in and about the bed or head-board, wherein the bugs and nits neſtle and breed; and then their being wetted all again with more of the ſame mixture, which dries in as faſt as you uſe it, pouring ſome of it into the joints and holes where the bruſh or ſpunge cannot reach, will never fail abſolutely to deſtroy them all. Some beds that have much wood work can hardly be thoroughly cleared without being firſt taken down; but others that can be drawn out, or that you can get well behind, to be done as it ſhould be, may. The ſmell this mixture occaſions will be all gone in two or three days; which is very wholeſome, and to many people agreeable. Remember always to ſhake the mixture together very well, whenever you uſe it, which muſt be in the day-time, not by candlelight, leſt the ſubtlety of the mixture ſhould catch the flame as you are uſing it, and occaſion damage. Dodſley's Annual Reg. 1764.

BUGGERY, a connection againſt nature between the human and brute ſpecies. Others have beſtowed time and paper in deſcribing a practice ſo repugnant to decency and probability; but as we truſt none but thoſe who poſſeſs a truly debaſed and filthy curioſity, would wiſh to caſt their eyes on a page ſo contaminated, The Royal Encyclopædia will not in this inſtance follow the faſhion: in the words of the ſweetly deſcriptive Sterne, *we wipe it off, and ſay no more about it.*

BUGLOSS, or Viper's Bugloss, in botany, *anchuſa*, the name of a plant whoſe ſtalks are rough, round, ſolid, and erect.

Bees are very fond of the viper's bugloſs, and there is reaſon to think that this plant, aſſiſted by the culture of a ſkilful gardener, may receive, perhaps, as many improvements as the auricula did. Its branches will riſe to the height of three feet, and no vegetable would better adorn flower-pots in large chimnies; for if the water be changed, it continues blowing near a fortnight after cutting. Its ultra-marine, blue-colour, is the fineſt that can be ſeen, and the ſtalks are garniſhed with flowers from top to bottom; dyers might, perhaps, extract an uſeful tincture from the roots. This plant grows wild in hard harſhy ſoils.

BUILDING, a fabric erected by art, either for devotion, magnificence, or conveniency.

Building is alſo uſed for the art of conſtructing and raiſing an edifice; in which ſenſe it comprehends as well the expences as the invention and execution of the deſign.

For a hiſtory of the riſe and progreſs of building from the earlieſt ages to the preſent time, alſo for complete inſtructions for conſtructing and ornamenting the cottage and the palace, ſee Syſtem of Architecture, and the eight annexed Plates.

BUL, in the ancient Hebrew chronology, the eighth month of the eccleſiaſtical, and the ſecond of the civil, year; it has ſince been called Marſhevan, and anſwers to our October.

BULAFO, a muſical inſtrument, conſiſting of ſeveral pipes of wood tied together with thongs of leather, ſo as to form a ſmall interſtice between each pipe. It is uſed by the negroes of Guinea.

BULB, or Bulbous Root, ſignifies a root of a roundiſh figure, and uſually furniſhed with fibres at its baſe.

Bulbous roots are ſaid to be ſolid, when compoſed of one uniform lump of matter; truncated, when compoſed of a multitude of coats ſurrounding each other; ſquamoſe, when compounded of, or covered with, leſſer flakes; duplicate, when there are only two to each plant; and congerate, when there is a congeries of ſuch roots to each plant.

Dr. Grew obſerves, that in bulbous plants, as well as many other perrenial ones, the root is annually renewed, or repaired, out of the trunk or ſtalk itſelf: that is, the baſis of the ſtalk continually and inſenſibly deſcends below the ſurface of the earth; and hiding itſelf therein, is both in nature, place, and office, changed into a true root. Thus, in brownwort, the baſe, ſinking by degrees, becomes the upper part of the root; the next year, the lower part; and the next it rots away, a freſh ſupply coming.

BULCARD, an Engliſh name for the galcetta, a ſmall ſea-fiſh caught among the rocks on the Corniſh and other ſhores.

BULGARIAN *Language*, the ſame with the lingua heneta, or ſclavonic.

BULGOLDA *Lapis*, the name of the ſtone taken out of the head of an animal in America.

BULIMY, an enormous appetite, attended with fainting, and coldneſs of the extremities, called alſo canine appetite. See MEDICINE.

BULK *of a Ship*, denotes her whole content in the hold for ſtowage of goods.

BULK *Heads*, are partitions made acroſs a ſhip, or lengthways, with boards of timber, whereby one part is divided from another.

BULL, in eccleſiaſtical writers, denotes an inſtrument diſpatched out of the Roman chancery, ſealed with lead; anſwering to the edicts, letters patent, and proviſions, of ſecular princes.

We meet with four kinds of theſe bulli, or bullæ; golden, ſilver, waxen, and leaden; all in uſe among the emperors and kings of the middle and barbarous ages. In ſome, the impreſſion is made on the ſolid metal itſelf; in others on wax, and only incloſed in a metalline box, or caſe.

The bull is the third kind of apoſtolical reſcript, and the moſt in uſe, both in affairs of juſtice and of grace.

If the bulls be letters of grace, the lead is hung on ſilken threads; if they be letters of juſtice, and executory, the lead is hung by a hempen cord. They are all wrote in an old round Gothic letter.

The ſeal preſents, on one ſide, the heads of St. Peter and St. Paul; on the other, the name of the pope, and the year of his pontificate.

BULL, the male of the ſpecies called the neat or cow kind. Reſpecting thoſe of our own country, ſee Syſtem of AGRICULTURE, Sect. XXIII. and the word DAIRY.

This ſpecies in a wild ſtate, now ſo numerous on the continent of America, are ſaid to have ſprung from one bull and ſeven cows, which were carried thither by ſome of the firſt conquerors.

In the iſland of Hiſpaniola, the French buccaneers purſue bulls with dogs, and kill them with fire-arms. At Buenos Ayres, the Spaniſh toradors chaſe them on horſeback, armed with a long lance, at the end of which is a half-moon of ſharp ſteel. Having drawn a number of the horned kind together, they let the cows eſcape, but dextrouſly take the bulls with their half-moons on the hind-legs, by which, diſabling them from flight, they are eaſily diſpatched.

The hunting both of the bull and boar is at this day carried on, and proves of conſiderable importance. That of the former furniſhes France with the fineſt hides brought from America. The bucaneers put the hides in packs which they call loads, mixing together hides of full grown bulls, of young bullocks, and of cows. Each of theſe loads is compoſed of two bull-hides, or of an equivalent; that is to ſay, either of two real bull-hides, or of one bull-hide and two cow-hides, or of four cow-hides, or of three young bullocks hides; three bullocks hides being reckoned equivalent to two full grown bulls hides, and two cows hides equivalent to one bulls hide. Theſe bulls they commonly call oxen in France, though they be not gelt. Each load is commonly ſold for ſix pieces of eight rials, which is a Spaniſh coin, the French coin being but little current, or not at all, in the iſland of St. Domingo.

The boar meat bucanned, in the manner above mentioned is ſold by the bundle or pack, weighing commonly 60 pounds, at the rate of ſix pieces of eight per pack. The palmetto leaves ſerve to pack it up in; but their weight is deducted, ſo that there muſt be in each pack 60 pounds of net fleſh. Theſe bucaneers have alſo a great trade of the lard of boars, which they melt, and gather in large pots called potiches. This lard, which is called mantegua, is alſo ſold for about eight pieces of eight per pot. There is a great trade, and a great conſumption of each of theſe merchandizes in the French ſettlements of the iſland of St. Domingo, and in thoſe of Tortuga: beſides which, they uſed to ſend great quantities of them to the Antilles, and even into the continent of French America. There is alſo a great deal of it ſold for the ſupport of the crews of the ſhips that come from France for trading, or which the privateers of Tortuga fit out for cruiſing againſt the Spaniards.

BULL *Fighting*, a ſport or exerciſe much in vogue among the Spaniards and Portugueſe, conſiſting in a kind of combat of a cavalier or torador againſt a wild bull, either on foot or on horſeback, by riding at him with a lance. This ſport the Spaniards received from the Moors, among whom it was celebrated with great eclat. The Moors probably received the cuſtom from the Romans, and they from the Greeks.

BULL *Finch*, a ſpecies of the loxia. This is a very pernicious bird in gardens and orchards. They feed on the young buds of trees in ſpring, which contain the bloſſoms for the ſummer's fruit. The black-thorn, or ſloe-tree is the great favourite of the bull-finch, in the field, and in the garden, the damſon tree; on this account they ſhould be watched early in the ſpring, when the bud of all fruit-trees is endangered by them.

The wild note of this bird is not in the leaſt muſical; but when tamed, it may be taught any tune after a pipe, or to whiſtle any notes; and it ſeldom forgets what it has learned. Theſe birds may be taught to ſpeak, and ſome thus inſtructed are annually brought to London from Germany.

BULL *Frog*, a ſpecies of the frog, common in Sweden, and the northern parts of America, with four divided toes on the fore-feet, and five webbed ones on the hinder. When the limbs are extended, it meaſures near two feet: it is very voracious, and will frequently ſwallow young ducks and other fowl; its croaking is ſo loud as to reſemble the roaring of a bull; whence its name.

BULL *Head*, the Engliſh name given to a ſmall fiſh of the cottus kind, found very frequently in ſhallow running waters, called alſo the Miller's thumb.

BULLA, in antiquity, a golden ornament of a globular figure, and hollow within, wherein was contained ſome amulet, to ſerve as a preſervative from witchcraft and envy, hung about the neck by thoſe who triumphed among the Romans, and alſo by the children of the patricians, as a badge of their hereditary nobility and freedom. Mr. Whitaker, in his hiſtory of Mancheſter, mentions one of gold, lately found near that place which had no apperture at which an amulet could be introduced.

BULLACE *Tree*, in botany, a ſpecies of plum tree, or rather the ſloe, it grows wild and is a native of this country.

BULLET, an iron or leaden ball or ſhot, wherewith fire arms are loaded. Bullets are caſt in iron moulds, conſiſting of two concave hemiſpheres, with a handle whereby to hold them: and between them is a hole, called the gate, at which to pour in the melted metal. The chaps or hemiſpheres of bullet moulds are firſt punched, being blood-red hot, with a round ended punch, of the ſhape and nearly of the ſize of the intended bullets. To cleanſe the inſides, they make uſe of a bullet bore, which conſiſts of a ſteel ſhank, having a globe at one end, wherewith to bore the inſide of a mould clean, and of the intended ſize.

BULLION, uncoined gold or ſilver in the maſs.

Thoſe metals are called ſo, either when ſmelted from the native ore, and not perfectly refined; or when they are perfectly refined, but melted down in bars or ingots, or in any unwraught body, of any degree of fineneſs.

When gold and ſilver are in their purity, they are ſo ſoft and flexible, that they cannot well be brought into any faſhion for uſe, without being firſt reduced and hardened with an alloy of ſome other baſer metal.

To prevent theſe abuſes which ſome might be tempted to commit in the making of ſuch alloys, the legiſlators of civilized countries have ordained, that there ſhall be no more than a certain proportion of a baſer metal to a particular quantity of pure gold or ſilver, in order to make them of the fineneſs of what is called the ſtandard gold or ſilver of ſuch a country.

Silver and gold, whether coined or uncoined, (though uſed for a common meaſure of other things), are no leſs a commodity, than wine, tobacco, or cloth; and may, in many caſes, be exported as much to the national advantage as any other commodity.

BUMICILLI, a ſect of Mahometan ſorcerers in Africa: they pretend to fight againſt the devil; and frequently run about covered with blood and bruiſes, in a great fright.

BUNT *of a Sail*, is the middle part of it purpoſely formed into a kind of bag or pouch, that it may catch and receive the more wind.

The bunt is chiefly uſed in topſails; for courſes are for the moſt part cut ſquare, or at leaſt with a ſmall allowance for bunt or compaſs. They ſay the bunt holds much leeward wind; that is, it hangs too much to leeward.

BUNTING, in ornithology, the Engliſh name of the EMBERIZA.

The bill of this bird is ſingularly conſtructed; the ſides of the upper mandible form a ſharp angle, bending towards the lower; and in the roof of the former is a hard knob, adapted to bruiſe corn or other ſeeds.

BUOY, at ſea, a block of wood, or cork, ſometimes an empty caſk well cloſed, ſwimming on the ſurface of the water, and faſtened by a chain or cord, to a large ſtone, piece of broken cannon, or the like; ſerving to mark the dangerous places near a coaſt, or rocks, ſhoals, wrecks of veſſels, &c.

Alſo a piece of wood, or a barrel at ſea, faſtened ſo as to float directly over the anchor; that the men, who go in the boat to weigh the anchor, may certainly know where the anchor lies.

BUPRESTES, a ſort of oblong cantharides, of a ſtinking ſmell, and very ſevere bite. It is of the ſame nature with the common cantharides, or Spaniſh fly, and does great injury to the cattle which eat it. They form, in entomology, a genus of inſects, of the order of coleoptera, comprehending ſeveral ſpecies.

BURCA, among the Turks, the name of the rich covering of the door of the houſe at Mecca; it is ten feet long, and five wide; and there are ſeveral figures and Arabic letters on it, very richly embroidered in gold, on a ground of red and green.

BURDEN, ſignifies a heavy weight or load.

BURDOCK, *Arctium*, in botany, a genus of the ſyngeneſia polygamia æqualis claſs of plants. There are three ſpecies; the two firſt of which are common weeds, growing on the ſides of roads and foot paths in moſt parts of England; and are not cultivated in botanic gardens. The firſt is ordered for medicinal uſe by the college of phyſicians.

The root of the common burdock is a very powerful diuretic and diaphoretic. It is given with great ſucceſs, in decoction, in obſtructions of the ſpleen, and in dropſies. It is alſo recommended by ſome in all diſeaſes of the breaſt and lungs, in aſthmas, in the ſtone, and in the ſciatica. The ſeed of it is eſteemed by many to be one of the greateſt remedies for the ſtone known; and, by the inſtances that have been produced of its doing ſervice in diſeaſes of the reins, it ſeems to merit a fair trial. The freſh leaves are by ſome recommended as a dreſſing for old ulcers, and for burns and luxations. They are alſo applied to the ſoles of the feet, as a remedy in hyſteric complaints.

The leſſer BURDOCK, or *Xanthium*, is a genus of the monœcia pentandria claſs. There are four ſpecies.

The roots of this are of a bitter and acrid taſte, and are recommended as of great ſervice in ſcrophulous caſes.

BURGAGE, tenure, proper to boroughs and towns, whereby the inhabitants hold their lands and tenements of the king, or other lord, at a certain yearly rate.

BURGESS, an inhabitant of a borough, or one who poſſeſſes a tenement therein, which gives a right to vote for members of parliament.

In other countries, burgeſs and citizen are confounded together; but with us they are diſtinguiſhed.

The word is alſo applied to the magiſtrates of ſome towns; as the bailiff and burgeſſes of Weſtminſter, and many others.

BURGESS is now ordinarily uſed for the repreſentative of a borough town in parliament.

BURGHMOTE, the court of a borough. By the laws of king Edgar, the burghmote was to be held thrice in the year; by thoſe of Henry I. 12 times.

BURGLARY, or NOCTURNAL HOUSE-BREAKING, *burgi latrocinium*, which by the ancient Engliſh law was called *hameſucken*, as it is in Scotland to this day, has always been looked upon as a very heinous offence; not only becauſe of the abundant terror it carries with it, but alſo as it is a forcible invaſion and diſturbance of that right of habitation which every individual might acquire even in a ſtate of nature; an invaſion, which, in ſuch a ſtate, would be ſure to be puniſhed with death, unleſs the aſſailant were ſtronger. But, in civil ſociety, the laws come into the aſſiſtance of the weaker party: and, beſides that they leave him this natural way of killing the aggreſſor if he can, they alſo protect and avenge him in caſe the aſſailant is too powerful. And the law has ſo particular and tender regard to the immunity of a man's houſe, that it ſtyles it his caſtle, and will never ſuffer it to be violated with impunity; agreeing herein with the ſentiments of ancient Rome. For this reaſon no outward doors can in general be broken open to execute any civil proceſs; though in criminal cauſes the public ſafety ſuperſedes the private.

The definition of a burglary, as given us by Sir Edward Coke, is, "he that by night breaketh and entereth into a manſion-houſe, with intent to commit a felony." In this definition there are four things to be conſidered; the time, the place, the manner, and the intent.

1. The time muſt be by night, and not by day: for in the day-time there is no burglary; *i. e.* if there be day-light or crepuſculum enough, begun or left, to diſcern a man's face withal. But this does not extend to moonlight; for then many midnight burglaries would go unpuniſhed; and beſides, the malignity of the offence does not conſiſt ſo much in its being done in the dark, as at the dead of night; when all the creation, except beaſts of prey, are at reſt; when ſleep has diſarmed the owner, and rendered his caſtle defenceleſs.

2. As to the place. It muſt be, according to Sir Edward Coke's definition, in a manſion-houſe: for no diſtant barn, warehouſe, or the like, are under the ſame privileges, nor looked upon as a man's caſtle of defence; nor is breaking open of houſes wherein no man reſides, and which for the time being are not manſion-houſes, attended with the ſame circumſtances of midnight terror. A houſe, however, wherein a man ſometime reſides, and which the owner hath left only for a ſhort ſeaſon, *animo revertendi*, is the object of burglary, though no one be in it at the time of the fact committed. And if the barn, ſtable, or warehouſe, be parcel of the manſion-houſe, though not under the ſame roof or contiguous, a burglary may be committed therein; for the capital houſe protects and privileges all its branches and appurtenants, if within the curtilage or homeſtall.

3. As to the manner of committing burglary: there muſt be both a breaking and an entry to complete it. But they need not both be done at once; for, if a hole be broken one night, and the ſame breakers enter the next night through the ſame, they are burglars. But if a perſon leaves his doors or windows open, it is his own folly and negligence; and if a man enters therein it is no burglary; yet, if he afterwards unlocks an inner or chamber door, it is ſo. To come down a chimney is held a burglarious entry; for that is as much cloſed as the nature of things will permit. So alſo, to knock at the door, and, upon opening it, to ruſh in with a felonious intent; or, under pretence of taking lodgings, to fall upon the landlord and rob him; or to procure a conſtable to gain admittance in order to ſearch for traitors, and then to bind the conſtable and rob the houſe; all theſe entries have been adjudged burglarious, though there was no actual breaking: for the law will not ſuffer itſelf to be trifled with by ſuch evaſions, eſpecially under the cloke of legal proceſs.

4. As to the intent, it muſt be clear that ſuch breaking and entry be with a felonious intent, otherwiſe it is only a treſpaſs.

BURGOMASTER, the chief magiſtrate of the great towns in Flanders, Holland, and Germany. The power and juriſdiction of the burgomaſter is not the ſame in all places, every town having its particular cuſtoms and regulations: at Amſterdam there are four choſen by the voices of all thoſe people in the ſenate who have either been burgomaſters or echevins. Their authority reſembles that of our lord-mayor and aldermen; they diſpoſe of all under offices that fall in their time, keep the key of the bank, and enjoy a ſalary of 500 guilders, all feaſts, public entertainments, &c. being defrayed out of the common treaſury.

BURGOO, or BURGOUT, a ſea-faring diſh, made of whole oatmeal, or greets, boiled in water, till they burſt; then mixed with butter. It is made in Scotland and in Wales, by mixing oatmeal and water, and boiling it into a moderate conſiſtence. It is a cheap and ſtrengthening diet.

BURGOO is held by Cockburn very proper to correct that thickneſs of humours and coſtiveneſs to which the other diet of ſailors much diſpoſes them. Yet the burgoo victualling is the leaſt liked of all their proviſions, becauſe of the ſcanty allowance of butter to it. The ſame author thinks it might be worth the conſideration of thoſe to whom the care of the ſeamen is committed, to contrive to render this food more agreeable to them.

BURIAL, the interment of a deceaſed perſon.

The rites of burial are looked upon in all countries, and at all times, as ſacred. Nor are we to wonder, that the ancient Greeks and Romans were extremely ſolicitous about the interment of their deceaſed friends, ſince they were ſtrongly perſuaded, that their ſouls could not be admitted into the Elyſian fields till their bodies were committed to the earth; and if it happened that they never obtained the rites of burial, they were excluded from the happy manſions for the term of 100 years.

Of thoſe who were allowed the rites of burial, ſome were diſtinguiſhed by particular circumſtances of diſgrace attending their interment: thus perſons killed by lightning were buried apart by themſelves; thoſe who waſted their patrimony, forfeited the right of being buried in the ſepulchres of their fathers; and thoſe who were guilty of ſelf-murder were privately depoſited in the ground, without the accuſtomed ſolemnities. Among the Jews, the privilege of burial was denied only to ſelf-murderers, who were thrown out to rot on the ground. The primitive Chriſtian church denied the more ſolemn rites of burial to unbaptized perſons, ſelf-murderers, and excommunicated perſons who continued obſtinate and impenitent, in a manifeſt contempt of the church's cenſures.

The place of burial among the Jews was never particularly determined. We find they had graves in the town and country, upon the highways, in gardens, and upon mountains. Among the Greeks, the temples were made repoſitories for the dead in the primitive ages; yet the general cuſtom in latter ages, with them, as well as with the Romans and other heathen nations, was to bury their dead without their cities, and chiefly by the highways. They ſeem to have had a particular averſion to burning; their method was to put the body whole into the ground, or, if there was occaſion for any other way of burying, they embalmed the body, and laid it in a catacomb.

The Danes, and northern nations, in their ſecond age, buried their dead under earthen hillocks. Sometimes huge pyramids of ſtone were raiſed over their bodies, many of which are ſtill remaining in divers parts of England.

In the eighth century, the people began to be admitted into the church-yards; and ſome princes, founders, and biſhops, into the church. The practice was firſt introduced into the Romiſh church by Gregory the Great, who was brought over into England by Cuthbert, archbiſhop of Canterbury, about the year 750: and the practice of erecting vaults in chancels, and under the altars, was begun by Lanfranc, archbiſhop of Canterbury, when he had rebuilt the church in this city, about the year 1705. From that time, the matter ſeems to have been left to the diſcretion of the biſhop. By our common law, no perſon can be buried within the church, without conſent of the incumbent, excluſively of the biſhop; becauſe the freehold of the church belongs to him, and he is deemed the beſt judge who are entitled to the favour of being buried in the church.

BURLESQUE, a ſpecies of compoſition intended to excite laughter and ridicule; practiſed with wonderful ſucceſs by our countrymen BUTLER and COTTON; the former in *Hudibras*, and the latter in *Virgil Traveſtie*.

A more polite kind of burleſque, but equally ſatirical, is the *Martinus Scriblerius* of Mr. Pope, and thoſe recent publications the *Rolliad* and *Probationary Odes*. Who can avoid laughing, when the following lines are given as the production of a gentleman, who having traverſed the globe, returns completely qualified for a Britiſh ſenator? And thus addreſſes his wondering hearers:

"Begin the ſong from whence the Rhine,
The Elbe, the Danube, Weſer, rolls;—
Joſeph, nine Circles, forty ſeas are thine,—
Thine twenty million ſouls!
I burn, I burn, I glow, I glow,
With antique and with modern lore,
I ruſh from Boſphorus to Po,
To Nilus from the Nore.
Why were thy pyramids, O! Egypt rais'd,
But to be meaſur'd, and be prais'd?
Avaunt ye crocodiles! your threats are vain!
On Norway's ſeas, my ſoul unſhaken,
Brav'd the ſea ſnake and the kraken;
And ſhall I heed the river's ſcaly train?
Afric, I ſcorn thy alligator band!
Quadrant in hand,
I take my ſtand,
And eye thy moſs-clad needle, Cleopatra grand!

Probationary Ode, No. 9

Machinery may be employed in a burleſque poem as the Lutrin of Boileau, or Hudibras, with more ſucceſs and propriety than in any other ſpecies of poetry. For burleſque poems, though they aſſume the air of hiſtory, give entertainment chiefly by their pleaſant and ludicrous pictures: it is not the aim of ſuch a poem to raiſe ſympathy; and for that reaſon, a ſtrict imitation of nature is not neceſſary. And hence, the more extravagant the machinery in a ludicrous poem, the more entertainment it affords.

BURN, in a general ſenſe, implies the effects of fire or exceſſive heat in ſubſtances whereby they are conſumed or injured. In ſurgery or medicine, injury received by fire or heat in any part of the body.

Luſitanus recommends an unguent, made of the aſhes of laurel leaves burnt, with hog's fat dropped on them, for a burn; or, on occaſion, the *unguentum populeum*, with vine-leaves laid over it. Panarole obſerves, that clay laid on a burn abates the pain; and that the brewers in Holland uſe a decoction of ivy for the cure of burns.

For the complete management of burns and ſcalds, ſee SURGERY.

BURNET, in botany, *Poterium*, a plant cultivated for the uſe of cattle. See Syſtem of AGRICULTURE.

BURNING, the action of fire on ſome pabulum or fuel, by which the minute parts thereof are put into a violent motion, and ſome of them aſſuming the nature of fire themſelves, fly off *in orbem*, while the reſt are diſſipated in form of vapour, or reduced to aſhes.

BURNING, in antiquity, a way of diſpoſing of the dead, much practiſed by the ancient Greeks and Romans, and ſtill retained by ſeveral nations in the Eaſt and Weſt Indies. The antiquity of this cuſtom riſes as high as the Theban war, where we are told of the great ſolemnity accompanying this ceremony at the pyre of Menæceus and Archemorus, who were co-temporary with Jair the eighth judge of Iſrael. The origin of this cuſtom ſeems to have been out of friendſhip to the deceaſed; their aſhes were preſerved as we preſerve a lock of hair, a ring, or a ſeal, which had been the property of a deceaſed friend.

Kings were burnt in cloth made of the aſbeſtos ſtone, that their aſhes might be preſerved pure from any mixture with the fuel and other matters thrown on the funeral pile. The ſame method is ſtill obſerved with the princes of Tartary. Among the Greeks, the body was placed on the top of a pile, on which were thrown divers animals, and even ſlaves and captives, beſides unguents and perfumes. The manner of burning among the Romans was not unlike that of the Greeks: the corpſe, being brought out without the city, was carried directly to the place appointed for burning it; which, if it joined to the ſepulchre, was call buſtum; if ſeparate from it, uſtrina; and there laid on the rogus or pyra, a pile of wood prepared, on which to burn it, built in ſhape of an altar, but of different height according to the quality of the deceaſed. The body was not placed on the bare pile, but on the couch or bed whereon it lay. This done, the next of blood performed the ceremony of lighting the pile; which they did with a torch, turning their face all the while the other way, as if it were done with reluctance. During the ceremony, decurſions and games were celebrated; after which came the oſſilegium, or gathering of the bones and aſhes; alſo waſhing and anointing them, and repoſiting them in urns.

Among ſurgeons, burning denotes the application of an actual cautery, that is, a red-hot iron inſtrument, to the part affected, otherwiſe denominated cauterization. The whole art of phyſic among the Japoneſe lies in the choice of places proper to be burnt; which are varied according to the diſeaſe. In the country of the Mogul, the colic is cured by an iron ring applied red-hot about the patient's navel. Certain it is, that ſome very extraordinary cures have been performed accidentally by burning. The following caſe is recorded in the Memoirs of the Academy of Sciences by M. Homberg. A woman, who for ſeveral years had her legs and thighs ſwelled in an extraordinary manner, found ſome relief from rubbing them before the fire with brandy every morning and evening. One evening the fire chanced to catch the brandy ſhe had rubbed herſelf with, and ſlightly burnt her. She applied ſome brandy to her burn; and in the night all the water her legs and thighs were ſwelled with was entirely diſcharged by urine, and the ſwelling did not again return.

BURNING GLASS.

A convex glaſs commonly ſpherical, which being expoſed directly to the ſun, collects all the rays falling thereon into a very ſmall ſpace called the focus; where wood, or any other combuſtible matter being put, will be ſet on fire. The term burning-glaſs is alſo uſed to denote thoſe concave mirrors, whether compoſed of glaſs quick-ſilvered, or of metalline matters, which burn by reflection, condenſing the ſun's rays into a focus ſimilar to the former.

Among the moderns, the moſt remarkable burning mirrors are thoſe of Settala, of Villette, of Tſchirnhauſen, and M. Buffon. Settala, canon of Padua, made a parabolic mirror, which, according to Schottus, burnt pieces of wood at the diſtance of 15 or 16 paces.

M. Tſchirnhauſen's mirror at leaſt equals the former, both in bigneſs and effect. The following things are noted of it in the *Acta Eruditorum*. 1. Green wood takes fire inſtantaneouſly, ſo as a ſtrong wind cannot extinguiſh it. 2. Water boils immediately; and eggs in it are preſently edible. 3. A mixture of tin and lead, three inches thick, drops preſently, and a little after burns into holes. 4. Things not capable of melting, as ſtones, bricks, &c. becoming ſoon red-hot, like iron. 5. Slate becomes firſt white, then a black glaſs 6. Tiles are converted into a yellow glaſs, and ſhells into a blackiſh yellow one. 7. A pumice-ſtone, emitted from a volcano, melts in white glaſs; and, 8. A piece of crucible alſo vitrifies in eight minutes. 9. Bones are ſoon turned into an opaque glaſs, and earth into a black one. The breadth of this mirror is near three Leipſic ells, its focus two ells from it; it is made of copper, and its ſubſtance is not above double the thickneſs of the back of a knife.

Vilette, a French artiſt of Lyons, made a large mirror, which was bought by Tavernier, and preſented to the king of Perſia; a ſecond, bought by the king of Denmark; a third preſented by the French king to the royal academy; a fourth has been in England, where it was publickly expoſed. The effect hereof, as found by Dr. Harris and Dr. Deſaguliers, are, that a ſilver ſixpence is melted in 7″ and ½, a king George's halfpenny in 16″, and runs with a hole in 34. Tin melts in 3″, caſt-iron in 16″, ſlate in 3. An emerald melts into a ſubſtance like a turquois ſtone; a diamond weighing four grains loſes ⅞ of its weight: the aſbeſtos vitrifies; as all other bodies will do, if kept long enough in the focus; but when once vitrified, the mirror can go no farther with them. This mirror is 47 inches wide, and is ground to a ſphere of 76 inches radius; ſo that its focus is about 38 inches from the vertex. Its ſubſtance is a compoſition of tin, copper, and tin-glaſs.

Every lens, whether convex, plano-convex, or convexo-convex, collects the ſun's rays, diſperſed over its convexity, into a point by refraction; and is therefore a burning glaſs. The moſt conſiderable of this kind is that made by M. de Tſchirnhauſen, before mentioned; the diameter of his lens's are three and four feet, the focus at the diſtance of 12 feet, and its diameter an inch and a half. To make the focus the more vivid, it is collected a ſecond time by a ſecond lens parallel to the firſt, and placed in that point where the diameter of the cone of rays formed by the firſt lens is equal to the diameter of the ſecond: ſo that it receives them all; and the focus, from an inch and a half, is contracted into the ſpace of eight lines, and its force increaſed proportionably.

Sir Iſaac Newton preſented a burning-glaſs to the Royal Society, conſiſting of ſeven concave glaſſes, ſo placed, as that all their foci join in one phyſical point. Each glaſs is about 11 inches and a half in diameter: ſix of them are placed round the ſeventh, to which they are all contiguous; and they form a kind of ſegment of a ſphere, whoſe ſubtenſe is about 34 inches and a half, and the central glaſs lies about an inch farther in than the reſt. The common focus is about 22 inches and a half diſtant, and about an inch in diameter. This glaſs vitrifies brick or tile in 1″, and melts gold in 30″.

It would appear, however, that glaſs quickſilvered is a more proper material for burning-glaſſes than metals; for the effects of that ſpeculum wherewith Mr. Macquer melted the platina, ſeem to have been ſuperior to thoſe above mentioned, though the mirror itſelf was much ſmaller. The diameter of this glaſs was only 22 inches, and its focal diſtance 28. Black flint, when expoſed to the focus, being powdered to prevent its crackling and flying about, and ſecured in a large piece of charcoal, bubbled up, and ran into tranſparent glaſs in leſs than half a minute. Heſſian crucibles, and glaſs-houſe pots, vitrified completely in three or four ſeconds. Forged iron ſmoked, boiled, and changed into a vitreſcent ſcoria as ſoon as it was expoſed to the focus. The gypſum of Montmartre, when the flat ſides of the plates or leaves of which it is compoſed were preſented to the glaſs, did not ſhow the leaſt diſpoſition to melt; but, on preſenting a tranſverſe ſection of it, or the edges of the plates, it melted in an inſtant, with a hiſſing noiſe, into a browniſh yellow matter. Metallic and calcarous bodies, melted with ſo much the more difficulty as they were more white and poliſhed, inflecting part of the ſun's rays; and this difference was ſo remarkable, that in the focus of this mirror, ſo fuſible a metal as ſilver, when its ſurface was poliſhed, did not melt at all. For a further account, ſee Syſtem of Optics.

Burning *Springs*. Of theſe there are many in different parts of the world; particularly one in Dauphiny near Grenoble; another near Hermanſtadt in Tranſylvania; a third at Chermay, a village near Switzerland; a fourth in the canton of Friburg; and a fifth not far from the city of Cracow in Poland. There alſo is, or was, a famous ſpring of the ſame kind at Wigan in Lancaſhire, which, upon the approach of a lighted candle, would take fire and burn like ſpirit of wine for a whole day. But the moſt remarkable one of this kind, or at leaſt that of which we have the moſt particular deſcription, was diſcovered in 1711 at Broſely in Shropſhire. The following account of this remarkable ſpring was given by the reverend Mr. Maſon, Woodwardian profeſſor at Cambridge, dated February 18th, 1746. "The well for four or five feet deep is ſix or ſeven feet wide; within that is another leſs hole of like depth dug in the clay, in the bottom whereof is placed a cylindric earthen veſſel, of about four or five inches diameter at the mouth, having the bottom taken off and the ſides well fixed in the clay rammed cloſe about it. Within the pot is a brown water thick as puddle, continually forced up with a violent motion beyond that of boiling water, and a rumbling hollow noiſe, riſing or falling by fits five or ſix inches; but there was no appearance of any vapour riſing, which perhaps might have been viſible, had not the ſun ſhone ſo bright. Upon putting a candle down at the end of a ſtick, at about a quarter of a yard diſtance, it took fire, darting and flaſhing after a very violent manner for about half a yard high, much in the manner of ſpirits in a lamp, but with great agitation. It was ſaid, that a tea-kettle had been made to boil in about nine minutes time, and that it had been left burning for 48 hours without any ſenſible diminution. It was extinguiſhed by putting a wet mop upon it; which muſt be kept there for a little time, otherwiſe it would not go out. Upon the removal of the mop there riſes a ſulphureous ſmoke laſting about a minute, and yet the water is very cold to the touch." In 1755, this well totally diſappeared by the ſinking of a coal-pit in its neighbourhood.

The cauſe of the inflammable property of ſuch waters, is with great probability ſuppoſed to be their mixture with petroleum, which is one of the moſt inflammable ſubſtances in nature, and has the property of burning on the ſurface of the water.

BURNISHER, a round poliſhed piece of ſteel, ſerving to ſmooth and give a luſtre to metals.

Of theſe there are different kinds of different figures, ſtraight, crooked, &c. Half burniſhers are uſed to ſolder ſilver, as well as to give a luſtre.

BURNISHING, the art of ſmoothing or poliſhing a metalline body, by a briſk rubbing of it with a burniſher.

BURROWS, or Berrows, holes in a warren, ſerving as a covert for rabbets, &c.

BURSAR, or Burser, *Burſarius*, is a treaſurer or caſh-keeper. In this ſenſe we meet with burſars of colleges, who generally act as ſecretary or ſteward. Conventual burſars were officers in monaſteries, who were to deliver up their account yearly on the day after Michaelmas. The word is formed from the Latin *burſa*, whence alſo the Engliſh word *purſe*; hence alſo the officer, who in a college is called *burſar*, in a ſhip is called *purſer*.

BURTON, in the ſea language, a ſmall tackle, conſiſting of two ſingle blocks, capable of being made faſt any where at pleaſure, for hoiſting of ſmall things in or out, and which will purchaſe more than a ſingle tackle with two blocks. It is generally employed to tighten the ſhrouds of the top maſts.

BURY, is ſometimes uſed to denote the hole or den of ſome animal under ground.

In which ſenſe we ſay, the bury of a badger, a tortoiſe or rabbit.

BUSELAPHUS, in tetrapodology, the name of an animal of the goat kind, called alſo moſchelaphus. It is of a medium ſhape between the ſtag and ox kind. Its head and feet are long, legs and feet ſmall, the tail about a foot long, and in ſhape like that of an heifer; its upper part is reddiſh and very naked, lower covered with long hairs. The hair of its whole body is of a tawny or reddiſh yellow colour; the horns are black, ſmooth at the top, and round every where elſe. It has two teats, and is an extremely tame and quiet animal, and naturally fond of play. It is extremely ſwift in running, and in moſt reſpects, except in ſize, greatly reſembles the common antelope.

BUSH, a term uſed for ſhrubs of the ſame kind branching and growing cloſe together: thus we ſay, a furze buſh, bramble buſh, &c.

Bush alſo implies a bough or boughs, hung out as a ſign at taverns. It takes the denomination from hence, that, anciently, ſigns where wine was ſold were buſhes chiefly of ivy, cypreſs, or the like plants, which keep their verdure long. This cuſtom gave riſe to the Engliſh proverb, "Good wine needs no *buſh*."

BUSHEL, a meaſure of capacity for things dry; as grains, pulſe, dry fruits, &c. containing four pecks, or eight gallons, or one eighth of a quarter.

By 12 Hen. VII. cap. 5. a buſhel is to contain eight gallons of wheat: the gallon eight pounds of wheat, troy-weight; the pound twelve ounces, troy weight; the ounce twenty ſterlings; and the ſterling thirty-two grains, or corns of wheat growing in the midſt of the ear.

This ſtandard buſhel is kept in the Exchequer; when being filled with common ſpring water, and the water meaſured before the houſe of commons in 1696, in a regular parallelopiped, it was found to contain 2145,6 ſolid inches; and the ſaid water being weighed, amounted to 1131 ounces and 14 penny weights troy.

Beſides the ſtandard legal buſhel we have ſeveral local buſhels, of different dimenſions in different places. At Abingdon and Andover, a buſhel contains nine gallons; at Appleby and Penrith, a buſhel of peaſe, rye, and wheat, contains 16 gallons; of barley, big, malt, mixt malt, and oats, 20 gallons. A buſhel contains at Carliſle, 24 gallons; at Cheſter, a buſhel of wheat, rye, &c. contains 32 gallons, and of oats 40; at Dorcheſter, a buſhel of malt and oats contains 10 gallons; at Falmouth, the buſhel of ſtricken coals is 16 gallons, of other things 20, and uſually 21 gallons; at Kingſton upon Thames, the buſhel contains eight and a half; at Newbury 9; at Wycomb and Reading, eight and three fourths; at Stamford, 16 gallons. At Paris, the buſhel is divided into two half buſhels; the half buſhel into two quarts; the quart into two half quarts; the half quart into two litrons; and the litron into two half litrons. By a ſentence of the provoſt of the merchants of Paris, the buſhel is to be eight inches two lines and a half high, and ten inches in diameter; the quart four inches nine lines high, and ſix inches nine lines wide; the half quart four inches three lines high, and five inches diameter; the litron three inches and a half high, and three inches ten lines in diameter. Three buſhels make a minot, ſix a mine, twelve a ſeptier, and a hundred and forty-four a muid.

In other parts of France, the buſhel varies.

BUSKIN, a kind of ſhoe, ſomewhat in manner of a boot, and adapted to either foot, and worn by either ſex. This part of dreſs, covering both the foot and mid-leg, was tied underneath the knee; it was very rich and fine, and principally uſed on the ſtage by actors in tragedy. It was of a quadrangular form; and the ſole was ſo thick, as that, by means thereof, men of the ordinary ſtature might be raiſed to the ſame pitch and elevation as the heroes they perſonated. The colour was generally purple on the ſtage: it was diſtinguiſhed from the ſock, worn in comedy, that being only a low common ſhoe. The buſkin ſeems to have been worn, not only by actors, but by girls, to raiſe their height; travellers and hunters alſo made uſe of it, to defend themſelves from the mire. In claſſic authors, we frequently find the buſkin uſed to ſignify tragedy itſelf.

BUSS, in maritime affairs, a ſmall ſea-veſſel uſed by the Engliſh and the Dutch in the herring fiſhery, commonly from 48 to 60 tons burden, and ſometimes more: a buſs has two ſmall ſheds or cabins, one at the prow, and the other at the ſtern; that at the prow ſerves for a kitchen.

BUST, or Busto, in ſculpture, the figure, or portrait of a perſon in relievo, ſhewing only the head, ſhoulders, and ſtomach, the arms being lopped off; and commonly placed on a pedeſtal or conſole.

BUSTARD, *Otis*, in ornithology, the name of a large bird.

In the Linnæan ſyſtem, the otis makes a diſtinct genus of birds of the order of the grallæ.

There are four ſpecies. The common buſtard is of the ſize of the common turkey, its beak is like that of the common gallinaceous fowls; its head and neck are grey; its belly white, and its back variegated with tranſverſe ſtreaks of red and black; it has no hinder toe, by which, and by its ſize, it is eaſily diſtinguiſhed. The male is diſtinguiſhed from the female by being of a much larger ſize, and by a tuft of feathers about five inches long on each ſide of the lower mandible. Beſides, the males have a pouch, whoſe entrance lies immediately under the tongue, which is capable of holding near ſeven quarts; this ſecures them againſt drought, in thoſe dry tracts where they commonly live, and is probably filled with water, to ſupply the hen when ſitting, or the young before they can fly. It feeds on herbs and grain, and earth worms, and eats very greedily on the leaves of dandelion, and particularly on the ſeeds of hemlock, which ſeems very ſingular. It is frequent in many parts of England, where there are large heaths and plains: they fly very heavy, and with difficulty raiſe themſelves from the ground; they are extremely ſhy; if they ſee a man at the diſtance of a mile they immediately take wing. They are ſometimes caught by greyhounds; and their fleſh is eſteemed a great dainty. The leſſer buſtard, or otis tetrax of Linnæus, is about the ſize of a pheaſant; for the generic characters ſee Syſtem of Ornithology.

BUSTOM, in antiquity, a pyramid or pile of wood, whereon were anciently placed the bodies of the deceaſed, in order to be burnt.

Some authors ſay, it was only called buſtum, after the burning *quaſi bene uſtum:* before the burning it was more properly called *pyra*; during it *rogus*, and afterwards, *buſtum.*

BUTCHER, a perſon who ſlaughters cattle for the uſe of the table, or who cuts up and retails the ſame.

Among the ancient Romans, there were three kinds of eſtabliſhed butchers, whoſe office it was to furniſh the city with the neceſſary cattle, and to take care of preparing and vending their fleſh. The ſuarii provided hogs; the pecuarii or boarii, other cattle, eſpecially oxen; and under theſe was a ſubordinate claſs, whoſe office was to kill, called *lanii*, and *carnifices*. To exerciſe the office of butcher among the Jews with dexterity, was of more reputation than to underſtand the liberal arts and ſciences. They have a book concerning ſhamble-conſtitution; and in caſe of any difficulty, they apply to ſome learned rabbi for advice: nor was any allowed to practiſe this art, without a licence in form; which gave the man, upon evidence of his abilities, a power to kill meat, and others to eat what he killed; provided he carefully read every week for one year, and every month the next year, and once a quarter during his life, the conſtitution above mentioned. We have ſome very good laws for the better regulation and preventing the abuſes committed by butchers. A butcher that ſells ſwine's fleſh meaſled, or dead of the murrain, for the firſt offence ſhall be amerced; for the ſecond, have the pillory; for the third, be impriſoned, and make fine; and for the fourth, abjure the town. Butchers not ſelling meat at reaſonable prices, ſhall forfeit double the value, leviable by warrant of two juſtices of the peace. No butcher ſhall kill any fleſh in his ſcalding-houſe, or within the walls of London, on pain to forfeit for every ox ſo killed, 12d. and for every other beaſt, 8d. to be divided betwixt the king and the proſecutor.

Butcher *Bird*, in ornithology, the Engliſh name of the lanius, the ſmalleſt of all the European birds of prey, yet very fierce and deſtructive. Its beak is all the way ſtraight, except juſt at the end, where it is ſlightly hooked, the upper mandible furniſhed with a ſharp proceſs, and its tail faſhioned like that of the magpye, the outer feathers being the ſhorteſt, the reſt gradually longer. The ancients called it the tyrannus, and in Engliſh we ſometimes alſo call it the ſhrike.

There are ſeveral ſpecies of the lanius: the principal are,

1. The common larger kind, called the mattageſs. 2. The ſmaller, called the fluſher. And 3. The lanius minor, or grey little butcher-bird. For a repreſentation of which, ſee Ornithology, Plate I. Order 2, Genus IV.

Butcher's *Broom*, *ruſcus*, in botany, a genus of the dioecia ſyngeneſia claſs. Miller enumerates eight, and Linnæus five ſpecies.

The root of butcher's broom, roſcus aculeatus of Linnæus, is one of the five aperient ones, and is celebrated by authors as a very powerful attenuant and reſolvent. It is good in all chronic caſes, and is frequently preſcribed in diet drinks, intended to open obſtructions of the viſcera, or to promote urine. Riverius tells us of an hydropic perſon who was completely cured by uſing a decoction of butcher's broom for his only drink, and taking two purges of ſena.

BUTIGA, is an inflammation of the whole face, otherwiſe called gutta roſacea.

BUTLER, an officer whoſe chief charge is over the cellar and drinkables.

BUTLERAGE is a duty of two ſhillings for every ton of wine imported by merchants ſtrangers; being a compoſition (in lieu of the priſage payable in kind by Engliſh only) in conſideration of the liberties and freedoms granted to them by king John, and king Edward I. by a charter called charta mercatoria.

BUTMENTS, in architecture, thoſe ſupporters or props, on or againſt which the feet of arches reſt.

Butments of arches are the ſame with buttreſſes. They anſwer to what the Romans call *ſublices*, the French *culees* and *butees.*

The butments or abutments of bridges next the banks ſhould be built more firm and ſolid, as ſerving to ſuſtain the whole ſeries of arches, and hinder them from ſpreading.

BUTT, a veſſel, or meaſure of wine, or beer, containing two hogſheads, or 126 gallons. Otherwiſe called pipe.

A butt of currants is from fifteen to twenty-two hundred weight. It is alſo applied in huſbandry to a ſmall land in a common field; and in naval matters to the end of a plank which joins another under water.

BUTTER, an animal oil, extracted from cream or the richer parts of milk, by heating, or by agitation in a churn, &c.

The antient Greeks do not appear to have had any notion of butter, as their poets make no mention of it; although they are frequently ſpeaking of milk and cheeſe.

As a wholeſome aliment, butter ſhould be freſh and free from rancidity, and not fried or burnt; otherwiſe the acid being diſengaged by age and fermentation, as well as by fire, it will diſorder digeſtion, render it difficult and painful, excite acrid, empyreumatic belchings, and introduce much acrimony into the blood.

Butter is an emollient, and has virtues approaching to thoſe of oil; having a peculiar power of reſiſting poiſon, and obtunding the acrimony thereof; by ſuppleing and relaxing the parts. Dr. Quincy thinks it has a tendency to ſtop in the capillaries and glands, and foul the viſcera; whence proceed blotches and cutaneous diſeaſes. Some repreſent it as a diuretic, purgative, and promoter of expectoration.

For the complete management of the butter dairy, according to the moſt approved method uſed in this kingdom, ſee Article Dairy.

Butter *Bur*, petaſites, in botany, an officinal plant, both in figure and virtues, reſembling maſter-wort. Linnæus has comprehended this plant under the genus of tuſſilago, which belongs to the claſs of ſyngeneſia polygamia ſuperflua.

Butter *Nut*, a fruit in New-England whoſe kernel yields a great quantity of ſweet oil.

Butter *Wort*, pinguicula, in botany, a genus of the diandria monogynia claſs. There are four ſpecies. The common butterwort, or pinguicula vulgaria of Linnæus, is found growing on bogs in many parts of England, and flowers in June; but is never cultivated in gardens.

Butter *of Stone*, a kind of mineral drug found on the higheſt mountains, and hardeſt rocks of Siberia, being drawn by the ſun's heat, in the way of tranſudation, from the dry ſubſtance of the ſtones themſelves, and adhering to the ſurface thereof like a ſort of calx, which, having received its full coction, is ſcraped off by the inhabitants under the name of kamine maſla. The Ruſſians aſcribe many virtues to it. It is much uſed for the dyſentery and venereal diſeaſes; but its operation is ſo violent, however corrected by other ingredients, that none but the Ruſſians dare uſe it.

Butter *Fiſh*, a ſmall fiſh, common in Cornwal, ſhaped ſomewhat like an eel, and diſtinguiſhed by two rows of black ſpots along its back, and called *gunellus.*

BUTTER *Fly*, in entomology, papilio; the name of a numerous genus of inſects.

The following method of laying butterflies on paper, in order to preſerve their likeneſs, is extracted from Edwards's Hiſtory of Birds, Vol. II. p. 122.

"Take butterflies, or field-moths, either thoſe catched abroad, or ſuch as are taken in caterpillars, and nurſed in the houſe till they be flies; clip off their wings very cloſe to their bodies, and lay them on clean paper, in the form of a butterfly when flying; then have ready prepared gum arabic that hath been ſome time diſſolved in water, and is pretty thick; if you put a drop of ox gall into a ſpoonful of this, it will be better for the uſe; temper them well with your finger, and ſpread a little of it on a piece of thin white paper, big enough to take both ſides of the fly; when it begins to be clammy under your finger, the paper is in proper order to take the feathers from the wings of the fly; then lay the gummed ſide on the wings, and it will take them up; then double your paper ſo as to have all the wings between the paper; then lay it on a table, preſſing it cloſe with your fingers; and you may rub it gently with ſome ſmooth hard thing; then open the paper and take out the wings, which will come forth tranſparent: the down of the upper and under ſide of the wings, ſticking to the gummed paper, form a juſt likeneſs of both ſides of the wings in their natural ſhapes and colours. The nicety of taking off flies depends on a juſt degree of moiſture of the gummed paper: for, if it be too wet, all will be blotted and confuſed; and if too dry, your paper will ſtick ſo faſt together, that it will be torn in ſeparation. When you have opened your gummed papers, and they are dry, you muſt draw the bodies from the natural ones, and paint them in water-colours: you muſt take paper that will bear ink very well for this uſe; for ſinking paper will ſeparate with the reſt, and ſpoil all."

Butter *Fly Fiſh*, the Engliſh name for the fiſh called by authors *blennus*, or *blennius.*

It has its name of the butter-fly fiſh from a ſpot in the fin, which reſembles thoſe in the wings in ſome butter-flies. See Syſtem of Ichthyology.

Butter *Jags*, flowers of the wild trefoil.

BUTTERY. Officers in the king's buttery, are a gentleman, yeoman, and three grooms of the buttery. The buttery among us is uſually placed near the cellar; being commonly the room next the top of the cellar ſtairs.

BUTTOCK *of a Ship* is her full breadth right aſtern from the tuck upwards. According as a ſhip is built, broad or narrow at the tranſom, ſhe is ſaid to have a broad or narrow buttock.

BUTTONS make an article in dreſs, whoſe form and uſe are too familiar to need a deſcription. The matter of which they are made is various; as metal, ſilk, mohair, &c.

Method of making common Buttons. Common buttons are generally herally made of mohair; ſome indeed are made of ſilk, and others of thread; but the latter are of a very inferior ſort. In order to make a button, the mohair muſt be previouſly wound on a bobbin; and the mould fixed on a board by means of a bodkin thruſt through the hole in the middle of it. This being done, the workman wraps the mohair round the mould in three, four, or ſix columns, according to the button.

Horſe-hair BUTTONS. The moulds of theſe buttons are covered with a kind of ſtuff compoſed of ſilk and hair; the warp being belladine ſilk, and the ſhoot horſe-hair. This ſtuff is wove with two ſelvedges, in the ſame manner and in the ſame loom as ribbands. It is then cut into ſquare pieces proportional to the ſize of the button, wrapped round the moulds, and their ſelvedges ſtitched together, which form the under part of the button.

Cleanſing of BUTTONS. A button is not finiſhed when it comes from the maker's hands; the ſuperfluous hairs and hubs of ſilk muſt be taken off, and the button rendered gloſſy and beautiful, before it can be ſold. This is done in the following manner. A quantity of buttons are put into a kind of iron ſieve, called by workmen a ſingeing box. Then a little ſpirit of wine being poured into a kind of ſhallow iron diſh, and ſet on fire, the workman moves and ſhakes the ſingeing box, containing the buttons, briſkly over the flame of the ſpirit, by which the ſuperfluous hairs, hubs of ſilk, &c. are burnt off, without damaging the buttons. Great care, however, muſt be taken that the buttons in the ſingeing box be kept in continual motion; for if they are ſuffered to reſt over the flame, they will immediately burn. When all theſe looſe hairs, &c. are burnt off by the flame of the ſpirit, the buttons are taken out of the ſingeing box, and put, with a proper quantity of the crumbs of bread, into a leather bag, about three feet long, and of a conical ſhape; the mouth or ſmaller end of which being tied up, the workman takes one of the ends in one hand, and the other in the other, and ſhakes the hand briſkly with a particular jerk. This operation cleanſes the buttons, renders them very gloſſy, and fit for ſale.

Gold-twiſt BUTTONS. The mould of theſe buttons is firſt covered in the ſame manner with that of common buttons. This being done, the whole is covered with a thin plate of gold or ſilver, and then wrought over of different forms, with purle and gimp. The former is a kind of thread compoſed of ſilk and gold wire twiſted together; and the latter, capillary tubes of gold or ſilver, about the tenth of an inch long. Theſe are joined together by means of a fine needle, filled with ſilk, thruſt through their apertures, in the ſame manner as beads or bugles. The principal manufactory for the above kind of buttons is at Leeke in Staffordſhire.

Manner of making Plated BUTTONS. The metal to be uſed being reduced into thin plates, or leaves of the thickneſs intended, by means of a rolling preſs, is cut into little round pieces, of a diameter proportionable to the wooden mould they are made to cover: this cutting is performed with a ſharp punch, on a leaden block or table. Each piece of metal thus cut, and taken off from the plate, is reduced to the form of a button, by beating it ſucceſſively in ſeveral ſpherical cavities, with a round piece of iron, in form of a puncheon; ſtill beginning with the flatteſt cavity, and proceeding to the more ſpherical, till the plate has got all the relievo required; and the better to manage ſo thin a plate, they form ten or twelve to the cavities at once; and alſo boil the metal to make it more ductile.

The inſide thus formed, they give an impreſſion to the outſide, by working it with the ſame iron puncheon, in a kind of mould like the minter's coins, engraven *en creux*, or indentedly; and faſtened to a block or bench. The cavity of this mould, wherein the impreſſion is to be made, is of a diameter and depth ſuitable to the ſort of button to be ſtruck in it; each kind requiring a particular mould. Between the puncheon and the plate is placed ſome lead, which contributes to the better taking off all the ſtrokes of the graving; the lead, by reaſon of its ſoftneſs, eaſily giving way to the parts that have relievo; and as eaſily inſinuating itſelf into the trace, or engraving of the dentures.

The Manner of making Metal BUTTONS. The metal with which the moulds are intended to be covered is firſt caſt into ingots, and then flatted into thin plates or leaves, of the thickneſs intended, at the flatting-mills; after which it is cut into ſmall round pieces proportionable to the ſize of the mould they are intended to cover, by means of proper punches on a block of wood covered with a thick plate of lead.

Each of thoſe pieces of metal is then ſtamped with a hammer, or in an engine, and there receives the impreſſion with which they are ornamented. The ſhank is afterwards ſodered on, and each button is finiſhed and receives a poliſh on a lathe. The perfection this art has attained at Birmingham is aſtoniſhing: a large copper button accurately finiſhed, and covered with pure gold or ſilver, can be ſold by the manufacturer for the trifling price of one halfpenny, and fair profit gained.

Buttons made of hair, or other foreign buttons, ſhall not be imported, on pain of forfeiture, &c. 13 and 14 Car. II. cap. 13. 4 W. and M. cap. 10. Alſo buttons are not to be made of cloth, ſtuff, or wood, under penalties. Stat. 4 and 5 W. and M. 10 W. III. cap. 2. 4 Geo. I. cap. 7. 7 Geo. I. ſtat. 1. cap. 12.

BUTTON, in botany, denotes a flower or cluſter of leaves not yet expanded; and is much of the ſame import with bud. The term button is chiefly uſed in ſpeaking of vines and roſes; and is otherwiſe denominated eye, ſprout, bud, burgeon, &c.

BUTTON, in building, denotes a ſlight faſtening for a door or window, made to turn on a nail.

BUTTON, in chemiſtry, ſignifies the metal which is collected generally in a roundiſh maſs, and uſually covered with leather, to prevent making contuſions in the body.

BUTTON *Tree of Jamaica*, conocarpus, in botany, a genus of the pentandria monogynia claſs. Linnæus enumerates three, and Miller two ſpecies.

BUTTRESS, a kind of butment built archwiſe, or, a maſs of ſtone or brick, ſerving to prop or ſupport the ſides of a building, wall, &c. on the outſide, where it is either very high, or has any conſiderable load to ſuſtain on the other ſide, as a bank of earth, &c. Buttreſſes are uſed againſt the angles of ſteeples and other buildings of ſtone, &c. on the outſide, and along the walls of ſuch buildings as have great and heavy roofs, which would be ſubject to thruſt the walls out, unleſs very thick, if no buttreſſes were placed againſt them. They are alſo placed for a ſupport and butment againſt the feet of ſome arches, that are turned acroſs great halls in old palaces, abbeys, &c.

BUTTRIS, in farriery, an inſtrument of ſteel, fitted to a wooden handle, wherewith they pare the foot of a horſe to prepare it for ſhoeing.

BUVETTE, or BEUVETTE, in the French laws, an eſtabliſhed place in every court, where the lawyers and counſellors may retire, warm themſelves, and take a glaſs of wine by way of refreſhment, at the king's charge.

There is one for each court of parliament, but theſe are only for perſons belonging to that body; there are others in the *palais* whither other perſons alſo reſort.

BUXABAUMIA, in botany, a genus of the cryptogamia moſſes.

BUYING, the act of making a purchaſe, or acquiring the property of a thing for a certain price.

BUYING ſtands oppoſed to ſelling, and differs from borrowing or hiring, as in the former the property of the thing is alienated for perpetuity, which in the latter is not.

BUYING *the Refuſal*, is giving money for the right or liberty of purchaſing a thing at a fixed price, in a certain time to come; chiefly uſed in dealing for ſhares in ſtock. This is ſometimes alſo called by a cant name, *buying the bear*.

BUZ, in ichthyology, the name of a fiſh more commonly known by that of albula, and caught in the German lakes.

BUZZARD, bouteo, the name of a bird of prey, of the long winged hawk kind, belonging to the firſt order, and the ſecond genus. See Syſtem of ORNITHOLOGY.

BY-LAWS, BYE-LAWS, or BI-LAWS, private or peculiar orders and regulations for the good government of a city, court, or other community, made by general conſent of the members thereof; being not repugnant to the general laws of the realm.

By ſtat. 9 Hen. VII. cap. 7. bye-laws made by corporations are to be approved by the lord-chancellor, or chief-juſtices, under penalty of 40l.

The word is formed from the Saxon *by*, *habitation*, *vill*, and *laxa*, q. d. *lex villæ*, or *town-hall*. They are alſo called *birlaws*, *byrlaws*, and *burlaws*, *bilager*, and *bellagines*. Such is the cuſtom in Kent of deciding controverſies among neighbours about boundaries, by the ſeneſchals, or bailiffs.

In Scotland, thoſe are called *laws of burlaw*, or *byrlaw*, which are made and determined by neighbours, elected by common conſent in burlaw courts; wherein cognizance is taken of complaints betwixt neighbour and neighbour. The men thus choſen as judges or arbitrators are called *burlaw-men*, or *byrlaw-men*.

BYRRHUS, in natural hiſtory, a genus of inſects of the order of coleopteræ, with elevated, almoſt ſolid, and compreſſed antennæ. There are five ſpecies. See Syſtem of ENTOMOLOGY.

BYSSUS, or BISSUM, a fine ſort of thready matter produced in India, Egypt, and about Elis in Achaia, of which the richeſt apparel was anciently made, eſpecially that worn by the prieſts both Jewiſh and Egyptian.

The ancients ſeem to have applied the name indifferently to any kind of matter that was ſpun and wove finer than wool: ſo that it is probable there were divers ſorts of byſſus. This is certain, that Ariſtotle gave divers ſorts of byſſus.

This byſſus, though groſly ſpun, appears much finer and more beautiful than wool, and comes not much ſhort of ſilk. Stockings and other ſuch manufactures are ſtill made of it, which would be more valuable if ſilk were leſs common.

BYSSUS, in botany, a genus of moſſes belonging to the cryptogamia algæ. The character is taken from this circumſtance, that they are covered with a ſimple capillary filament or down, reſembling ſoft duſt. There are 15 ſpecies, all natives of Britain, growing upon rotten wood, old walls, &c.

BYTTNERIA, in botany, a genus of the pentandria monogynia claſs; the corolla is compoſed of five petals; the capſule has five lobes, and is covered with prickles. There is only one ſpecies.

C

C THE third letter, and ſecond conſonant, of the alphabet, is pronounced like *k*, before the vowels *a*, *o*, and *u*; but like *s* before *e*, *i*, and *y*.

As a numeral, C ſignifies 100, CC 200, &c.

C, in muſic, placed after the cliff, intimates that the muſic is in common time, which is either quick or ſlow, as it is joined with allegro or adagio: if alone, it is uſually adagio. If the C has a ſtroke down the middle, or is turned, the firſt requires the air to be played quick, and the laſt very quick.

CAA-APIA, in botany, the name of a Braſilian plant, deſcribed by Marcgrave, Piſo, and others; the root of which ſo much reſembles the ipecacuanha in its virtues, that ſome have erroneouſly called it by the ſame name. It is an aſtringent and emetic, as the ipecacuanha, but it poſſeſſes both theſe qualities in a much weaker degree, and is therefore neceſſarily given in a much larger doſe, a dram being the quantity commonly given at once. The Braſilians bruiſe the whole plant, and expreſs the juice, which they take internally, and alſo apply it externally to wounds made by poiſoned arrows, and by the bites of ſerpents. Some have ſuppoſed the root of this plant to be the white ipecacuanha; but this is an error, that being little different from the grey.

CAABA, or CAABAH, properly ſignifies a ſquare ſtone building; but is particularly applied by the Mahometans to the temple of Mecca, built, as they pretend, by Abraham and Iſhmael his ſon.

Before the time of Mahomet, this temple was a place of worſhip for the idolatrous Arabs, and is ſaid to have contained no leſs than 360 different images, equalling in number the days of the Arabian year. They were all deſtroyed by Mahomet, who ſanctified the caaba, and appointed it be the chief place of worſhip for all true believers. The temple is in length, from north to ſouth, about 24 cubits; its breadth from eaſt to weſt, is 23; and its height, 27. The door, which is on the eaſt ſide, ſtands about four cubits from the ground; the floor being level with the bottom of the door. In the corner next this door is the black ſtone, ſo much celebrated among the Mahometans. On the north ſide of the caaba, within a ſemicircular incloſure 50 cubits long, lies the white ſtone, ſaid to be the ſepulchre of Iſhmael, which receives the rain-water from the caaba, by a ſpout formerly of wood, but now of gold.

CAAMINI, in botany, a name given by the Spaniards and others to the fineſt ſort of Paraguayan tea. It is the leaf of a ſhrub which grows on the mountains of Maracaya, and is uſed in Chili and Peru as the tea is with us. The mountains where this ſhrub grows naturally are far from the inhabited parts of Paraguay; but the people of the place know ſo well the value and uſe of it, that they conſtantly furniſh themſelves with great quantities from the ſpot. They uſed to go out on theſe expeditions many thouſands together; leaving their country in the mean time expoſed to the inſults of their enemies, and many of themſelves periſhing by fatigue. To avoid theſe inconveniences, they have of late planted theſe trees about their habitations; but the leaves of the cultivated ones have not the fine flavour of thoſe that grow wild.

CAAPIBA, in botany, the name given by Plumier to a genus of plants, called afterwards by Linnæus ciſſampelos.

CAB, an Hebrew dry meaſure, being the ſixth part of a ſeah or ſatum, and the 18th part of an ephah. A cab contained $2\frac{5}{6}$ pints of our corn-meaſure.

CABAL, a name given to a ſort of drink made of dried raiſins. The manner in which the Portugueſe make cabal is this; they take out the ſtones of about twenty pounds of raiſins, and then bruiſing the raiſins a little, they put them into a barrel of white wine, in the month of January or February, and let them ſtand till about Eaſter. It is then very clear and rich, luſcious and palatable to the taſte. It is recommended to ſtop coughs, and give ſtrength to the ſtomach. It is worth while to try the experiment with the ſame proportion of raiſins to the ſame quantity of our Engliſh cyder, which would probably prove a fine drink.

CABALA *Vein*, in natural hiſtory, a name given by our Suſſex miners to one kind of the iron ore commonly wrought in that country. It is a ſtony ore, of a browniſh colour with a bluſh of red, which is more or leſs conſpicuous in different parts of the ſame maſſes. It is uſually found in thin ſtrata, lying not far from the ſurface, and is not very rich in iron, but it runs very readily in the fire.

CABBAGE, in botany, braſſica, the name of a plant well known, and of which there are ſeveral ſpecies cultivated in gardens and alſo in fields as a food for cattle. See Syſtem of AGRICULTURE, Sect. XI.

Species. 1. The ſabauda, or Savoy cabbage. 2. The rubra, or red cabbage. 3. The pyramidalis, or ſugar-loaf cabbage. 4. The præcox, or early cabbage. 5. The peregrina, or foreign muſk-cabbage. 6. The muſcovitica, or ſmall Ruſſia cabbage. 7. The capitata, or large-ſided cabbage. 8. The viridis, or green Savoy. 9. The laciniata, or borecole. 10. The ſeleniſia, or green borecole. 11. The fimbriata, or Siberian borecole, by ſome called Scotch kale.

There are ſeveral other ſpecies, the principal of which are, The turnip rooted cabbage, cauliflower, purple and white broccoli, ſea cabbage or kale, rape or cold wort, and a few others not generally known or cultivated.

We mean in this place to ſpeak of the culture of ſuch cabbage as are uſed for culinary purpoſes.

Culture. Cabbages of all ſorts delight in a deep, rich, light, and well looſened ground, in an open ſituation. They will indeed grow in any ordinary ground that has been dug; but the better the ſoil and its tilth are, the finer and better flavoured the plants will prove.

The early and the ſugar-loaf cabbages, are the ſorts generally ſown for ſummer uſe. The moſt proper ſeaſon for ſowing them is about the end of July, or beginning of Auguſt. When the plants have ſeven or eight leaves, they ſhould be removed into beds of well prepared mould, and there ſet about three or four inches aſunder every way, that they may grow ſtrong, without running up in height: and towards the latter end of October they ſhould be again tranſplanted in the place where they are to remain. They ſhould be here ſet in rows three feet aſunder, and two feet and a half diſtant from each other in the row. They muſt be kept clear from weeds, and ſhould either be earthed up from time to time, as is the common practice, or, which will be much more beneficial, the ground between them ſhould be repeatedly dug pretty deep, or otherwiſe well ſtirred and looſened, during their growth. About May they will turn in their leaves for cabbaging; and if this be then aſſiſted by tying them up pretty cloſe with a ſlender twig of oſier, their heads will be blanched in the middle, and fit for cutting, at leaſt a fortnight ſooner than they would be, if not tied up. But it muſt be obſerved of this early kind, that the cabbaging is ſoon completed after the leaves begin to turn, and that the heads almoſt as quickly afterwards become hard and burſt. The ſugar-loaf cabbage is therefore more generally planted, becauſe it is not ſo cloſe leaved, grows and cabbages more ſlowly, and continues good for a long time.

The muſk cabbage, which requires exactly the ſame culture as the former, will be fit for uſe in October, and will laſt till Chriſtmas; but is more tender, and therefore more liable to be killed by hard weather.

The common white, red, flat, and long ſided cabbages, are cultivated chiefly for winter uſe. The time for ſowing them is in the beginning or middle of April. The young plants of theſe ſorts, like thoſe of all other cabbages, ſhould be pricked out into ſhady borders, when they have got ſix or eight leaves, that they may acquire ſtrength, and not run up with high ſtems; for the ſhorteſt ſhanked cabbages are always found to ſucceed beſt. Towards the middle of June they ſhould be tranſplated from theſe borders into the places where they are to remain, at the diſtance of two feet and a half from each other, in rows three feet and a half aſunder; for this will be ſufficient either for earthing up the ſtems, as is commonly practiſed, or for the more beneficial method of digging and ſtirring the earth between them. If they are planted out in a dry ſeaſon, they ſhould be watered every other evening, till they have taken freſh root.

The kitchen gardeners near London generally plant rows of theſe cabbages between their artichokes, cauliflowers, &c. but they ſeem, upon the whole, to do beſt when planted alone. They will begin to be fit for uſe ſoon after Michaelmas, and will continue good till the end of February, if the winter be not ſo ſevere as to deſtroy them. This may, however, be prevented by pulling them up in November, trenching the ground up in ridges, laying the cabbages as cloſe as poſſible, on one ſide againſt thoſe ridges, and then throwing in the earth ſo as wholly to bury their ſtems. In this manner they may be kept till after Chriſtmas: for though their outer leaves may decay, as they often will in very wet or hard weather, their inſide will remain ſound, provided they were large and hard when thus laid down.

That ſpecies of cabbage called ſavoy, require exactly the treatment as the foregoing, except that, as they do not grow ſo large they need not be planted ſo far aſunder. Two feet and a half ſquare will be a ſufficient diſtance between them. They always thrive beſt in an open ſituation, quite free from trees and hedges; for they are very apt to be greatly preyed upon by caterpillars and other vermin, in cloſe places, eſpecially if the autumn proves dry. If theſe vermin are not very numerous, they are picked off by hand as faſt as they are ſeen, and deſtroyed by treading them under foot: but when their numbers are very great, the moſt expeditious way of deſtroying them is, to turn a parcel of hungry turkeys in among them. Savoys are moſt eſteemed after they have been pinched by the froſt.

The management of the Ruſſian cabbage, which is ſo hardy as to bid defiance to the ſevereſt winter, requires the ſame management, except the time of ſowing, which like the ſavoy ſhould not be till late in the ſpring, and being very ſmall, does not require ſo much room when planted out. It ſhould alſo have a clear open ground to grow on; but it will not laſt long before it will burſt, and run up to ſeed. Many think it a very ſweet and well taſted plant, though it is not now cultivated near ſo much as formerly. The trading gardeners around London ſeem to have excluded it entirely from their grounds; perhaps chiefly on account of its ſmallneſs; but it ſtill deſerves a place in private kitchen gardens.

The ſea cabbage grows naturally upon the gravelly ſea ſhores of many parts of England, and particularly in Suſſex and Dorſetſhire, where many people dig it up from among the gravel, in the ſpring, and prefer it to every other kind of cabbage. In that blanched ſtate, before its ſhoots have been expoſed to the air, it is very ſweet and tender, and may be eaſily propagated in gardens, by ſowing its ſeeds ſoon after they are ripe, in a ſandy or gravelly ſoil. It will thrive there exceedingly, and increaſe greatly by its creeping roots; but its heads will not be fit to cut before the ſecond year. To have it in perfection, a layer of ſand or gravel, four or five inches thick, ſhould be ſpread, at Michaelmas, upon the bed in which theſe plants grow, to allow a ſufficient depth for cutting their ſhoots, before they appear above ground; for till then they will be white, tender, and well taſted; but the air renders them green, tough, and bitter. This earthing up, or rather new ſanding or gravelling the bed, ſhould therefore be repeated every autumn, in the ſame manner as is practiſed for aſparagus. It is the only culture that this ſort of cabbage will require.

The beſt method of ſaving the ſeed of all ſorts of cabbages is this: about the end of November you ſhould make choice of ſome of your beſt cabbages, which you ſhould pull up and carry to ſome ſhed or other covered place, where you ſhould hang them up for three or four days by their ſtalks, that the water may drain from between their leaves; then plant them in ſome border, under a hedge or pale, quite down to the middle of the cabbage, leaving only the upper part of the cabbage above ground, obſerving to raiſe the earth about it, ſo that it may ſtand a little above the level of the ground; eſpecially if the ground be wet, when they will require to be raiſed conſiderably above the ſurface. If the winter ſhould prove hard, you muſt lay a little ſtraw, or peaſe-haulm, lightly upon them, to ſecure them from the froſt; taking it off as often as the weather proves mild, leſt by keeping them too cloſe they ſhould rot. In the ſpring of the year theſe cabbages will ſhoot out ſtrongly, and divide into a great number of ſmall branches: you muſt therefore ſupport their ſtems, to prevent their being broken off by the wind; and, if the weather ſhould be very hot and dry when they are in flower, you ſhould refreſh them with water once a week, all over the branches, which will greatly promote their ſeeding, and preſerve them from mildew.

When your pods begin to change brown, you will do well to cut off the extreme part of every ſhoot with the pods, which will ſtrengthen your ſeeds: for it is generally obſerved, that thoſe ſeeds which grow near the top of the ſhoots are ſubject to run to ſeed before they cabbage; ſo that there will be no loſs by this method, but a great advantage. When your ſeed begins to ripen, you muſt be very careful to ſecure it from being eaten by the birds, which are very fond of it; and when it is fully ripe, cut off the ſtalks, thoroughly dry the whole, threſh out the ſeed, and preſerve it in bags for uſe.

CABECA, or **CABESSE**, a name given to the fineſt ſilks in the Eaſt Indies, as thoſe from 15 to 20 per cent. inferior to them are called barina. The Dutch diſtinguiſh two ſorts of cabecas; namely, the moor cabeca, and the common cabeca. The former is ſold at Amſterdam for about 21½ ſchellinghen Flemiſh, and the other for about 18½.

CABIDOS, or **CAVIDOS**, a long meaſure uſed at Goa, and other places of the Eaſt Indies belonging to the Portugueſe, to meaſure ſtuffs, linens, &c. and equal to $\frac{4}{7}$ of the Paris ell.

CABIN, is ſometimes uſed for the huts or cottages of ſavages, and other poor people.

The habitations of the Indians in Virginia are cabins, about nine or ten feet high, which are made after this manner: they fix poles into the ground, and bring the tops of them one within another, and ſo tie them together; the outſide of theſe poles they line with bark, to defend them from the injuries of the weather, but they leave a hole in the top, right in the middle of the cabin, for the ſmoke to go out; round the inſide of their cabins they have banks of earth caſt up, which ſerve inſtead of ſtools and beds.

CABINS, in a ſhip, are ſmall cells, or apartments for the officers of the ſhip to lie in; very narrow, and in form of armories or preſſes; uſed in ſeveral parts of the ſhip, particularly on the quarter-deck, and on each ſide of the ſteerage. The bed-places erected for ſailors at the ſhip's ſide, in merchant-men, are likewiſe called cabins.

CABINET, the moſt retired place in the fineſt apartment of a building; ſet apart for writing, ſtudying, or preſerving any thing very precious.

A complete apartment conſiſts of a hall, anti-chamber, chamber, and cabinet; with a gallery on one ſide.

CABINET is ſometimes particularly uſed for a place at the end of a gallery, wherein are preſerved the paintings of the beſt maſters, conveniently ranged, and accompanied with buſts, and figures of marble and bronze, with other curioſities.

In this ſenſe, cabinet amounts to the ſame with what is called by Vitruvius, pinecotheca. Sometimes there are ſeveral rooms deſtined for this uſe, which are all together called cabinet, or gallery.

CABINET alſo denotes a kind of buffet or cheſt of drawers, partly for the preſervation of things of value, and partly as a decoration of a chamber, gallery, or other apartment. In the repoſitory of the Royal Society is a Chineſe cabinet, filled with the inſtruments and ſimples uſed by the ſurgeons of that country. The moſt remarkable are thoſe which are contrived for ſcratching, picking, and tickling the ears, in which the Chineſe take great pleaſure.

CABINET is alſo uſed in ſpeaking of the more ſelect and ſecret councils of a prince or adminiſtration.

Thus we ſay, the ſecrets, the intrigues of a cabinet.

To avoid the inconveniencies of a numerous council, the policy of Italy, and practice of France, have introduced cabinet councils; a remedy worſe than the diſeaſe.

King Charles I. is charged with firſt eſtabliſhing this uſage in England. Beſides his privy council, that prince erected a kind of cabinet council, or junto, under the denomination of a council of ſtate; compoſed of archbiſhop Laud, the earl of Strafford, and lord Collington, with the ſecretaries of ſtate.

Yet ſome pretend to find the ſubſtance of a cabinet council of much greater antiquity, and even allowed by parliament, who anciently ſettled a quorum of perſons moſt confided in, without whoſe preſence no arduous matter was to be determined; giving them power to act without conſulting the reſt of the council. As long ſince as the 28th of Henry III. a charter paſſed in affirmance of the ancient rights of the kingdom; which provided that four great men, choſen by common conſent, who were to be conſervators of the kingdom, among other things, ſhould ſee to the diſpoſing of moneys given by parliament, and appropriated to particular uſes; and parliament were to be ſummoned as they ſhould adviſe. But even of theſe four, any two made a quorum; and generally the chief juſtice of England and chancellor were of the number of the conſervators. Math. Par. 28 Henry III.

In the firſt of Hen. VI. the parliament provides, that the quorum for the privy council be ſix or four at leaſt; and that in all weighty conſiderations, the dukes of Bedford and Glouceſter, the king's uncles, ſhould be preſent; which ſeems to be erecting a cabinet by law.

CABIRI, a term in the theology of the ancient Pagans, ſignifying great and powerful gods; being a name given to the gods of Samothracia.

CABIRIA, feſtivals in honour of the Cabiri, celebrated in Thebes and Lemnos, but eſpecially in Samothracia, an iſland conſecrated to the Cabiri. The ceremony of initiation was performed by placing the candidate, crowned with olive-branches, and girded about the loins with a purple ribband, on a throne, about which the prieſts, and perſons before initiated, danced.

CABLE, a thick, long, three-ſtrand rope, ordinarily of hemp, ſerving to hold ſhips firm at anchor, and to tow veſſels in large rivers. In Europe, the cables are commonly made of hemp; in Africa, of long ſtraw or ruſhes called baſs; and in Aſia, of a peculiar kind of Indian graſs.

Every cable, of whatſoever thickneſs it be, is compoſed of three ſtrands; every ſtrand of three ropes; and every rope of three twiſts; the twiſt is made of more or leſs threads, according as the cable is to be thicker or thinner.

In the manufacture of cables, after the ropes are made, they uſe ſticks, which they paſs firſt between the ropes of which they make the ſtrands, and afterwards between the ſtrands of which they make the cable, to the end that they may all twiſt the better, and be more regularly wound together; and alſo to prevent them from twining or entangling, they hang, at the end of each ſtrand and of each rope, a weight of lead or of ſtone.

The number of threads each cable is compoſed of, is always proportioned to its length and thickneſs; and it is by this number of threads that its weight and value are aſcertained: thus, a cable of three inches circumference, or one inch diameter, ought to conſiſt of 48 ordinary threads, and to weigh 192 pounds; and on this proportion cables of any length and dimenſions may be eſtimated.

The ſheet anchor cable, is the greateſt cable belonging to a ſhip. *The ſtream cable*, a hawſer or rope, ſomething ſmaller than the bowers, and uſed to moor the ſhip in a river or haven, ſheltered from the wind and ſea, &c. *To ſerve or plate the cable*, is to bind it about with ropes, clouts, &c. to keep it from galling in the hawſe. *To ſplice a cable*, is to make two pieces faſt together, by working the ſeveral threads of the rope the one into the other.

Pay more **CABLE**, is to let more out of the ſhip. *Pay cheap the cable*, is to hand it out apace. *Veer more cable*, is to let more out, &c.

CABLE's *Length*, is a meaſure of 120 fathoms, or the uſual length of the cable.

CABLING, in architecture, the figure of a ſtaff, or reed, either plain or carved, in reſemblance of a rope, or a ruſh, wherewith a third part of the flutings of a column are ſometimes filled up; hence called cabled flutings.

There are alſo cablings in relievo without fluting, eſpecially on certain pilaſters, as in the church of Sapienza at Rome.

CABOCHED, in heraldry, is when the heads of beaſts are borne without any part of the neck, full-faced. See **Heraldry.**

CABOLETTO, a coin of the republic of Genoa, worth about 3d. of our money.

CABOTE, in ichthyology, the name of a fiſh of the cuculus kind, more uſually known among authors by the name of the corax.

CABURE, in ornithology, the name of a ſmall Braſilian bird of the owl-kind; very beautiful, and very eaſily tamed. It is of a brown colour, variegated with white, and is feathered down to the toes. The Braſilians keep it tame for its diverting tricks; it will play with people like a monkey, and is perfectly harmleſs.

CABURNS, in ſea-language, denote ſmall lines made of ſpun yarn, wherewith to bind cables, ſeize tackles, and the like.

CACABOGA, in amphibiology, the name of an American ſpecies of ſerpent, by ſome accounted the ſame with the tareiboia, or black water-ſnake of that part of the world, but by others deſcribed as yellow in colour, living about houſes, and doing great miſchief among poultry, though not fatal to mankind in its bite.

CACALLA. Foreign coltsfoot, a genus of the ſyngeneſia order of plants, and polygamia æqualis claſs. See Syſtem of **Botany**, and for the uſe and culture, ſee **Coltsfoot.**

CACAO, the chocolate-nut tree, is by Linnæus joined to the theobroma, a genus of the pentandria order, belonging to the polyadelphia claſs of plants; but of the true chocolate-nut there is only one ſpecies known, which we therefore chooſe to deſcribe ſeparately. The tree producing it is about 8 inches in thickneſs, and 12 feet in height, with a ſmooth ſhining bark. The leaves grow alternately, are broad and pointed, ſet on flat pedicles near an inch long. The flowers come forth only from the trunk and larger branches, in cluſters of about eight or ten; each flower conſiſting of five capſular leaves, and five petals, with ſtamina, and a ſtylus. To one of theſe little tufts of bloſſoms uſually ſucceeds a ſingle fruit about the ſize of a ſwan's egg, but longer, more tapering, and ending in a point. The fruit hangs pendant; and, when ripe, has a ſhell of a purple colour, in ſubſtance ſomewhat like that of a pomegranate, and furrowed from end to end; containing in the middle many kernels of the ſize of acorns, incloſed in a mucilaginous ſubſtance, and which are known amongſt us by the name of cacao-nuts, of which chocolate is made.

This tree is a native of America, and no other part of the world. The places of its growth, are the bay of Campeachy on Coſta Rico, between Portabel and Nicaragua, the coaſt of Coraccos, Guajaquil, and Colima. All the ſugar iſlands, however, are proper for its cultivation.

The cacao is a very tender plant, generally planted between rows of plantain trees, the ground well cleaned and manured; the nuts ſhould be planted in rows in a rainy ſeaſon, and will not endure tranſplanting. As the fruit ripens at Chriſtmas and Midſummer, thoſe are the proper times for planting; for if they are kept long out of the ground they loſe all vegetative power. When the chocolate tree firſt appears above the ground, great care ſhould be taken to protect them; for this reaſon, the plantain trees ſhould be ſet two or three months before the cacao nut, that they may be large enough to afford them ſhelter. In twenty days after planting, they will be ſix inches high, and have four or ſix leaves. In a year they will be two feet and a half; in two years three feet and half; and will begin to bloſſom: the early bloſſoms ſhould be taken off as they weaken the young plant. The fourth they may be permitted to bear a moderate crop: if the chocolate tree is planted on a good ſoil and well taken care of, it will continue productive 30 years. When the fruit is ripe, it is picked from the trees in baſkets, afterwards the pod is opened, and the nuts taken out and laid on reeds and mats to dry; they are then put in veſſels and preſſed down, and frequently ſtirred to prevent too great a fermentation: on a due ferment depends their preſervation.

Notwithſtanding this tedious culture, it is the moſt profitable way in which a plantation can be laid out. Five or ſix negroes will be able to manage a plantation of 10,000 trees of this kind. The profit of each tree may be valued at 5s. annually; in which caſe, ſuch a plantation would be worth 2500l. per annum.

The chocolate tree has been cultivated by the curious in this country, but with great difficulty: it is too tender to endure the open air in this climate in the warmeſt ſeaſon; it is alſo attended with great trouble to preſerve the ſeeds during a voyage; for which purpoſe the nuts muſt be planted in a box, and have the minuteſt care beſtowed on them while they are on board a ſhip.

CACHALOT, in ichthyology, a cetaceous fiſh, with teeth in the lower jaws only; claſſed by Linnæus under the phyſeter. The blunt-headed cachalot is one of the ſpecies that yields the ſpermaceti; there are beſides, the round-headed, and the high-finned cachalots.

CACHEF, or **Cacheef**, in the Turkiſh affairs, the governor of a city, town, or even a province of Egypt.

The title cachef is alſo given to the captains or commanders of little flying armies, intended to keep the Arabs in obedience.

Egypt is divided by the Turks into thirty-nine cacheſtecks, or governments.

CACHEXY, in medicine, an ill ſtate or diſpoſition of body; wherein the nutrition is depraved throughout the whole habit; accompanied with a ſwelling, or bloating of the fleſhy parts; a flaccid ſtate of the body, eaſily perceived externally, and ariſing from a viſcoſity of the juices, and a remiſſion of the tonic motions of the parts.

The word is formed from *κακος, ill*, and *ἕξις, habit*, or *diſpoſition.*

Signs of the **Cachexy.** There is no diſeaſe more readily known than this, as none has ſuch obvious and diſtinctive ſymptoms. The face, hands, feet, and legs, are always bloated, and ſwelled beyond their natural dimenſions; the natural heat of the body decreaſes, and there is an evident and actual ſenſation of cold in the parts. This is attended with an univerſal languor, and anxiety of mind, and a painful weakneſs in going up ſtairs, or walking up hill; the appetite is very uncertain; and loathings of food are very frequent; after food, there are all the ſymptoms of a bad digeſtion, as tenſions and oppreſſions about the ſtomach and flatulencies. The bowels are in a very uncertain ſtate, ſometimes remaining coſtive for a long while; and at others, throwing off the food undigeſted, in the manner of a lientery; the patients have all a great propenſity to ſleep, but they are not refreſhed by it. The urine is but ſmall in quantity, and is ſometimes crude and reddiſh: ſometimes limpid, but always has a livid appearance. The pulſe is languid and weak; and the blood, if it happens to be ſeen by any accident, is pale and thin, and abounds in ſerocities. The patients always complain alſo of a ſhortneſs of the breath, and a difficulty of breathing, eſpecially after the body has been at any time in motion. Heats and fluſhings come on at times, and the head is always diſturbed; always torpid and inclined to ſleep, and ſometimes vertiginous and violently painful; and œdematous tumors appear in the feet, when the patient is ſtanding up, but diſappear again when he lies down.

There is always alſo a ſenſe of weight and preſſure in the abdomen; ſometimes in the right hypochondrium, ſometimes in the left; and often deeply inward under the navel; ſometimes the whole abdomen is inflated and hard, and ſometimes it is only partially ſo; hardneſſes and inequalities being ſenſible to the touch in it.

It moſt frequently attacks perſons of a phlegmatic habit, and is more common among the women than men, as well on account of their ſofter texture, as of the frequent diſorder the irregularity of their menſtrual diſcharges throws them into. Women, oftener, however, are brought into it through a defect of the menſes than by the exceſs of their diſcharge.

Cauſes. Among theſe are to be reckoned, the living in wet and damp rooms; the leading an idle and ſedentary life, and the feeding on viſcous things, and drinking great quantities of water. On the contrary, the abuſe of ſpirituous liquors will alſo occaſion it; and the taking of aſtringent medicines at the times when the blood is in violent emotions, as in hæmorrhages and acute fevers; the ſtriking in of cutaneous fevers will alſo ſometimes occaſion it; and very often the omiſſion or ſuppreſſion of habitual diſcharges of blood, by whatever paſſages. Great loſs of blood is vulgarly ſuppoſed to be one of the principal agents in bringing on this diſeaſe, but improperly; for when this ſucceeds ſuch diſcharges, it is rather owing to their being long continued than violent, and to the improper diet of the patient afterwards, which prevents a proper ſupply of blood again, than from the actual loſs of it. Improper treatment of the gout, and the abuſes of volatile ſalts in high fevers, are alſo too often the cauſe of this diſeaſe. For Cure, &c. See **Medicine.**

CACHRYS, a genus of the pentrandria order, belonging to the digynia claſs of plants. There are five ſpecies, viz. the trifida, with bipinnated leaves; the ſicula, with double winged leaves; the libanotis, with ſmooth furrowed ſeeds; the linearea, with plain channelled fruit; and the hungarica, with a plain, fungous channelled ſeed. All theſe are perennial plants, riſing pretty high, and bearing large umbels of yellow flowers, and may be propagated by ſeeds which ought to be ſown ſoon after they are ripe; for if they are kept out of the ground till the next ſpring, they often miſcarry. They muſt alſo be ſown in a ſhady border where they are to remain: for the plants, having long tap-roots, will not bear tranſplanting.

CACHUNDE, the name of a medicine, celebrated among the Chineſe and Indians, and made of ſeveral aromatic ingredients, perfumes, medicinal earth, and precious ſtones: they make the whole into a ſtiff paſte. In China, the principal perſons uſually carry a ſmall piece in their mouths, which is a continued cordial, and gives their breath a very ſweet ſmell. It is a highly valuable medicine alſo, in all nervous complaints; and is eſteemed a prolonger of life, and a provocative to venery, the two great intentions of moſt of the medicines in uſe in the Eaſt.

CACTUS, in botany, the melon thiſtle.

CADARI, or **Kadari**, a ſect of Mahometans, who aſſert free-will, attribute the actions of men to men alone, not to any ſecret power determining the will; and deny all abſolute decrees of predeſtination.

The author of this ſect was Mabed ben Kaled Al Gihoni, who ſuffered martyrdom for it.

CADE, a cag, caſk, or barrel. A cade of herrings is a veſſel containing the quantity of 500 red herrings, or 1000 ſprats.

CADE *Worm*, in entomology, the phryganium, a common worm found in ditches, and uſed as a bait for fiſh. The fly produced from this worm has a long body, four brown wings, and a forked tail, and is found in the month of Auguſt very frequent on waters.

CADENCE, in muſic, a kind of cloſe, or reſt, either at the end of a ſong, or ſome of its parts, into which it is divided as into members, or periods.

The word ſeems a metaphor drawn from the dancing-ſchool, where it properly ſignifies a pauſe, or fall, from motion to reſt. A cadence is properly when the parts fall, and terminate on a chord, or note, the ear ſeeming naturally to expect it. Regularly it is to be made on the final or dominant, though ſometimes alſo on the mediant, or middle chord of a mode.

Cadences in ſinging anſwer nearly to points or ſtops in diſcourſe. They are reſts contrived to favour the weakneſs of the performers, as well as the hearers, of a muſical compoſition. The chief cadence or cloſe is the key itſelf, in which the baſs muſt always conclude; the next in dignity is the fifth above, and the next to that the third. Or if the baſs be ſharp, the fourth or ſecond above the key. See MUSIC.

CADENCE, in reading, is a falling of the voice below the key note at the cloſe of every period. In reading, whether proſe or verſe, a certain tone is aſſumed which is called the key-note; and in this tone the bulk of the words are ſounded; but this note is generally lowered towards the cloſe of every ſentence.

CADETS, the younger brothers of a family: a term naturalized in our language from the French.

In Paris, among the citizens, the cadets have an equal portion with the eldeſt: in other places, the eldeſt has all. According to the cuſtom of Spain, one of the cadets, in great families, takes the mother's name.

CADET is alſo a young gentleman ſoldier, who, to attain to ſome knowledge in the art of war, and in expectation of preferment, chooſes to carry arms as a private man in a company of foot, to qualify himſelf for a commiſſion.

Cadet differs from volunteer, as the former takes pay, though only that of a private man, whereas the latter ſerves without pay.

CADI, among the Turks and Saracens, denotes an ordinary judge, who decides in all civil controverſies within the diſtrict of a town or city, though ſubject to appeals to ſuperior judges.

The term Cadi, uſed abſolutely, denotes the judge of a ſmaller town or village; thoſe of cities being called mollas, or moulas, ſometimes mouli cadis, or great cadis.

We find numerous complaints of the avarice, extortion, and iniquity of the Turkiſh cadies; all juſtice is here venal; the people bribe the cadies; the cadies bribe the moulas; the moulas the cadileſchers; and the cadileſchers the mufti.

CADILESCHER, or CADI-LESKER, a capital officer of juſtice among the Turks, anſwering to a chief juſtice among us.

There are but three cadileſchers in all the grand ſignior's territories; the firſt is that of Europe; the ſecond, of Natolia; and the third reſides at Grand Cairo. This laſt is the moſt conſiderable. They have their ſeats in the divan next the grand vizier.

CADIZADELITES, a ſect among the muſſulmen, reſembling the ancient ſtoics, who avoid all feaſting and diverſion, and affect an uncommon gravity in all they do or ſay.

CADMIA, in pharmacy, a name which has been variouſly applied; but it uſually denotes a mineral ſubſtance, whereof there are two kinds, natural and artificial.

The natural cadmia, again, is of two ſorts; the one containing arſenic, and called cadmia foſſilis, or cobalt; the other containing zinc, called calamine.

CADRITES, an order of religious among the Mahometans; whoſe founder was Abdul Cadri, a great philoſopher and lawyer; whence they take their name, Cadrites.

They live in common, and in a kind of monaſteries, which, however, they are allowed to quit, if they requeſt it, and to marry; on condition of their wearing black buttons on their garments, to diſtinguiſh them from the reſt of the people.

In their monaſteries, they paſs the greateſt part of every Friday night in running round, holding each other's hand, and crying inceſſantly, *hhai*, *living*, one of the names of God: one of the number plays all the time on a flute, to animate them in this extravagant dance.

CADUCEUS, or CADUCEUM, Mercury's rod or ſceptre; a wand entwiſted with two ſerpents, worn by that deity as the enſign of his quality and office.

The caduceus found on medals, is a common ſymbol ſignifying good conduct, peace, and proſperity. The rod expreſſes power, the two ſerpents, prudence; and two wings, diligence.

CADUCI, from *cado*, to fall; the name of a claſs in Linnæus's calycina, conſiſting of plants whoſe calix is a ſimple perinihium, ſupporting a ſingle flower or fructification, and falling off either before or with the petals. It ſtands oppoſed to the claſſes perſiſtentes in the ſame method, and is exemplified in muſtard and ranunculus.

CÆCÆ, *Glandulæ*. See GLANDS.

CÆCILIA, in amphibiology, the name of a genus of ſerpents. There are two ſpecies; 1. The tentacula, a native of America. 2. The gutinoſa of the Indies.

CÆCUM, the blind gut. See Syſtem of ANATOMY.

CÆLATURA, or COELATURA, the art of engraving on metals, ſtones, woods, or the like, with inſtruments of ſteel, diamond, &c.

CÆRITES, *Tabulæ*, in Roman hiſtory, the cenſors tables, wherein were entered the names of ſuch perſons as, for ſome miſdemeanor, were to loſe the right of ſuffrage in elections at Rome.

The original of the appellation aroſe hence; that during the captivity of Rome under the Gauls, the Cærites, or inhabitants of Cære, a city in Etruia, preſerved their ſacred books, and other matters belonging to the worſhip of the gods, in gratitude for which, the Romans dignified the Cærites with the appellation of Roman citizens, but without admitting them into any part of the adminiſtration.

CÆSALPINIA, in botany, Braſil, a genus of the decandria monogynia claſs. There are two ſpecies. See BRASIL.

CÆSAR, among the Romans, was a long time uſed for the heir intended, or preſumptive of the empire; as king of the Romans is now uſed for that of the German empire.

The Cæſars were a kind of adjuncts or aſſociates of the empire, *participes imperii*. They wore the imperial mantle, purple, and diadem, and walked with other marks of the ſovereign dignity; they were created like the emperors, by putting on the purple robe.

CÆSARIAN, operation in midwifery, the operation of extracting the fœtus from the mother, whether living or dead, by an inciſion through the abdomen into the uterus. Thoſe brought into the world in this manner, are called Cæſares, and *Cæſones, a cæſo matris utero*; as were C. Julius Cæſar, Scipio Africanus, Manlius, and our Edward VI. See Syſtem of MIDWIFERY.

CÆSARIANS, or CÆSARIENSES, in Roman antiquity, were miniſters or officials of the procurator Cæſaris, to whom belonged the keeping of the fiſcal accounts, and taking poſſeſſion of effects devolving or eſcheating to the emperor. Theſe were called catholiciani. From the appellation Cæſarianus ſome deduce the modern word ſergeant.

CÆSTUS, a large leathern gantlet, loaded with lead uſed in the combat, or exerciſes, of the ancient athletæ.

Calepine ſays it was a kind of a club with leaden balls hanging from it, ſuſpended by leathern thongs: but he was miſtaken, it being only a leathern thong ſtudded with nails of lead or iron; part of it was twiſted round the hand and arm, to prevent their being broken or diſlocated. See CESTUS.

CÆSURA, in the ancient poetry, is when, in the ſcanning of a verſe, a word is divided, ſo that one part ſeems cut off, and goes to a different foot from the reſt; e. gr.

Menti | *ri no li : nun* | *quam men* | *dacia proſunt.*

Where the ſyllables *ri*, *li*, *quam*, and *men* are *cæſures*.

CÆSURA, in the modern poetry, denotes a reſt or pauſe towards the middle of a long Alexandrian verſe; by which the voice and pronunciation are aided, and the verſe divided into two hemiſtichs.

CÆTERIS *Paribus*, a Latin term, in frequent uſe among mathematical and phyſical writers.

The words literally ſignify, *other things being equal*; which expreſſes pretty nearly their meaning as a term. Thus, we ſay the heavier the bullet, *cæteris paribus*, the greater the range: *i. e.* by how much the bullet is heavier, if the length and diameter of the piece, and the quantity and ſtrength of the powder, be the ſame, by ſo much will the utmoſt range or diſtance of a piece of ordnance be greater.

Thus alſo in a phyſical way, we ſay, the velocity and quantity of blood circulating in a given time, through any ſection of an artery, will, *cæteris paribus*, be according to its diameter, and nearneſs to, or diſtance from the heart.

CAFFA, cotton cloths painted with ſeveral colours, and of divers deſigns; they are manufactured in the Eaſt-Indies, and ſold at Bengal.

CAFFACA, in natural hiſtory, a peculiar kind of earth, of a grey colour, having a light caſt of green in it, uſed by the Turks and Tartars. It is very ſoft and unctuous, and ſomething reſembles our fullers earth: but is more aſtringent, and adheres very firmly to the tongue; theſe people bathe very frequently, and they uſe this earth on thoſe occaſions.

CAG, or KEG, a barrel or veſſel, generally containing about four or five gallons.

CAGE, an incloſure made with wire, wicker, or other matter, interwoven latticewiſe, for the detention of wild beaſts or birds.

The word is French, *cage*, formed from the Italian *gaggia*, of the Latin *caveo*.

Beaſts were uſually brought to Rome ſhut up in oaken or beechen cages, artfully formed, and covered or ſhaded with boughs, that the creatures, deceived with the appearance of a wood, might fancy themſelves in their foreſt. The fiercer ſort were pent in iron cages, leſt wooden priſons ſhould be broke through.

In ſome priſons there are iron cages for the cloſer confinement of criminals.

CAGIT, in natural hiſtory, a name given by the people of the Philippine iſlands, to a ſpecies of parrot, very common in their woods; it is of a middling ſize, and is all over of a fine green colour.

CAGUI, in tetrapodology, a Braſilian monkey, called alſo pougi, of which there are two ſpecies, the jacchus and œdipus, the one large, the other ſmaller.

CAHYS, a dry meaſure for corn, uſed in ſome parts of Spain, particularly at Seville and at Cadiz. It is near a buſhel of our meaſure.

CAIA, in the Turkiſh military orders, an officer ſerving in the poſt of a deputy or ſteward, and acting for the body of the janizaries.

CAJEPUT, an oil brought from the Eaſt Indies. The ſmell of the oil of cajeput reſembles that of cardamums. Four or five drops of this oil of cajeput, in a proper liquor, are recommended as an excellent nervous medicine, and as of great efficacy in the cardialgia.

CAIMACAN, or Caimacam, a dignity in the Ottoman empire, anſwering to that of lieutenant, or vicar, among us.

The word is compoſed of the two Arabic words, *Caim machum*, q. d. he who holds the place, or diſcharges the functions of another.

There are uſually two caimacans; one reſides at Conſtantinople, who is the governor thereof; the other attends the grand vizir, in quality of his lieutenant. Sometimes there are three caimacans; one conſtantly attending the grand ſignior, another the grand vizir, and a third conſtantly at Conſtantinople, who examines affairs of policy, and regulates them in great meaſure. The caimacan that attends the vizir, only officiates when at a diſtance from the grand ſignior; his function ceaſing, when the vizir is with the ſultan. The caimacan of the vizir is his ſecretary of ſtate, and the firſt miniſter of his council.

CAISSON, in the military art, a wooden cheſt, into which ſeveral bombs are put, and ſometimes filled only with gunpowder: this is buried under ſome work whereof the enemy intend to poſſeſs themſelves, and, when they are maſters of it, is fired, in order to blow them up.

Caisson is alſo uſed for a wooden frame or cheſt uſed in laying the foundations of the piers of a bridge.

CAITAIA, in tetrapodology, the name of an American monkey, remarkable for its ſweet ſmell; it has indeed ſomewhat of a ſcent of muſk about it; its hair is long, and of a whitiſh yellow colour; its head is round; its forehead depreſſed, and very ſmall; its noſe ſmall and flatted, and its tail arched. It is eaſily tamed and kept about houſes, but is very clamorous and quarrelſome.

CALABASH, a kind of veſſel formed of the ſhell of a gourd, emptied and dried, ſerving to put divers kinds of goods in, as pitch, roſin, and the like. The word is Spaniſh, *calabaca*, which ſignifies the ſame. The Indians alſo, both of the North and South Sea, put the pearls they have fiſhed in calabaſhes, and the negroes on the coaſt of Africa do the ſame by their gold duſt. The ſmaller calabaſhes are alſo frequently uſed by theſe people as a meaſure, by which they ſell theſe precious commodities to the Europeans. The ſame veſſels likewiſe ſerve for putting in liquors; and do the office of cups, as well as bottles, for ſoldiers, pilgrims, &c.

Calabash Tree, creſcentia, in botany, a genus of the didynamia angioſpermia claſs. Linnæus mentions one, and Miller two ſpecies, the firſt of which grows naturally in Jamaica, and in all the Leeward iſlands; it has a thick trunk, covered with a whitiſh bark, which riſes from twenty to thirty feet high, and at the top divides into many branches, forming a large regular head.

CALAE, or Calaem, a ſpecies of Indian tin, which, by force of fire, is tranſmutable into ceruſs, like that made of our lead.

CALAMANCO, a woollen ſtuff, manufactured in Brabant and in Flanders. There are alſo a great many made in England. It is commonly woven wholly of wool; there are ſome, however, wherein the warp is mixed with ſilk, and others with goat's hair. There are calamancos of all colours, and diverſly wrought. Some are quite plain, others have broad ſtripes, adorned with flowers; ſome with plain broad ſtripes; ſome with narrow ſtripes; and others watered. This is alſo no inconſiderable branch of the woollen manufacture in England, both for home wear and exportation. Kidderminſter, in the county of Worceſter, ſtands foremoſt in this branch.

CALAMARIÆ, in botany, an order of plants in the fragmenta methodi naturalis of Linnæus. See Syſtem of BOTANY.

CALAMBA, or Calambac, a kind of wood brought from China, uſually ſold under the denomination of lignum aloes, or agallochum, growing chiefly in Malacca and Sumatra; and much uſed in India for making beads and crucifixes.

CALAMINE, Calamy, *Lapis Calaminaris*, or *Cadmia Foſſilis*, a ſort of ſtone of mineral, containing zinc, iron, and ſometimes other ſubſtances. It is conſiderably heavy, and the more ſo the better; moderately hard and brittle, or of a conſiſtence betwixt ſtone and earth: the colour is ſometimes whitiſh or grey; ſometimes yellowiſh, or of a deep yellow; ſometimes red; ſometimes brown or blackiſh. It is plentiful in ſeveral places of Europe, as Hungary, Tranſylvania, Poland, Spain, Sweden, Bohemia, Saxony, Goſlar, France, and England, particularly in Derbyſhire, Glouceſterſhire, Nottinghamſhire, and Somerſetſhire, as alſo in Wales. The calamine of England, however, is by the beſt judges allowed to be ſuperior in quality to that of moſt other countries. It ſeldom lies very deep, being chiefly found in clayey grounds near the ſurface. In ſome places it is mixed with lead-ores. It is the only true ore of zinc, and is uſed as an ingredient in making of braſs, ſee BRASS. It is prepared by waſhing in running water, which takes off the light earthy parts, and leaves the calamine and lead behind; by ſhaking afterwards in water with a ſieve the lead drops to the bottom, it is afterwards baked four or five hours and ſtirred all the time. Newman relates various experiments with this mineral, the only reſult of which was to ſhow that it contained iron as well as zinc. The moſt remarkable are the following. A ſaturated ſolution of calamine in the marine acid, concentrated by evaporating part of the liquor, exhibits in the cold an appearance of fine cryſtals, which on the application of warmth diſſolve and diſappear. Glue diſſolved in this ſolution, and afterwards inſpiſſated, forms an extremely ſlippery tenacious maſs, which does not become dry. Sulphur boiled in the ſolution ſeems to acquire ſome degree of tranſparency. This mineral is an article in the materia medica; but, before it comes to the ſhops, is uſually roaſted or calcined, in order to ſeparate ſome arſenical or ſulphureous matter which in its crude ſtate it is ſuppoſed to contain, and to render it more eaſily reducible into a fine powder. In this ſtate it is employed in collyria againſt defluxions of thin acrid humours upon the eyes, for drying up moiſt running ulcers, and healing excoriations. It is the baſis of an officinal drying cerate.

Though the lapis calaminaris is the only native ore of zinc, there is another ſubſtance from which that ſemi-metal is alſo obtained. This is called cadmia fornacum, or cadmia of the furnaces, to diſtinguiſh it from the other. This is a matter ſublimed when ores containing zinc, like thoſe of Rammelſberg, are ſmelted. This cadmia conſiſts of the flowers of the ſemi-metal ſublimed during the fuſion, and adhering to the inner ſurfaces of the walls of furnaces, where they ſuffer a ſemi-fuſion, and therefore acquire ſome ſolidity. So great a quantity of theſe are collected, that they form very thick incruſtations, which muſt be frequently taken off.

CALAMINT, in botany, an officinal plant, whoſe leaves are reputed warm, aperient, and diaphoretic, and enter ſeveral alexipharmic compoſitions. It is enumerated by Miller among the ſpecies of meliſſa, or baum.

There are three ſorts of calamint in uſe, viz. the ſilveſtris; the vulgaris, or montana; and paluſtris, or aquatica.

CALAMITES, in natural hiſtory, a name given by ſome to the oſteocolla, which, when in ſmall pieces, ſometimes pretty exactly reſembles the barrel of a quill; others have called ſome of the foſſile coralloides by this name, there being frequently in them the reſemblance of ſeveral quills cemented together in ſtone.

CALAMUS, *Aromaticus*, a ſpicy bitteriſh root, produced by a peculiar kind of water plant, growing in the Levant, and even in ſeveral parts of England.

The beſt is that which is greyiſh without, and reddiſh within; its pulp white, and taſte ſomewhat bitter; but its leaves, as well as roots, ſweet ſcented.

The agreeable flavour and peculiar taſte of the root, are owing to an eſſential oil.

CALANGAY, a ſpecies of parrot in the Philippine iſlands, it is all over white, and has a creſt of white feathers on its head; it is of the ſize of a pigeon, and is eaſily kept tame, and learnt to talk. It is called alſo in ſome of the Philippines *catatua* and *abacay*.

CALASH, or Calesh, a ſmall light kind of chariot, or chair, with very low wheels, uſed chiefly for taking the air in parks and gardens. The word is French, *calache*.

The calaſh is for the moſt part richly decorated, and open on all ſides, for the conveniency of the air, and proſpect; or at moſt encloſed with light mantlets of waxed cloth, to be opened or ſhut at pleaſure.

In the Philoſophical Tranſactions, we have a deſcription of a new ſort of calaſh, going on two wheels, not hung on traces, yet eaſier than the common coaches; having this farther advantage, that whereas a common coach will overturn if one wheel goes on a ſurface a foot and a half higher than that of the other, this will admit of a difference of three feet and one third, without danger of overturning. The ladies alſo wear a dreſs on their heads as a ſubſtitute for a hat or bonnet, called a calaſh.

CALASIRIS, in antiquity, a linen tunic worn by the Phœnician, Egyptian, Roman, and other prieſts.

CALATHUS, in antiquity, a kind of hand baſket made of light wood, or ruſhes; uſed by the women ſometimes to gather flowers, but chiefly after the example of Minerva, to put their work in.

The figure of the calathus, as repreſented on ancient monuments, is narrow at the bottom, and widening upwards, like that of a top. Pliny compares it to that of a lily.

CALATRAVA, a military order, in Spain, inſtituted in 1158, by Sancho III. king of Caſtile, on the following occaſion. The Moors going to attack the little city Calatrava, and the Templars, who held it, ſurrendered it up to the king, on a ſuſpicion of their inability to defend it; Diego Valeſquez, a Ciſtercian monk, but a man of quality, perſuaded Raimond, abbot of Fitero, a monaſtery of Ciſtercians, to beg Calatrava of the king. He obtained it; and Raimond and Diego put themſelves in it; being followed by a great number of people who joined them out of zeal, for the defence of Calatrava. The Moors abandoning the enterprize, many of thoſe, who came to the defence of the city, entered the order of the Ciſtercians; and that under a habit more fit for military than monaſtic exerciſe. Accordingly, they began to make excurſions on the Moors; and this was the riſe of the order of Calatrava.

The knights bear a croſs gules, fleury with green, &c. Their rule and habit were originally that of the Ciſtercians, but their dreſs was a little ſhortened, on account of their exerciſes: and in proceſs of time they were permitted a ſecular habit.

CALAUDRA, in ornithology, the name of a bird of the lark-kind, and of the ſhape of the common lark, but conſiderably larger. This bird is either the ſame with the common Engliſh bunting, or very like it.

CALCAR, in glaſs-making, is the name of a ſmall oven, or reverberatory furnace, in which the firſt calcination of ſand and ſalt of pot-aſhes is made, for turning them into what they call frit.

CALCAREOUS, ſomething that partakes of the nature and qualities of calx, or lime.

We ſay a calcareous earth, calcareous ſtone.

Calcareous earths and ſtones, properly ſo called, have been found by experiment to conſiſt of the following component parts, viz. quick-lime, or pure calcareous earth; fixed air, which, when extricated from them, is permanently elaſtic; and water. Theſe earths acquire cauſticity, and loſe a great part of their weight by calcination, and by diſſolution in acids, in conſequence of the diſcharge of a conſiderable quantity of fixed air.

CALCEDONY, *Lapis Calcedonius*, one of the loweſt prized among precious ſtones; diverſified with various colours, partly tranſparent, and partly opake.

The calcedony nearly reſembles the common agate, and is reputed a ſpecies thereof: its colour is a miſty grey, clouded with blue, yellow, or purple. It is ſuppoſed to be the white agate of of the ancients; though we ſometimes find pieces of it blackiſh.

It is very fit for the graver; and much uſed to engrave arms, &c. upon, as being harder and preferable to cryſtal. The cleareſt and beſt is that with a pale caſt of blue.

CALCINATION, the act of reducing any matter or ſubſtance into a calyx. See Syſtem of CHEMISTRY.

CALCINATUM *Minus*, denotes a thing which is naturally ſweet, as ſugar, manna, &c.

CALCIS *Os*. See OS CALCIS.

CALCITRAPA, in botany. See CENTAURY.

CALCITRAPOIDES, thorny knap-weed, in botany. See CENTAURY.

CALCULARII, in antiquity, a ſort of jugglers who practiſed ſlight of hand. Their art conſiſted in laying ſeveral calculi, or counters on the table, then covering them with cups, and ſhifting and changing them with dexterity, like what is practiſed by modern jugglers.

CALCULARY *of a Pear*, a congeries of little ſtony knots diſperſed through the whole parenchyma of the fruit, particularly in the Burgundy pear.

The calculary is no vital or eſſential part of the fruit; the ſeveral knots whereof it conſiſts being only ſo many concretions or precipitations out of the ſap, as we ſee in urines, wines, and other liquors.

CALCULATION, the act of computing ſeveral ſums, or ſolving queſtions, by memory, or by means of arithmetic, algebra, &c.

CALCULUS, primarily denotes a little ſtone or pebble, anciently uſed in making computations, taking of ſuffrages, playing at tables, and the like. In after-times, pieces of ivory, and counters ſtruck of ſilver, gold, and other matters, were uſed in lieu thereof, but ſtill retaining the ancient names. The Roman judges anciently gave their opinions by calculi, which were white for abſolution, and black for condemnation. This uſage is ſaid to have been borrowed from the Thracians, who marked their happy or proſperous days by white, and their unhappy by black, pebbles, put each night into an urn.

Beſides the diverſity of colour, there were ſome calculi alſo which had figures or characters engraven on them, as thoſe which were in uſe in taking the ſuffrages both in the ſenate and at aſſemblies of the people. Theſe calculi were made of thin wood, poliſhed, and covered over with wax. The letters marked upon theſe calculi were U. R. for *uti rogas*, and A for *antiquo*; the firſt of which expreſſed an approbation of the law, the latter a rejection of it. Afterwards the judges who ſat in capital cauſes uſed calculi marked with the letter A for *abſolvo*; C for *condemno*; and N. L. for *non liquet*, ſignifying that a more full information was required.

CALCULUS *Literalis*, or *Literal* CALCULUS, is the ſame with ſpecious arithmetic, or algebra, ſo called from its uſing the letters of the alphabet: in contradiſtinction to numeral arithmetic, which uſes figures. See Syſtem of ALGEBRA.

CALCULUS, in medicine, the diſeaſe of the ſtone in the bladder, or kidneys. See STONE.

CALCULUS *Tiburtinus*, a ſort of figured ſtone, formed in great plenty about the cataracts of the Anio, and other rivers in Italy; of a white colour, and in ſhape oblong, round, or echinated. They are a ſpecies of the ſtiriæ lapidiæ, and generated like them; and ſo like ſugar-plums in the whole, that it is a common jeſt at Rome to deceive the unexperienced by ſerving them up at deſerts.

CALDARIA *Judiciaria*, the method of trial, or pugation by by boiling water.

CALDARIUM, antient baths, being a brazen veſſel or ciſtern, placed in the hypocauſtum, full of hot water, to be drawn thence into the piſcina or bath, to give it the neceſſary degree of heat; anſwering the ſame purpoſes as the bagnios and ſweating rooms of the moderns.

In this ſenſe the caldarium ſtood contradiſtinguiſhed from the tepidarium and frigidarium.

CALDRON, a large utenſil, commonly made of copper, and uſed for boiling food and other matters; it implies nearly the ſame as furnace.

Boiling in CALDRONS, is a capital puniſhment ſpoken of in middle-age writers, decreed to divers ſorts of criminals, but chiefly to debaſers of the coin.

CALEA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs of plants. There are three ſpecies.

CALEDONIANS, in antiquity, the antient inhabitants of that part of Britain which lies northward beyond Graham's Dyke, or the wall of Antoninus Pius, afterwards called Picts by the Romans and Provincials. The term Caledonii became, in proceſs of time, ſo common among the Roman writers, that they applied it generally to all Britain, and all the foreſts of Britain.

Camden derives the name from the plural kaledion, of the Britiſh word kaled, hard; whence Caledonii, denoting a people hardy, uncivilized, and ruſtic. Buchanan derives it from the old Scottiſh word calden, hazel-tree.

CALEFACTION, a ſchool term for the action of fire in heating a body; or the impulſe which the particles of a hot body impreſs on other bodies around.

CALENDAR, in aſtronomy and chronology; more generally termed KALENDAR, to which we refer.

CALENDAR *of Priſoners*, is a liſt of all their names, with their ſeparate judgments in the margin, which the judge ſigns, and the execution of which is committed to the reſpective ſheriffs.

CALENDARIUM FLORÆ, in botany, a calendar containing an exact regiſter of the reſpective times in which the plants of any given province or climate germinate, expand, and ſhed their leaves and flowers, or ripen and diſperſe their ſeeds.

CALENDER, a machine uſed in manufactories to preſs certain woollen and ſilken ſtuffs and linens, to make them ſmooth, even, and gloſſy, or to give them waves, or water them, as may be ſeen in mohairs and tabbies. This inſtrument is compoſed of two thick cylinders or rollers, of very hard and well poliſhed wood, round which the ſtuffs to be calendered are wound: theſe rollers are placed croſs-wiſe between two very thick boards, the lower ſerving as a fixed baſe, and the upper moveable by means of a thick ſcrew with a rope faſtened to a ſpindle which makes its axis: the uppermoſt board is loaded with large ſtones of an amazing weight. At Paris they have an extraordinary machine of this kind, called the royal calender, made by order of M. Colbert. The lower table or plank is made of a block of ſmooth marble, and the upper is lined with a plate of poliſhed copper. The alternate motion of the upper board ſometimes one way and ſometimes another, together with the prodigious weight laid upon it, gives the ſtuffs their gloſs and ſmoothneſs; or gives them the waves, by making the cylinders on which they are put, roll with with great force over the undermoſt board. When they would put a roller from under the calender, they only incline the undermoſt board of the machine. The dreſſing alone, with the many turns they make the ſtuffs and linens undergo in the calender, gives the waves, or waters them, as the workmen call it. It is a miſtake to think, as ſome have aſſerted, and Mr. Chambers among others, that they uſe rollers with a ſhallow indenture or engraving cut into them.

CALENDERS, a ſort of Mahometan friars, ſo called from Santon Calenderi their founder. This Santon went bareheaded, without a ſhirt, and with the ſkin of a wild beaſt thrown over his ſhoulders. He wore a kind of apron before, the ſtrings of which were adorned with counterfeit precious ſtones. His diſciples are rather a ſect of Epicureans, than a ſociety of religious. They honour a tavern as much as they do a moſque; and think they pay as acceptable worſhip to God by the free uſe of his creatures, as others do by the greateſt auſterities and acts of devotion.

CALENDULA, the marygold, a genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants. Of this there are eight ſpecies, none of them natives of Europe.

CALENTURE, an inflammatory fever, frequent at ſea, attended with a delirium: wherein the patients imagine the ſea to be green fields; and, if not prevented, will leap over-board.

The diſeaſe is chiefly found in ſailing towards the Weſt-Indies, as they approach the tropic. Thoſe affected have a fierce look, and are very unruly, being ſo eager to get to their imaginary cool verdure, and ſo ſtrong, that ſix men ſometimes ſcarce ſuffice to detain them. The diſeaſe chiefly ſeizes the young and ſtrong, eſpecially of a ſanguine complexion; the pulſe is extremely low. When taken in time, it rarely proves mortal.

The ſeat of this diſorder is in the ſtomach, and its principal ſource ſeems to be the eating ſalt proviſions for a long time together. Vomiting, bleeding, a ſpare diet, and the neutral ſalts commonly complete a cure; a ſingle vomit generally removes the diſorder, and cooling medicines reſtore the patient.

CALESIAM, in botany, a very tall and beautiful tree; the wood is of a dark purple colour, ſmooth and flexible; the flowers grow in cluſters at the ends of the boughs, very like the flowers of vines, and are ſucceeded by berries in cluſters, like grapes or currants, full of a ſucculent and inſipid pulp, encloſing a ſtone, having a white inſipid kernel.

It grows commonly in Malabar, bears fruit once a year, and is fruitful from ten years ſtanding to fifty and upwards: of the wood they make ſheaths for knives and ſwords. The bark is uſed by the natives as a medicine of great efficacy in various diſorders.

CALF, *Vitulus*, in tetrapodology, the young one of a cow, an animal too well known to need a particular deſcription. For directions for rearing calves, ſee Syſtem of AGRICULTURE, Sect. XXIII. And for the diſorders they are incident too, ſee FARRIERY.

CALF *Skins*, in the leather manufacture, are prepared and dreſſed by the tanners, ſkinners, and curriers, who ſell them for the uſe of the ſhoemakers, ſaddlers, bookbinders, and other artificers, who employ them in their ſeveral manufactures.

Dreſſed in Sumach, the ſkin of this animal is curried black on the hair ſide, and dyed of an orange colour on the fleſh ſide, by means of ſumach, chiefly uſed in the making of belts.

The Engliſh calf ſkin is much valued abroad, and the commerce thereof very conſiderable in France and other countries; where divers attempts have been made to imitate it, but hitherto in vain.

What is like to baffle all endeavours for imitating the Engliſh calf in France is, the ſmallneſs and weakneſs of the calves about Paris; which, at fifteen days old, are not ſo big as the Engliſh when firſt calved.

CALIBER, or CALIPER, the diameter of any body; thus we ſay, two columns of the ſame caliber, the caliber of the bore of a gun, the caliber of a bullet, &c.

CALIBER *Compaſſes*, are uſed by gunners, for taking the diameters of the ſeveral parts of a piece of ordnance, or of bombs, bullets, &c. Their legs are therefore circular; and move on an arch of braſs, whereon is marked the inches and half inches, to ſhow how far the points of the compaſſes are opened aſunder.

Some are alſo made for taking the diameter of the bore of a gun or mortar.

The gaugers alſo ſometimes uſe calipers, to embrace the two heads of any caſk, in order to find its length.

The calipers uſed by carpenters and joiners, is a piece of board notched triangular-wiſe in the middle for the taking of meaſure.

CALIBER *Rule*, is an inſtrument, wherein a right line is ſo divided, as that the firſt part being equal to the diameter of an iron or leaden ball of one pound weight, the other parts are to the firſt, as the diameters of balls of two, three, four, &c. pounds, are to the diameter of a ball of one pound. The caliber is uſed by engineers, from the weight of the ball given, to determine its diameter or caliber, or vice verſa.

CALIDÆ PLANTÆ, from *calor*, heat; plants that are natives of warm climates. Such are thoſe of the Eaſt Indies, South America, Egypt, and the Canary Iſlands. Theſe plants, ſays Linnæus, will bear a degree of heat which is as 40 on a ſcale in which the freezing point is 0, and 100 the heat of boiling water. In the 10th degree of cold they ceaſe to grow, loſe their leaves, become barren, are ſuffocated, and periſh.

CALIDUCT, in antiquity, a kind of pipes or canal diſpoſed along the walls of houſes or apartments, uſed by the antients for conveying heat to ſeveral remote parts of the houſe from one common furnace.

The ancient caliducts ſeem both for thrift and uſe preferable to the German ſtoves; and might even challenge the advantage of our own faſhion, were it not that the very ſight of a fire adds ſomething of luſtre to a room.

CALIETA, in botany, a name uſed by ſome authors for a ſort of yellow fungus common about the roots of trees.

CALIGA, in Roman antiquity, was the proper ſoldier's ſhoe, made in the ſandal faſhion, without upper leather to cover the ſuperior part of the foot, though otherwiſe reaching to the middle of the leg, and faſtened with thongs. The ſole of the caliga was of wood, like the ſabot of the French peaſants.

CALIN, a compound metal, whereof the Chineſe make tea-canniſters, and the like. The ingredients ſeem to be lead and tin.

CALIPH, or KALIF, the ſupreme eccleſiaſtical dignity among the Saracens; or, as it is otherwiſe defined, a ſovereign dignity among the Mahometans, veſted with abſolute authority in all matters relating both to religion and policy. In the Arabic it ſignifies ſucceſſor or vicar; the caliphs bearing the ſame relation to Mahomet that the popes pretend they do to Jeſus Chriſt or St. Peter. It is at this day one of the Grand Signior's titles, as ſucceſſor of Mahomet; and of the Sophi of Perſia, as ſucceſſor of Ali. One of the chief functions of the caliph, in quality of imam or chief prieſt of Muſſulmaniſm, was to begin the public prayers every Friday in the chief moſque, and to deliver the khothbak or ſermon. In after-times, they had aſſiſtants for this latter office; but the former the caliphs always performed in perſon. The caliph was alſo obliged to lead the pilgrims to Mecca in perſon, and to march at the head of the armies of his empire. He granted inveſtitures to princes; and ſent ſwords, ſtandards, gowns, and the like, as preſents to princes of the Mahometan religion; who, though they had thrown off the yoke of the caliphate, nevertheleſs held of it as vaſſals.

CALIXTINS, a name given to thoſe, among the Lutherans, who follow the ſentiments of George Calixtus, a celebrated divine, and profeſſor at Helmſtadt, in the duchy of Brunſwick, who died in 1656: he oppoſed the opinion of St. Auguſtin, on predeſtination, grace, and free-will.

CALKINS, or CALKERS, in farriery, a part prominent from a horſe-ſhoe, intended to ſecure the beaſt from ſliding, commonly called rough ſhoeing, or turning up.

The calkins are the end or extremity of horſe-ſhoes turned or bent downwards, and forged to a ſort of point, to make the beaſt ſtep more ſafe and ſteady on the ice.

The inconvenience of calkins is, that they hinder the horſe from treading evenly on the ground, and thus occaſion wrenches on the foot, or ſtrains in the ſinews; eſpecially in ſtony ways, where the hardneſs of the bottom will not ſuffer the catkins to penetrate: add, that they are apt to make a horſe cut.

CALLA, or WAKE ROBIN, in botany, a genus of the gynandria polyandria claſs of plants.

CALLAF, in botany, a low, ſhrubby tree, growing in the Eaſt, of ſmooth wood, and leaves ſomewhat reſembling the cherry-tree. It has a place in the gardens of the nobility, on account of its incomparable fragrancy; and is cultivated with great care by the peaſants, for the profit they make of its flowers.

An excellent water is prepared from the flowers, eſpecially at Damaſcus, which is of ſo ſtrengthening a virtue, that we have nothing to compare with it: for by the extraordinary ſweetneſs of its ſmell, it wonderfully relieves perſons under a lipothymy.

CALLICHTHUS, in ichthyology, a name given by ſome writers to the anthias, a ſmall fiſh caught in the Adriatic, and ſuppoſed to be a certain token of there being no voracious fiſhes near the place where it is found; it is called alſo *ſacer piſces*, the *holy fiſh*, and is a very beautiful fiſh.

CALLICO, a cloth made of cotton, and printed in a variety of patterns with different colours, the manufacture of which till lately was confined to the Eaſt-Indies, but now in many reſpects excelled in our own country, particularly at Mancheſter and its environs: Ireland and Scotland are alſo induſtriouſly cultivating this branch. Thoſe chintzs or callicos manufactured in the Eaſt, are brought to this country by the Eaſt-India Company, and re-exported by other merchants, to moſt part of Europe; the ſale and wear of them being prohibited in England. This reſtraint now ceaſes to be a grievance, even to thoſe who wiſh to be arrayed in the moſt ſplendid produce of the cotton; for as we before obſerved, our native iſland at this period rivals all the world in making printed cottons. The printing of callicos was eſtabliſhed in London about the year 1676.

By an act of parliament made in 1722, the uſe of dyed, painted, or printed India callicos is forbid, either in apparel or furniture, on the forfeiture of five pounds to the informer for every offence; and drapers ſelling ſuch callico forfeit 20l. 7 Geo. I. ſtat. 1. Cap. 7. Sect. II. but this prohibition does not extend to callicos dyed blue.

Upon the act's taking place, the callico printers fell to work to imitate the Indian callicos, by making the ſame ſtamps and impreſſions, and with the ſame beauty of colours upon Iriſh and Scotch linen.

CALLIGONUM, in botany, a genus of the polyandria digynia claſs; the fruit is briſtly, with a ſingle ſeed.

CALLIGRAPHUS, in antiquity, a copieſt or ſcrivener, who tranſcribed in a fair hand what the notaries had taken down in notes or minutes, being generally in a kind of cypher or ſhort-hand, which, as they were in that hand, being underſtood by few, were copied over fair, and at length, by perſons who had a good hand, for ſale, &c.

CALLIGRAPHY, the art of fair writing.

CALLIOPE, in the Pagan mythology, the muſe who preſides over eloquence and heroic poetry. She was thus called from the ſweetneſs of her voice, and was reckoned the firſt of the nine ſiſters.

CALLISIA, in botany, a genus of the triandria monogynia claſs.

CALLISTIA, in antiquity, a Leſbian feſtival, wherein the women preſented themſelves in Juno's temple, and the prize was aſſigned to the faireſt.

CALLITRICHE, in botany, a genus of the monandria digynia claſs.

CALLITRICHUS, in tetrapodology, a ſpecies of monkey, with a black, flattiſh face, white hairs on the ſides, and black ears, and the upper parts of the body are covered with ſoft hair, of a yellowiſh green colour, whence it is called the green monkey; and the lower parts with hair of a ſilvery colour. It is about the ſize of a ſmall cat.

CALLUS, or CALLOSITY, in a general ſenſe, is any cutaneous, fleſhy, or bony hardneſs, whether natural or preternatural.

In which ſenſe, clavi, or corns, on the hands or feet, are a ſpecies of callus. It is alſo uſed for a kind of node, which joins the extremities of a fractured bone. See SURGERY.

CALLYCHTHIS, in ichthyology, the name of a broad and flat ſea-fiſh, brought to market at Rome under the name of the lampuga. In the Linnæan ſyſtem, it is a ſpecies of the ſilurus.

CALM, the ſtate of reſt which appears in the air and ſea when there is no wind ſtirring. That tract of the Atlantic ocean ſituated between the tropic of Cancer and the latitude of 29° north, or the ſpace that lies between the trade and the variable winds, is frequently ſubject to calms of very long duration; and hence it has acquired amongſt ſeamen the name of the calm latitudes.

Two oppoſite winds will ſometimes make a calm. This is frequently obſerved in the gulf of Mexico, at no great diſtance from the ſhore, where ſome guſt or land-wind will ſo poiſe the general eaſterly wind, as to produce a perfect calm.

Calms are never ſo great in the ocean as on the Mediterranean, by reaſon the flux and reflux of the former keep the water in a continual agitation, even where there is no wind; whereas there being no tides in the latter, the calm is ſometimes ſo dead, that the face of the water is as clear as a looking glaſs; but ſuch calms are almoſt conſtant preſages of an approaching ſtorm.

CALOGERI, or CALOYERS, monks, or religious, in Greece, both male and female; inhabiting particularly mount Athos, but diſſeminated alſo throughout all the churches of the Eaſt. They follow the rule of St. Baſil, and make vows like the weſtern religious.

CALOMEL, dulcified ſublimate of Mercury. See PHARMACY.

CALOPHYLLUM, in botany, a plant of the polyandria monogynia claſs.

CALOTTE, a cap, or coif of hair, ſattin, or other ſtuff; uſed firſt for neceſſity, but now become an eccleſiaſtical ornament, in France, and other popiſh countries.

It was firſt worn by cardinal Richlieu: the red calotte is a badge of a cardinal.

CALOTTE, in architecture, a round cavity, or depreſſure, in form of a cup, or cap, lathed and plaiſtered, uſed to diminiſh the riſe, or elevation of a chapel, cabinet, alcove, &c. which, without ſuch an expedient, would be too high for other parts of the pile.

CALQUING, or CALKING, a term in painting, &c. uſed where the backſide of any deſign is covered with black lead, or red chalk; and the ſtrokes or lines traced through on a waxed plate, wall, or other matter; by paſſing lightly over each ſtroke of the deſign with a point, which leaves an impreſſion of the colour on the plate or wall. This method of off-tracing may likewiſe be performed by pricking the original print, or drawing, and tranſmitting coloured powder through the punctured holes, in order to mark the outlines on a new ground; or, by diſſolving part of the printing ink by means of ſoap, and impreſſing it in that ſtate on a freſh ground.

CALTROP, or CALTHROP, an inſtrument with four iron points, each three or four inches long, diſpoſed triangularwiſe; ſo that there are always three points bearing on the earth, the fourth being in the air.

Several of theſe, fixed in the ground, or thrown into breaches where the cavalry or infantry paſs, annoy them greatly.

CALTROPS, *Tribulus*, in botany, a genus of the decandria monogynia claſs. There are three ſpecies, natives of warm countries. It derives its name from the form of its fruit, which reſembles thoſe inſtruments of war that were caſt in the enemy's way, to annoy their horſes.

This plant, taken inwardly, is a vulnerary; and is ſaid to be of ſervice in a diarrhœa, and the ſtone.

CALVARIA, or CALVA, the ſcalp, or upper part of the head; ſo called from its growing bald firſt.

CALVARY, a term uſed in Catholic countries for a kind of chapel of devotion, raiſed on a hillock near a city; in memory of the place where Jeſus Chriſt was crucified near Jeruſalem.

CALVINISTS, in church hiſtory, thoſe who follow the opinions of Calvin; whoſe doctrine ſtill ſubſiſts in its greateſt purity at Geneva, where it was firſt broached, and from whence it was propagated. This is the prevailing religion of the United Provinces. In England, it is confined among the diſſenters; and in Scotland it is the only orthodox faith.

The Calviniſts are great advocates for the abſoluteneſs of God's decrees; and hold, that election and reprobation depend on the mere will of God, without any regard to the merit or demerit of mankind; that he affords to the elect an irreſiſtible grace, a faith that they cannot loſe, which takes away the freedom of will, and neceſſitates all their actions to virtue.

The Calviniſts believe that God foreknew a determinate number, whom he pitched upon to be perſons in whom he would manifeſt his glory; and, having thus foreknown them, he predeſtinated them to be holy, in order to which he gives them an irreſiſtible grace, which makes it impoſſible for them to be otherwiſe.

CALUMET, a myſtic kind of pipe uſed by the American ſavages as the enſign of peace, and for religious fumigation. The calumet is a ſort of tobacco-pipe, made of red, black, or white marble. The ſhank is decorated with rounds of feathers, and locks of hair, or porcupines quills: in it they ſmoke in honour of the ſun.

CALUMNY, the crime of accuſing another falſely and knowingly of ſome heinous offence.

CALX, properly ſignifies lime; a ſort of ſtone burnt or calcined in a kiln for various purpoſes. It is alſo uſed by chemiſts, and in pharmacy, for a fine powder remaining after the calcination of metals, and other ſubſtances. See Syſtem of CHEMISTRY and PHARMACY.

CALYCIFLORÆ, in botany, the 16th order in Linnæus's *Fragmenta methodi naturalis*. See Syſtem of BOTANY, Sect. VII.

CALYPTRA, in botany, a thin membranous involucrum, uſually of a conic figure, which covers the parts of fructification.

CALYX, among botaniſts, a general term, expreſſing the cup of a flower, or that part of a plant which ſurrounds and ſupports the other parts of the flower.

The cups of flowers are very various in their ſtructure, and on that account diſtinguiſhed by ſeveral names, as *perianthium*, *involucrum*, *ſpatha*, *gluma*, *&c.* See Syſtem of BOTANY.

CAMÆA, in foſſilogy, the name of a genus of the ſemipellucid gems.

Of this genus we have four known ſpecies.

CAMAIEU, or CAMAYEU, a word uſed to expreſs a peculiar ſort of onyx; alſo by ſome to expreſs a ſtone, whereon are found various figures, and repreſentations of landſcapes, &c. formed by a kind of luſus naturæ; ſo as to exhibit pictures without painting.

CAMALDULIANS, an order of religious, founded by Romuald, an Italian fanatic, in 1023, in the horrible deſart of Camaldoli, otherwiſe called Campo Malduli, ſituate in the ſtate of Florence, on the Apennines.

Their rule is that of St. Benedict; and their houſes, by the ſtatutes are never to be leſs than five leagues from cities.

CAMBER *Beam*, among builders, a piece of timber in an edifice cut archwiſe, or with an obtuſe angle in the middle, commonly uſed in platforms, as church leads, and on other occaſions where long and ſtrong beams are required.

CAMBERED *Decks*, among ſhip-builders. The deck or flooring of a ſhip is ſaid to be cambered, or to lie cambering, when it is higher in the middle of the ſhip's length, and droops toward the ſtem and ſtern, or the two ends. Alſo when it lies irregular.

CAMBLET, or CAMLET, a plain ſtuff compoſed of a warp and a woof, which is manufactured on a loom with two treddles, as linens and flannels are.

There are camblets of ſeveral ſorts: ſome of goat's hair, both in the warp and woof; others in which the warp is of hair, and the woof half hair and half ſilk; others again in which both the warp and the woof are of wool; and, laſtly, ſome in which the warp is of wool, and the woof of thread. Some are dyed in thread, others in the piece, others are marked and mixed; ſome are ſtriped, ſome waved or watered, and ſome figured.

Camblets are proper for ſeveral uſes, according to their different kinds or qualities: ſome ſerve to make garments both for men and women; ſome for bed curtains; others for houſehold furniture, &c.

CAMBRICKS, a ſpecies of very fine white linen made at Cambray, a great quantity of it is uſed in England.

CAMEL, or CAMELUS, in tetrapodology, a genus of quadrupeds belonging to the order of pecora. The ſpecies are,

I. The Dromedarius, or African camel, with one bunch or protuberance on the back. It has four callous protuberances on the fore-legs, and two on the hind ones. The hoof, or rather callous ſkin, of their feet, which is ſofter than the hoofs of other animals, enables the camel to walk along the ſandy paths of warm climates with greater eaſe; as, by yielding to the preſſure, it is not ſo ſubject to be injured by friction. The ſtructure and conſtitution of theſe creatures is admirably adapted to the climate which produces them. In Africa and Arabia, where this animal is moſt frequent, it is employed in carrying all kinds of burdens, when there is great ſcarcity of water. The camel has often been obſerved to travel longer than any other creature without drink. This it is enabled to do from a ſingular conſtruction in its ſtomach. It is one of the ruminating animals, and has four ſtomachs. At the top of the ſecond ſtomach there are ſeveral ſquare holes, which are the orifices of about 20 cavities or ſacks placed between the two membranes which compoſe the ſubſtance of this ſtomach. Theſe ſacks are ſo many reſervoirs which they fill over and above what ſatisfies their preſent thirſt, and ſerve for ſupplying them with water in long journeys through the dry and ſandy deſarts, where wells and rivers are ſeldom to be met with. Travellers, when much oppreſſed with drought, are ſometimes obliged to kill their camels, in order to have a ſupply of drink from theſe reſervoirs. By the above means camels are enabled to paſs over unwatered tracts for ſeven or eight days, without requiring the leaſt liquid; Leo Africanus ſays for 15. They can diſcover water by their ſcent at half a league's diſtance; and after a long abſtinence will haſten towards it, long before their drivers perceive where it lies. Their patience under hunger is ſuch, that they will travel many days, fed only with a few dates, or ſome ſmall balls of bean or barley-meal, or on the miſerable thorny plants they find in the deſart. The camel carries very heavy burdens; and travels long, but with a ſlow pace. The largeſt kind will carry a load of 1000 or 1200 lb. weight. They kneel down to be loaded, but riſe the moment they find the burden equal to their ſtrength: they will not permit any more to be put on. They are moſt mild and gentle at all times but when they are in heat: during that period they are ſeized with a ſort of madneſs, ſo that it is unſafe to approach them. They are not prevailed on to quicken their pace by blows; but go freely if gently treated, and ſeem enlivened by the pipe or any muſic. When fatigued, they lie on their breaſt.

II. The Bactrianus, or Bactrian camel, has two bunches on the back, the hindmoſt of which is by much the largeſt. It is a native of Africa, and is more rarely to be met with than the dromedary. It is alſo much ſwifter in its motions.

III. The Glama, Llama, or South American camel ſheep, has an almoſt even back, ſmall head, fine black eyes, and very long neck, bending much, and very protuberant near the junction with the body: in a tame ſtate, with ſmooth ſhort hair; in a wild ſtate, with long coarſe hair, white, grey, and ruſſet, diſpoſed in ſpots; with a black line from the head along the top of the back to the tail, and belly white. The tail is ſhort; the height from four to four feet and a half; the length from the neck to the tail, ſix feet. The carcaſe diveſted of ſkin and offals, according to the editor of Mr. Byron's voyage, weighed 200 lb. In general, the ſhape exactly reſembles a camel, only it wants the dorſal bunch. It is the camel of Peru and Chili; and, before the arrival of the Spaniards, was the only beaſt of burden known to the Indians. It is very mild, gentle, and tractable. We find, that, before the introduction of mules, they were uſed by the Indians to plough the land: that at preſent they ſerve to carry burdens of about 100 lb. that they go with great gravity; and, like their Spaniſh maſters, nothing can prevail upon them to change their pace. They lie down to the burden; and when wearied, no blows can provoke them to go on. Teuillee ſays, they are ſo capricious, that if ſtruck, they inſtantly ſquat down, and nothing but careſſes can make them ariſe. Their fleſh is eaten, and is ſaid to be as good as mutton. The wool has a ſtrong diſagreeable ſcent. They are very ſure footed; therefore uſed to carry the Peruvian ores over the ruggedeſt hills and narroweſt paths of the Andes. They inhabit that vaſt chain of mountains their whole length to the ſtraits of Magellan; but except where theſe hills approach the ſea, as in Patagonia, never appear on the coaſts. Like the camel, they have powers of abſtaining long from drink, ſometimes for four or five days: like that animal, their food is coarſe and trifling. In a wild ſtate, they keep in great herds in the higheſt and ſteepeſt parts of the hills; and while they are feeding, one keeps centry on the pinnacle of ſome rock: if it perceives the approach of any one, it neighs; the herd takes the alarm, and goes off with incredible ſpeed. They out run all dogs, ſo there is no other way of killing them but with the gun. They are killed for the ſake of their fleſh and hair; for the Indians weave the laſt into cloth. From the form of the parts of generation in both ſexes, no animal copulates with ſuch difficulty. It is often the labour of a day, *antequam actum ipſum venereum incipiant, et abſolvant.*

IV. The Pagos, or ſheep of Chili, has no bunch on the back. It is covered with a fine valuable wool, which is of a roſe red colour on the back of the animal, and white on the belly. They are of the ſame nature with the preceding; inhabit the ſame places, but are more capable of ſupporting the rigour of froſt and ſnow: they live in vaſt herds; are very timid, and exceſſively ſwift. The Indians take the pacos in a ſtrange manner: they tie cords with bits of cloth or wool hanging to them, above three or four feet from the ground, croſs the narrow paſſes of the mountains, then drive thoſe animals towards them, which are ſo terrified by the flutter of the rags, as not to dare to paſs, but, huddling together, give the hunters an opportunity to kill with their ſlings as many as they pleaſe. The tame ones will carry from 50 to 75 lb. but are kept principally for the ſake of the wool and the fleſh which is exceedingly well taſted.

The inhabitants of theſe countries eſtimate their wealth by the number of camels they poſſeſs: without them great part of Aſia and Africa would be wretched; by them the ſole commerce is carried on through arid and burning tracts, impaſſable but by beaſts which Providence formed expreſly for the burning deſarts. They do not differ in their nature or manners from the other kind. In winter they are covered with very long hair, which falls off in the ſpring, and is carefully gathered, being wove into ſtuffs, and alſo cloths to cover tents. In ſummer their hair is ſhort. Before the great heats, the owners ſmear their bodies to keep off the flies. The Arabs are very fond of the fleſh of young camels. The milk of theſe animals is their principal ſubſiſtence; and the dung of camels is the fuel uſed by the caravans in their travels over the deſarts. Camels have been introduced into Barbadoes and Jamaica; but for want of knowledge of their diet and treatment, have in general been of very little ſervice.

CAMERA *Obſcura*, a darkened room, or place into which a beam of light may be admitted through a ſmall aperture; and wherein, by means of a proper apparatus, the images of external objects are exhibited diſtinctly in their natural colours: as is explained under the Syſtem of OPTICS.

CAMERARIA, in botany, a genus of the monogynia order, belonging to the pentandria claſs of plants. Of this there are two ſpecies; the latifolia, and the anguſtifolia. The firſt is a native of the iſland of Cuba, and riſes with a ſhrubby ſtalk to the height of 10 or 12 feet, dividing into ſeveral branches, garniſhed with roundiſh pointed leaves placed oppoſite. The flowers are produced at the end of the branches in looſe cluſters, of a yellowiſh white colour. The ſecond ſort has an irregular ſhrubby ſtalk, which riſes about eight feet high, ſending out many branches which are garniſhed with very narrow thin leaves placed oppoſite at each joint. The flowers are produced ſcatteringly at the end of the branches, which are ſhaped like thoſe of the former ſort, but ſmaller. It is a native of Jamaica. Both theſe plants abound with an acrid milky juice like the ſpurge. They are propagated by ſeeds, which muſt be procured from the places of their growth. They muſt have a bark ſtove, for they are very tender plants; and in warm weather plenty of air.

CAMERLINGO, according to Ducange, ſignified formerly the pope's or emperor's treaſurer: at preſent, camerlingo is no where uſed but at Rome, where it denotes the cardinal who governs the eccleſiaſtical ſtate and adminiſters juſtice. It is the moſt eminent office at the court of Rome, becauſe he is at the head of the treaſury.

CAMERONIANS, a party of Preſbyterians, which ſprung up in Scotland in the reign of king Charles II. This ſect is now greatly declined. They are few in number, and ſplit into many parties.

It is alſo the denomination of a party of Calviniſts in France, who aſſerted that the will of man is only determined by the practical judgment of the mind; that the cauſe of men's doing good or evil proceeds from the knowledge which God infuſes into them; and that God does not move the will phyſically, but only morally, in virtue of its dependence on the judgment of the mind.

CAMILLI, and CAMILLÆ, in Roman antiquity, a certain number of boys and girls, who aſſiſted in the ſacrifices to the gods, but more eſpecially attended the flamen dialis.

CAMISADE, in the art of war, an attack by ſurpriſe in the night, or at the break of day, when the enemy is ſuppoſed to be a-bed.

CAMLETINE, a ſlight ſtuff, made of hair and coarſe ſilk, in the manner of camblet.

CAMP, the ground on which an army pitch their tents. It is marked out by the quarter-maſter general, who appoints every regiment their ground.

The chief advantages in chuſing a camp for an army, are, to have it near the water in a country of forage, where the ſoldiers may find wood for dreſſing their victuals; that it have a free communication with garriſons, and with a country from whence it may be ſupplied with proviſions; and, if poſſible, that it be ſituated on a riſing ground, in a dry ſoil. Beſides, the advantages of the ground ought to be conſidered, as marſhes, woods, rivers, and incloſures; and if the camp be near the enemy, with no river or march to cover it, the army ought to be intrenched. An army always encamps fronting the enemy; and generally in two lines, running parallel about 500 yards diſtance; the horſe and dragoons, on the wings, and the foot, in the centre: ſometimes a body of two, three, or four brigades is encamped behind the two lines, and is called the *body of reſerve*. The artillery and bread-waggons are generally encamped in the rear of the two lines. A battalion of foot is allowed 80 or 100 paces for its camp; and 30 or 40 for an interval betwixt one battalion and another. A ſquadron of horſe is allowed 30 for its camp, and 30 for an interval, and more if the ground will allow it.

Where the grounds are equally dry, thoſe camps are always the moſt healthful that are pitched on the banks of large rivers; becauſe, in the hot ſeaſon, ſituations of this kind have a ſtream of freſh air from the water, ſerving to carry off the moiſt and putrid exhalations. On the other hand, next to marſhes, the worſt encampments are on low grounds cloſe beſet with trees; for then the he air is not only moiſt and hurtful in itſelf, but by ſtagnating ecomes more ſuſceptible of corruption. However, let the ſituion of camps be ever ſo good, they are frequently rendered inectious by the putrid effluvia of rotten ſtraw, and the privies of he army; more eſpecially if the bloody flux prevails, in which afe the beſt method of preventing a general infection, is to ave the ground with the privies, foul ſtraw, and other filth of he camp, behind. This muſt be frequently done, if conſiſtent ith the military operations: but when theſe render it improper o change the ground often, the privies ſhould be made deeper han uſual, and once a-day a thick layer of earth thrown into hem till the pits are near full; and they are to be well covered, and upplied by others. It may alſo be a proper caution to order the its to be made either in the front or the rear, as the then ſtaionary winds may beſt carry off their effluvia from the camp. Moreover, it will be neceſſary to change the ſtraw frequently, as eing not only apt to rot, but to retain the infectious ſteams of he ſick. But if freſh ſtraw cannot be procured, more care muſt e taken in airing the tents, as well as the old ſtraw.

The Greeks had their camps fortified with gates and ditches. The Lacedæmonians made their camp of a round figure, looking upon that as the moſt perfect and defenſible of any form: we are not, however, to imagine, that they thought this form ſo eſſential to a camp, as never to be diſpenſed with when the circumſtance of the place required it. Of the reſt of the Grecian camps, it may be obſerved, that the moſt valiant of the ſoldiers were placed at the extremities, the reſt in the middle.

The figure of the Roman camp was a ſquare divided into two principal parts: in the upper part were the general's pavilion, or prætorium, and the tents of the chief officers; in the lower, thoſe of inferior degree were placed. On one ſide of the prætorium ſtood the queſtorium, or apartment of the treaſurer of the army; and near this the forum, both for a market-place, and the aſſembling of councils. On the other ſide of the prætorium were lodged the legati; and below it the tribunals had their quarters, oppoſite to their reſpective legions.

In the front of the Turkiſh camp are quartered the janizaries and other foot, whoſe tents encompaſs their aga: in the rear are the quarters of the ſpahis and other horſemen. The body of the camp is poſſeſſed by the ſtately tents or pavilions of the vizier or general, rais effendi or chancellor, kahija or ſteward, teſterdar baſhaw or lord treaſurer, and kapiſlar kahiaſee or maſter of the ceremonies. In the middle of theſe tents is a ſpacious field, wherein are erected a building for the divan, and a hafna or treaſury.

The Arabs ſtill live in camps, as the ancient Scenites did.

CAMPAIGN, a military term, ſignifying the ſpace of time during which armies are maintained, yearly, in the field.

The Germans begin their campaign very late; uſually waiting for harveſt: the French are always early, and begin ſometimes in winter, by which they have reaped great advantages.

CAMPANACEIA, in botany, an order of plants in the Fragmenta Methodi Naturalis of Linnæus. See Syſtem of Botany. Sect. VII. Ord. 29.

CAMPANIFORMIS *Flos*, in botany, a term uſed for a flower reſembling a bell in ſhape.

CAMPANOLOGIA, from *campana*, *bell*, and λογος, *ſcience*, the art or ſcience of ringing of bells.

CAMPANULA, in botany, the bell flower, a genus of the petandria monogynia claſs. There are forty-three ſpecies.

The different ſorts of this plant make beautiful ornaments for chimnies, and other places, being very tall, very much branched, and full of large and beautiful flowers, which retain their beauty a long time.

They are propagated by ſowing their ſeed in March, in a bed of light and undunged ſoil, or by parting the roots; but the latter method, being the more expeditious, is moſt practiſed. Almoſt every ſlip, taken from the roots in September, and in March, will thrive; but the plants raiſed from ſeeds are ſeen to produce the fineſt flowers: they are very tedious, however, this way, being three or four years before they flower. They ſhould, therefore, be tranſplanted the September after their ſowing into nurſery-beds, which ſhould be of a light ſoil and not wet; they ſhould be ſet here at ſix inches ſquare; and, in froſty weather, the whole beds ſhould be covered with mats, which will greatly ſtrengthen the roots. In the September of the third year, they ſhould be removed into pots, and ſheltered, during the ſevere weather, in glaſs frames; or elſe in wet weather, the pots muſt be turned ſideways; and in very cold, they muſt be ſet under a warm wall, and covered with haum, and ſurrounded with a little dung on the outſide of the pots, to preſerve the roots from the froſts. Theſe plants will often ſucceed without this care, but with it they produce their flowers in ſuch beauty and plenty, as amply to reward it.

CAMPEACHY-WOOD, a kind of wood brought from Yucatan, a province in America, and uſed in dying.

The heart of the tree, which alone is uſed, is at firſt red; after it has been felled ſome time, it becomes black; and if ſteeped in water, gives a black tincture, which may be uſed in writing.

It is very heavy, and burns admirably, and gives a clear laſting flame.

CAMPHOR, or Camphire, a ſolid concrete juice extracted from the wood of the laurus camphora.

Pure camphire is very white, pellucid, ſomewhat unctuous to the touch; of a bitteriſh aromatic taſte, yet accompanied with a ſenſe of coolneſs; of a very fragrant ſmell, ſomewhat like that of roſemary, but much ſtronger. It has been very long eſteemed one of the moſt efficacious diaphoretics; and has been celebrated in fevers, malignant and epidemical diſtempers. In deliria, alſo, where opiates could not procure ſleep, but rather aggravated the ſymptoms, this medicine has often been obſerved to procure it. All theſe effects, however, Dr. Cullen attributes to its ſedative property, and denies that camphire has any other medicinal virtues than thoſe of an antiſpaſmodic and ſedative. He allows it to be very powerful, and capable of doing much good or much harm. From experiments made on different brute creatures, camphire appears to be poiſonous to every one of them. In ſome it produced ſleep followed by death, without any other ſymptom. In others, before death, they were awakened into convulſions and rage. It ſeems, too, to act chiefly on the ſtomach; for an entire piece ſwallowed, produced the abovementioned effects with very little diminution. It is obtained by diſtilling the roots, and ſometimes the wood, and leaves, with water, in large iron pots, fitted with earthen heads ſtuffed with ſtraw: the camphor concretes among the ſtraw in its cryſtalline form: this is called rough camphor, and looks like Eaſt Indian ſaltpetre, or common bay-ſalt. In this ſtate it is imported into Europe, in caniſters; and the Dutch take care that it comes all refined by ſublimation, and prepared to our hands.

Manner of refining crude Camphor. It is ſublimed in low flat-bottomed glaſſes placed in ſand: the camphor concretes, in the upper part of the belly of the glaſs, into a ſolid cake, which, after the belly has been broke, is pared with a knife, and is the refined camphor of the ſhops. Rough camphor may be commodiouſly and effectually purified by diſſolving it in rectified ſpirit of wine: the ſpirit is recoverable by diſtillation, and the remaining camphor may be melted into a cake in the bottom of the veſſel, or of another glaſs.

The camphor-tree, in botany, is a ſpecies of the laurus or bay, which grows naturally in Japan, and ſeveral parts of India. It is a tree of middling ſtature, with oval, ſpear-ſhaped leaves, having three longitudinal veins which unite above the baſe. Theſe are male and female on different trees. The camphor-tree requires no artificial heat in winter, but will thrive very well in a warm, dry green-houſe.

CAMPHORATA, a medicinal plant, the camphoroſma of Linnæus; called, in Engliſh, ſtinking ground-pine; reputed cephalic and nervine; though little uſed in the modern practice.

It takes the name from its ſmell, which bears ſome reſemblance to that of camphor.

CAMPICURSIO, in the ancient military art, a march of armed men for ſeveral miles, from and back again to the camp to inſtruct them in the military pace. This exerciſe was nearly the ſame as the decurſio, from which it only differed, in that the latter was performed by horſemen, the former alſo by foot.

CAMPIDOCTORES, or Campiductores, in the Roman army, were officers who inſtructed the ſoldiery in the diſcipline and exerciſes of war, and the art of handling their weapons to advantage. Theſe are alſo ſometimes called campigeni, and armidoctores.

CAMPIDUCTOR, in middle-age writers, ſignifies the leader or commander of an army, or party.

CAMPION, lychnis, in botany, a genus of the decandria pentagynia claſs. Linnæus enumerates ſeven, and Miller eight ſpecies of this plant, which, for the beauty of their flowers, are cultivated in our gardens; they are very hardy plants, and are eaſily propagated, either by parting the roots, or by the ſeed.

The roots ſhould be parted in the latter end of Auguſt or beginning of September, and planted in a light dry ſoil.

Campion, *viſcus*, *ſilene*, in botany, a genus of the decandria tryginia claſs. Linnæus enumerates thirty-five, and Miller fourteen ſpecies, which are cultivated in gardens, beſide others which are diſregarded.

CAMURI, in ichthyology, the name of a ſea-fiſh of the lupus or baſſe kind, common in the ſeas and large rivers of America. It grows to about two feet long, and a foot thick.

CAMUS, probably derived from *καμπτω*, *I bend*, a perſon with a low, flat noſe, hallowed or ſunk in the middle. The Tartars are great admirers of camus beauties. Rubruquis obſerves, that the wife of the great Genghis Kan, a celebrated beauty, had only two holes for a noſe.

CAN, in ſea-language, a pump's can, is a ſort of wooden jug or pitcher, wherewith ſeamen pour water into pumps to make them work.

CANAL, an artificial cut in the ground, ſupplied with water from rivers, ſprings, &c. in order to make a navigable communication betwixt one place and another.

The particular operations neceſſary for making artificial navigations depend upon a number of circumſtances. The ſituation of the ground: the vicinity or connection with rivers; the eaſe or difficulty with which a proper quantity of water can be obtained; theſe and many other circumſtances neceſſarily produce great variety in the ſtructure of artificial navigations, and augment or diminiſh the labour and expence of executing them. When the ground is naturally level, and unconnected with rivers, the execution is eaſy, and the navigation is not liable to be diſturbed by floods: but, when the ground riſes and falls, and cannot be reduced to a level, artificial methods of raiſing and lowering veſſels muſt be employed; which likewiſe vary according to circumſtances. See the Article Lock.

A kind of temporary ſluices are ſometimes employed for raiſing boats over falls or ſhoals in rivers by a very ſimple operation. Two poſts or pillars of maſon-work, with grooves, are fixed, one on each bank of the river, at ſome diſtance below the ſhoal. The boat having paſſed theſe poſts, planks are let down acroſs the river by pullies into the grooves, by which the water is dammed up to a proper height for allowing the boat to paſs up the river over the ſhoal.

The Dutch and Flemings at this day, ſometimes when obſtructed by caſcades, form an inclined plane or rolling-bridge upon dry land, along which their veſſels are drawn from the river below the caſcade into the river above it. This, it is ſaid, was the only method employed by the ancients, and is ſtill uſed by the Chineſe, who are ſaid to be entirely ignorant of the nature and utility of locks. Theſe rolling-bridges conſiſt of a number of cylindrical rollers which turn eaſily on pivots, and a mill is commonly built near by, ſo that the ſame machinery may ſerve the double purpoſe of working the mill and drawing up veſſels.

It is almoſt needleſs to ſpend time in enumerating the many advantages which neceſſarily reſult from artificial navigations. Their utility is now ſo apparent, that moſt nations in Europe give the higheſt encouragement to undertakings of this kind wherever they are practicable. The advantages of navigable canals did not eſcape the obſervation of the ancients. From the moſt early accounts of ſociety we read of attempts to cut through large iſthmuſes, in order to make a communication by water, either betwixt different nations, or diſtant parts of the ſame nation, where land-carriage was long and expenſive.

The Chineſe have alſo a great number of canals; that which runs from Canton to Pekin, extends about 825 miles in length, and was executed about 800 years ago.

It would be an endleſs taſk to deſcribe the numberleſs canals in Holland, Ruſſia, Germany, &c. We ſhall therefore confine ourſelves to thoſe that are either already finiſhed, or at preſent executing, in our own country.

As the promoting of commerce is the principal intention of making canals, it is natural to expect that their frequency in any nation ſhould bear ſome proportion to the trade carried on in it, providing the ſituation of the country will admit of them. The preſent ſtate of England and Scotland confirms this obſervation. Though the Romans made a canal between the Nyne, a little below Peterborough, and the Witham, three miles below Lincoln, which is now almoſt entirely filled up, yet it is not long ſince canals were revived in England. They are now however become very numerous, particularly in the counties of York, Lincoln, and Cheſhire. Moſt of the counties betwixt the mouth of the Thames and the Briſtol channel are connected together either by natural or artificial navigations. The Thames and Severn are now united by a canal paſſing through Glouceſterſhire, commonly called the Stroudwater canal. There is a ſubterraneous paſſage cut through Salperton hill, near three miles in length.

The Duke of Bridgwater's canal, projected and executed under the direction of Mr. Brindley, was begun ſoon after he had obtained an act for this purpoſe in 1759. It was firſt deſigned for conveying coals from a mine on his grace's eſtate to Mancheſter, but has ſince been applied to many other uſeful purpoſes of inland navigation. It runs 27 miles on a perfect level; but at Barton it is carried by a very high aqueduct bridge over the Irwell, a navigable river; ſo that it is common for veſſels to be paſſing at the ſame time both under and above the bridge. It is likewiſe cut ſome miles into the hills, where the Duke's coal-mines are wrought.

The Lancaſter canal begins near Kendal, and terminates near Eccleſton, comprehending the diſtance of 72½ miles.

The canal from Liverpool to Leeds is 108⅓ miles: that from Leeds to Selby, 23¼ miles; from Cheſter to Middlewich, 26¾ miles; from the Trent to the Merſey, 88 miles; from the Trent to the Severn, 46½ miles. The Birmingham canal joins this near Wolverhampton, and is 24¼ miles: the Droitwich canal is 5½ miles: the Coventry canal, commencing near Litchfield, and joining that of the Trent, is 39¼ miles: the Oxford canal breaks off from this, and is 82 miles. The Cheſterfield canal joins the Trent near Gainſborough, and is 44 miles.

A communication is now formed, by means of this inland navigation, between Kendal and London, by way of Oxford; between Liverpool and Hull, by the way of Leeds; and between the Briſtol channel, and the Humber, by the junction formed between the Trent, the Severn, and the Thames.

A communication is alſo effected between the Forth and Clyde, in Scotland, greatly to the advantage of the country.

Various other projects are alſo in contemplation, which in all probability will be perfected in a few years, to the advancement of commere, and ornament of the country.

Canal, *Canalis*, in anatomy, a duct, or paſſage, through which any of the juices, or fluids of the body flow.

Under canals are included all kinds of veſſels, as arteries, veins, nerves, &c. See Syſtem of Anatomy.

CANARIUM, from *canis*, dog, in antiquity, a Roman ſacrifice, wherein dogs of a red and ruddy colour were ſacrificed, for ſecurity of the fruits of the earth againſt the raging heats, and diſorders of Sirius in the dog-days.

Canarium, in botany, a genus of the dioecia pentandria claſs. There is one ſpecies.

CANARY *Bird, Paſſer Canarienſis*, a ſpecies of ſinging birds, greeeniſh yellow in colour, formerly brought only from the Canary iſlands, but of late chiefly from Germany and Switzerland; which laſt, called alſo German birds, are preferred to the former. The chief place for breeding Canary-birds is Inſpruck and its environs, from whence they are ſent to Conſtantinople, as well as every part of Europe. They are a ſpecies of the fringilla.

Canary birds are diſtinguiſhed by different names, and different times and ages: ſuch as are about three years old are called runts; thoſe above two, are named criffs; thoſe of the firſt year under the care of the old ones, are termed branchers; thoſe that are new flown, and cannot feed themſelves, puſhers; and thoſe brought up by hand, neſtlings.

The Canary birds may be bred with us, and, if treated with proper care, they will become as vigorous and healthful as in the country from whence they have their name. The cages in which theſe birds are kept are to be made of either walnut-tree or oak, with bars of wire, becauſe theſe, being woods of ſtrength, do not require to be uſed in large pieces. Lofty narrow cages are the moſt proper.

If theſe birds eat too much, they grow over fat, loſe their ſhape, and their ſinging is ſpoiled; or at leaſt, they become ſo idle that they will ſcarce ever ſing. In this caſe their victuals is to be given them in a much ſmaller quantity, and they will by this means be recovered by degrees, and will ſing as uſual.

To breed and train Piping Birds. At the time that they are about to build their neſts, there muſt be put into their cages ſome hay, dried thoroughly in the ſun: with this muſt be mixed ſome moſs dried in the ſame manner, and ſome ſtag's hair; and great care is to be taken of breeding the young, in the article of food. As ſoon as the young birds are eight days old, or ſomewhat more, and are able to eat and pick up food for themſelves, they are to be taken out of the cage in which they were hatched, and each put ſeparately into another cage, and hung up in a room where it may never have an opportunity of hearing the voice of any other bird. After they have been kept thus about eight days, they are to be excited to ſing by a bird pipe; but this is not to be blowed too much, or in too ſhrill a manner, leſt they ſing themſelves to death.

For the firſt fifteen days the cages are to be covered with a black cloth, and for the fifteen days following with a green one. Five leſſons a day from the pipe are ſufficient for theſe young creatures; and they muſt not be diſturbed with ſeveral ſounds at the ſame time, leſt they confound and puzzle them: two leſſons ſhould be given them early in the morning, one about the middle of the day, and two more at night.

Canary birds being ſo much eſteemed for their ſong, are ſometimes ſold at a high price, according to the goodneſs and excellency of their notes; it is always adviſeable to hear the bird ſing before he is bought. In order to know whether he is in good health, take him out of the ſtore cage, and put him in a clean cage by himſelf: if he ſtands up boldly, without crouching or ſhrinking in his feathers, look with a briſk eye, and is not ſubject to put his head under his wing, it is a ſign that he is in good health.

Canary birds are ſubject to many diſeaſes, particularly impoſthumes, which affect the head, cauſe them to fall ſuddenly from the perch, and die in a ſhort time, if not ſpeedily cured. The moſt approved medicine is an ointment made of freſh butter, and capon's greaſe melted together. With this the top of the bird's head is to be anointed for two or three days, and it will diſſolve the impoſthume; but if the medicine has been too long delayed, then, after three or four times anointing, ſee whether the place of his head be ſoft; and if ſo, open it gently, and let out the matter, which will be like the yolk of an egg; when this is done, anoint the place, and the bird will be cured. At the ſame he muſt have figs with his other food, and in his water a ſlice or two of liquorice, with white ſugar candy.

The Canary bird will breed with a goldfinch or ſparrow, the produce are called mules.

Canary birds are various in their notes: ſome having a ſweet ſong, others a lowiſh note, others a long ſong, which is beſt, as having the greateſt variety of notes: but they ſing chiefly, either the tit lark, or nightingale notes.

CANATTE Coronde, a name given by the Ceyloneſe to a peculiar kind of cinnamon growing in that iſland: this is eſteemed the ſecond kind in value, and the name they give to it ſignifies bitter and aſtringent cinnamon. The trees which yield the eight different kinds of cinnamon, ſo very various in flavour and virtue are all ſo like one another, that it requires a greal deal of attention, to diſtinguiſh them. The root of this kind of cinnamon tree yields a very fine ſort of camphor. Phil. Tranſ. N° 409.

CANCELIER, in falconry, is when a light flown hawk, in her ſtooping, turns two or three times upon the wing, to recover herſelf before ſhe ſeizes.

CANCELLING, in the civil law, an act whereby ſome former deed is rendered null and void. This is otherwiſe called reſciſſion.

In the proper ſenſe of the word, to cancel, is to deface an obligation, by paſſing the pen from top to bottom, or acroſs it; which makes a kind of chequer lattice, which the Latins call *cancelli*. Tearing off the ſeal or name is alſo deemed cancelling.

CANCER, in aſtronomy, one of the twelve ſigns of the zodiac: ordinarily repreſented on the globe in form of a crab, and in aſtronomical books denoted by a figure; thus, ♋. It is the 4th conſtellation in the ſtarry zodiac, from which one quadrant of the ecliptic takes its denomination.

Tropic of CANCER, in aſtronomy, a leſſer circle of the ſphere parallel to the equator; and paſſing through the beginning of the ſign Cancer.

CANCER, in ichthyology. The CRAB. See cruſtaceous animals in the Syſtem of ENTOMOLOGY.

CANCER, in medicine, a roundiſh, hard, ragged, immoveable tumor, of an aſh or livid colour; encompaſſed round with branched turgid veins, full of black foul blood; ſituate chiefly in the glandulous parts: ſo called, as ſome will have it, from the reſemblance which the turgid veins ſhooting from it bear in figure to the crab-fiſh; or, as others ſay, becauſe like that fiſh, when once it has got hold, it is ſcarce poſſible to drive it away.

Cancers appear with ſuch a diverſity, that it ſeems impoſſible to give a definition which ſhall agree to all. Some have a round, unequal, livid, painful hardneſs; others are flat without lividity, and ſometimes indolent. The variety ariſes chiefly from their riſe, and the different parts they are ſeated in; as the breaſt, womb, lips, noſe, eyes, ears, &c. Phil. Tranſ. N° 260. p. 476.

CANCROMA, in ornithology, a genus of birds of the order of grallæ; having a gibbous beak, and the upper jaw in the form of a boat turned upwards. Linnæus reckons two ſpecies, the cochlearia, and the cancrophaga; the former is found in Guiana, and the latter in the Braſils.

CANDELARES, in botany, an order of plants in the Fragmenta Methodi Naturalis of Linnæus.

CANDELARIA, in entomology, is a ſpecies of inſect, belonging to the genus of fulgora, and order of hemiptera in the Linnæan ſyſtem. It is common in China.

CANDERROS, in the materia medica, a name of an Eaſt Indian gum, not much known among us, though ſometimes imported. It has much the appearance of common amber, only that it wants its yellow colour, being white and pellucid; we ſometimes ſee it turned into toys of various kinds, which are very light, and of a good poliſh.

CANDIDATE, a perſon who ſets up for ſome poſt or place either of honour or profit.

The word is formed of *candidus*, white, it being the colour wherein thoſe who aſpired to preferments in ancient Rome, were habited at the time of their appearing for the ſame, eſpecially at the public aſſemblies, in order to diſtinguiſh them from the croud.

The white gown wore by candidates was looſe and ungirded, nor was there any cloſe garment under it, which ſome interpret as done with deſign to avoid any ſuſpicion people might have of bribery; though Plutarch rather thinks it done to gain the affections of the people, by ſuing in ſuch an humble garb; or elſe that ſuch as had received wounds in the ſervice of their country, might more eaſily exhibit thoſe tokens of their courage and fidelity.

The Roman candidates uſually declared their pretenſions a year before the time of election, which was ſpent in making intereſt and gaining friends. Various arts of popularity were practiſed for this purpoſe, and frequent circuits made round the city, and viſits and compliments to all ſorts of perſons, the proceſs of which formed what was called ambitus.

CANDLE, a ſmall taper of tallow, wax, or ſpermaceti; the wick of which is commonly of ſeveral threads of cotton, ſpun and twiſted together.

A tallow candle, to be good, muſt be half ſheep's and half bullock's or cow's fat; for hog's tallow makes the candle gutter, and always gives an offenſive ſmell, with a thick black ſmoke. The wick ought to be pure, ſufficiently dry, and properly twiſted; otherwiſe the candle will emit an unconſtant vibratory flame; which is both prejudicial to the eyes, and inſufficient for the diſtinct illumination of objects.

There are two ſorts of tallow candles; the one dipped, the other moulded; the former are the common candles; the others are the invention of the Sieur le Brege at Paris.

As to the method of making candles, in general. After the tallow has been mixed in the due proportions, it is cut into very ſmall pieces, that it may melt the ſooner; for the tallow in lumps, as it comes from the butchers, would be in danger of burning or turning black, if it were left too long over the fire. Being perfectly melted and ſkimmed, they pour a certain quantity of water into it, proportionable to the quantity of tallow. This ſerves to precipitate, to the bottom of the veſſel, the impurities of the tallow, which may have eſcaped the ſkimmer. No water, however, muſt be thrown into the tallow deſigned for the three firſt dips; becauſe the wick, being ſtill quite dry, would imbibe the water, which makes the candles crackle in burning, and renders them of bad uſe. The tallow, thus melted, is poured into a tub, through a coarſe ſieve of horſe hair, to purify it ſtill more, and may be uſed after having ſtood three hours. It will continue fit for uſe 24 hours in ſummer, and 15 in winter. The wicks are made of ſpun cotton, which the tallow chandlers buy in ſkains, and which they wind up into bottoms or clues. Whence they are cut out, with an inſtrument contrived on purpoſe, into pieces of the length of the candle required; then put on the ſticks or broaches, or elſe placed in the moulds, as the candles are intended to be either dipped or moulded.

Making CANDLES. The liquid tallow is drawn off from the tub above mentioned, into a veſſel called the mould, ſink, or abyſs, of an angular form, perfectly like a priſm, except that it is not equilateral; the ſide on which it opens being only ten inches high; and the others, which make its depth, fifteen. On the angle, formed by the two great ſides, it is ſupported by two feet, and is placed on a kind of bench, in form of a trough, to catch the droppings, as the candles are taken out at each dip. The workman, takes two ſticks, or broches at a time, ſtrung with a proper number of wicks, viz. ſixteen, if the candles are to be of eight in the pound; twelve, if of ſix in the pound, &c. and holding them equidiſtant, by means of the ſecond and third finger of each hand, which he puts between them, he immerges the wicks two or three times for their firſt lay, and, holding them ſome time over the opening of the veſſel to let them drain, hangs them on a rack, where they continue to drain, and grow hard. When cooled, they are dipped a ſecond time, then a third, as before; only for the third lay they are immerged but twice, in all the reſt thrice. The operation is repeated more or leſs times, according to the intended thickneſs of the candles. With the laſt dip they neck them; i. e. plunge them below that part of the wick where the other lays ended.

It muſt be obſerved, that during the operation, the tallow is ſtirred from time to time, and the ſtock ſupplied with freſh tallow. When the candles are finiſhed, their peaked ends, or bottoms, are taken off; not with any cutting inſtrument, but by paſſing them over a kind of flat brazen plate, heated to a proper pitch by fire underneath, which melts down as much as is requiſite.

Mould CANDLES are eaſily made by thoſe who are in poſſeſſion of the apparatus, which conſiſts of tin tubes inſerted in a board or table; the wick is placed, and faſtened in the centre of the mould, by a wire or other matter, and very eaſily effected, about an inch being left out at the top. The tallow melted as before, is poured into the mould, and afterwards placed in the air to harden; the foot is then removed, and each candle leaves the tube perfected.

Wax CANDLES are made of a cotton or flaxen wick, ſlightly twiſted, and covered with white or yellow wax. Of theſe, there are ſeveral kinds: ſome of a conical figure, uſed to illuminate churches, and in proceſſions, funeral ceremonies, &c. (ſee TAPER); others of a cylindrical form, uſed on ordinary occaſions. The firſt are either made with a ladle or the hand. 1. To make wax candles with the ladle. The wicks being prepared, a dozen of them are tied by the neck, at equal diſtances, round an iron circle, ſuſpended over a large baſon of copper tinned, and full of melted wax: a large ladle full of this wax is poured gently on the tops of the wicks one after another, and this operation continued till the candle arrives at its deſtined bigneſs; with this precaution, that the three firſt ladles be poured on at the top of the wick, the fourth at the height of $\frac{3}{4}$, the fifth at $\frac{1}{2}$, and the ſixth at $\frac{1}{4}$, in order to give the candle its pyramidal form. Then the candles are taken down, kept warm, and rolled and ſmoothed upon a walnut-tree table, with a long ſquare inſtrument of box, ſmooth at the bottom. 2. As to the manner of making wax-candles by the hand, they begin to ſoften the wax, by working it ſeveral times in hot water, contained in a narrow but deep caldron. A piece of the wax is then taken out, and diſpoſed by little and little, around the wick, which is hung on a hook in the wall, by the extremity oppoſite to the neck; ſo that they begin with the big end, diminiſhing ſtill as they deſcend towards the neck. In other reſpects the method is nearly the ſame as in the former caſe. However, it muſt be obſerved, that, in the former caſe, water is always uſed to moiſten the ſeveral inſtruments, to prevent the wax from ſticking; and in the latter, oil of olives, or lard, for the hands, &c. The cylindrical wax candles are either made, as the former, with a ladle, or drawn. Wax candles drawn, are ſo called, becauſe actually drawn in the manner of wire, by means of two large rollers of woods turned by a handle, which, turning backwards and forward, ſeveral times, paſs the wick through melted wax contained in a braſs baſon, and at the ſame time through the holes of an inſtrument like that uſed for drawing wire faſtened at one ſide of the baſon.

Makers of candles are not to uſe melting-houſes, without due entry thereof at the exciſe office, on pain of 100l. and to give notice of making candles to the exciſe officer for the duties, and of the number, &c. or ſhall forfeit 50l. Removing the candles before weighed by the officer, or mixing them with others, is likewiſe liable to penalties.

Ruſh **CANDLES** are made of the pith of a ſort of ruſhes, peeled or ſtripped of the ſkin, except on one ſide, and dipped in melted tallow.

CANDLE is alſo a term in medicine, and is reckoned among the inſtruments of ſurgery. Thus the *candela fumalis*, or the *candela pro ſuffitu odorata*, is a maſs of an oblong form, conſiſting of odoriferous powders, mixed up with a third or more of the charcoal of willow or lime tree, and reduced to a proper conſiſtence with a mucilage of gum tragacanth, labdanum, or turpentine. It is intended to excite a grateful ſmell without any flame, to correct the air, to fortify the brain, and to excite the ſpirits.

CANDLE *Berry Tree*, myrica, in botany, an aromatic evergreen, from whoſe berries are drawn, by boiling, a green wax, of which candles are made. It is alſo called the Virginia myrtle. It is a genus of the dioecia tetrandria claſs. There are ſeveral ſpecies.

The firſt ſort grows naturally upon bogs in many parts of England, particularly in the northern and weſtern counties; as alſo in Windſor Park, and near Tunbridge Wells. This riſes with many ſhrubby ſtalks, near four feet high, which divide into ſeveral ſlender branches, garniſhed with ſtiff ſpear-ſhaped leaves of a light green, ſmooth, and a little ſawed at their points, emitting a fragrant odour when bruiſed.

Moſt of the other ſorts grow naturally in North America, where, as is before obſerved, the inhabitants get a ſort of green wax from the berries, which they make into candles. The method is deſcribed by Mr. Cateſby, in his Natural Hiſtory of Carolina. Slips of pine about the thickneſs of the finger, uſed in New England, and other colonies, to burn inſtead of candles, give a very good light.

Sale by **CANDLE**, or *Auction, by Inch of*. See Inch of **CANDLE**. There is alſo a kind of excommunication by inch of candle; wherein the time a lighted candle continues burning is allowed the ſinner to come to repentance; but after which he remains excommunicated to all intents and purpoſes.

CANDLEMAS, a feaſt of the church, held on the ſecond of February, in memory of the Purification of the Bleſſed Virgin.

It takes its name either from the number of lighted candles uſed by the Romiſh church, in the proceſſions of this day; or becauſe, before maſs, the church conſecrated candles for the whole year. This ceremony was prohibited in England, by an order of council in 1548.

CANDLESTICK, a houſehold utenſil, contrived to hold one or more lighted candles made of various kinds of materials. The larger and more ſtately candleſticks, contrived for holding a great number of candles, are called branches, and girandoles; and when made of glaſs, luſtres.

The golden candleſtick was, according to Moſes, the richeſt utenſil in the Jewiſh tabernacle. It was made of ſolid gold, and weighed a talent; and, according to Cumberland, the value of it, excluſive of the workmanſhip, was 5076 pounds. It contained ſeven lights, ſix branching out in three parts from the upright ſtem, and one on the top of it.

This ſacred utenſil was, after the Babyloniſh captivity, placed in the Temple; and when the Temple was deſtroyed, it was depoſited in the Temple of Peace, built by Veſpaſian; and the repreſentation of it ſtill remains on the triumphal arch, at the foot of mount Palatine, on which Veſpaſian's triumph is delineated.

CANDO, or **CONDI**, in commerce, a long meaſure uſed in ſeveral parts of the Eaſt Indies, particularly at Goa, the capital of the Portugueſe ſettlements there.

CANDOU, in botany, purchaſii, a tree much like the cork tree, and of the height of the walnut tree. The trunk is fungous, and lighter than cork; the bark whitiſh, and it bears no fruit.

CANDY, or **SUGAR CANDY**, a preparation of ſugar made by melting and cryſtallizing it ſix or ſeven times over, to render it hard or tranſparent. It is of three kinds, white, yellow, and red. The white comes from the loaf-ſugar, the yellow from the caſſonado, and the red from the muſcavado.

CANDYING, the act of preſerving ſimples in ſubſtance by boiling them in ſugar. See Art of **CONFECTIONARY**.

CANE, in botany, arundo, the ſame with reed.

Canes make a conſiderable article in commerce. There are imported into England ſeveral ſorts, as rattans, bamboes, wanghees, &c. Some are without knots, and very ſmooth and even; others are full of knots, about two inches diſtance from one another. Theſe laſt have very little elaſticity, and will not bend ſo well as the others.

Canes of Bengal are the moſt beautiful which the Europeans bring into Europe. Some of them are ſo fine, that people work them into bowls or veſſels, which being varniſhed over in the inſide, with black or yellow lacca, will hold liquors as well as glaſs or China ware does; and the Indians uſe them for that purpoſe. All kinds of the cane grow in wet ſituations, ſimilar to the reed with us; and is generally ſuppoſed would grow in Britain if cultivated.

CANE is alſo the name of a long meaſure, which differs according to the ſeveral countries where it is uſed.

At Naples the cane is equal to 7 feet 3½ inches Engliſh meaſure: the cane of Thoulouſe and the Upper Languedoc, is equal to the varre of Arragon, and contains five feet 8½ inches; at Montpelier, Provence, Dauphine, and the Lower Languedoc, to ſix Engliſh feet 5½ inches.

CANEPHORÆ, in Grecian antiquity, virgins who, when they became marriageable, preſented certain baſkets full of little curioſities to Diana, in order to get leave to depart out of her train, and change their ſtate of life.

CANEPHORIA, a ceremony which made part of a feaſt, celebrated by the Athenian virgins, on the eve of their marriage day.

CANGA, with the Chineſe, a wooden clog, borne on the neck, by way of puniſhment for divers offences.

The canga is compoſed of two ſpecies of wood notched, to receive the criminal's neck; the load lies on his ſhoulders, and is more or leſs heavy according to the quality of his offence. Some cangas weigh 200 pounds; the generality from 50 to 60 pounds. The mandarins condemn to the canga. Sentence of death is ſometimes commuted for by the penalty of the canga.

CANICULA is a name given to one of the ſtars of the conſtellation canis major; called alſo the dog ſtar.

CANICULA is the tenth in order in the Britannic catalogue; in Tycho's and Ptolemy's it is the ſecond. It is ſituated in the mouth of the conſtellation; and is of the firſt magnitude, being the largeſt and brighteſt of all the ſtars in the heavens.

CANINANA, in amphibiology, the name of a ſpecies of ſerpent found in America, and eſteemed one of the leſs poiſonous kinds. It grows to about two feet long, and is green on the back, and yellow on the belly. It feeds on eggs and ſmall birds; the natives cut off its head and tail, and eat the body as a delicate diſh.

CANINE, in a general ſenſe, ſomething that relates to dogs. Dr. Douglas gives frequent compariſons between the canine muſcles and the human.

The voice of perſons ſeized with the hydrophobia, is frequently uttered with a canine hoarſeneſs, and bears ſome reſemblance to the barking of a dog. Dr. Liſter accounts for the cynical appearances in the hydrophobia from a ſuppoſition, that the patient has undergone ſomewhat of a transformation into the canine nature, or that certain of the organical parts of his body, eſpecially the gula, tongue, &c. are diſpoſed after the manner of a dog. Phil. Tranſ. N° 207, and N° 147.

CANINE *Madneſs, rabies canina*, is uſually ſuppoſed the ſame with hydrophobia, though ſome diſtinguiſh, applying the former denomination where the patient raves, or has loſt all uſe of reaſon; the latter, where he ſtill retains his reaſoning faculty, only his members are ſubject to certain involuntary convulſive motions, as thoſe of an epileptic or aguiſh perſon.

The rabies canina is never without the hydrophobia, but the latter frequently without the former.

CANINUS *Muſculus*, the ſame as *elevator labii ſuperioris*.

CANINUS *Serpens*, in amphibiology, a name given by ſome writers to the mauballa of the Ceyloneſe, a ſnake that flies at every thing that comes in its way, in the manner of our dogs.

CANIS, *Dog*, makes a diſtinct, but very large genus of animals, of the order of *feræ*, and claſs of *mammalia*. For the different ſpecies, ſee Syſtem of **TETRAPODOLOGY**.

CANIS *Major*, the *Great Dog*, in aſtronomy, a conſtellation of the ſouthern hemiſphere, below Orion's feet, though ſomewhat to the weſtward of him.

CANIS *Minor*, the *Little Dog*, in aſtronomy, a conſtellation of the northern hemiſphere; called alſo by the Greeks *Procyon*, and by the Latins, *Antecanis* and *Canicula*.

CANKER, ſometimes denotes a ſpeck made by a ſharp humour, which gnaws the fleſh almoſt like a cauſtic; very common to children, in their mouth eſpecially.

In rural affairs, canker is uſed to expreſs a wound or blemiſh in the trunk of a tree, which does not heal up by nature, but will increaſe and damage, if not endanger, the whole tree. Theſe wounds are ſometimes occaſioned by accidents, as blows, or by the branches of one tree galling another by the motion they are put into by the winds: in this caſe, the offending branch muſt be removed or taken off. If the canker proceeds from a defect in vegetation, dig and lay the ſoil looſe on the roots; if the ground be of too ſandy and friable a texture, add ſuch earth as will give it tenacity, and if it be too ſtiff repleniſh it with a ſoil of a meliorating quality: drawing the edge of a ſharp knife down the tree or branch ſufficiently hard to perforate the bark, is frequently of ſervice.

CANNA, in botany, Indian cane, a flowering-reed, a genus of the monandria monogynia claſs.

All the ſorts are propagated by ſeeds, which ſhould be ſown on a hot-bed in the ſpring; and when the plants are fit to remove, they ſhould be tranſplanted into ſeparate ſmall pots, and plunged in a moderate hot-bed of tanner's bark.

CANNEL *Coal*, a black bituminous foſſil, frequent in Staffordſhire and Lancaſhire, of a fine hard texture, ſo as to receive a poliſh, and become of ſervice for divers works inſtead of ivory, but chiefly uſed for fuel, as affording a brighter and purer flame than the common ſea-coal.

Dr. Woodward takes our cannel-coal to be the ſame with the lapis amelites of the antients, and the lapis obſidianus of ſome later writers.

The choir of the cathedral of Litchfield is paved with coal for the black, and alabaſter for the white, which, when clean, reſembles marble. See COLLIERY.

CANNEQUINS, in commerce, white cotton cloths brought from the Eaſt Indies. They are a proper commodity for trading on the coaſt of Guinea, particularly about the rivers Senega and Gambia. Theſe linens are folded ſquare-wiſe, and are about eight ells long.

CANNEVAROLA, in ornithology, a name by which Aldrovandus, and ſome other authors, have called the leſſer reed-ſparrow, called by others, *ficedula cannabina*, and by Mr. Ray, *paſſer arundinaceus minor*.

CANNIBAL, is uſed by modern writers for an Anthropophagus, or man-eater.

We read many inſtances of cannibals in Cooke's Voyages. Tupia, whom Captain Cooke brought with him from one of the iſlands in the South Seas to New Zealand, and who underſtood their language, was directed to aſk one of the natives, what bones they were before them? The Indians, without heſitation replied, the bones of a man. When aſked, what was become of the fleſh, they replied they had eaten it. On being afterwards aſked, why they did not eat the body of a woman that was ſeen floating on the water? The woman, they ſaid, died of a diſeaſe; and added, ſhe was their relation, and they eat only the bodies of their enemies. Bankes's Geography, Sect. IV. p. 16.

CANNOCK, or CANNOT *Stone*, a baſe ſort of iron-ore, in Staffordſhire mines, of which the worſt metal is made.

CANNON, in war, a military engine for throwing iron, lead, or ſtone bullets, by force of gunpowder, to a place directly oppoſite to the axis of the cylinder whereof it conſiſts. See ART of GUNNERY.

The invention of braſs cannon is by Laney aſcribed to J. Owen: he ſays, that they were firſt known in England in the year 1535; but yet acknowledges, that, in the year 1346, there were four pieces of cannon in the Engliſh army at the battle of Creſſy, and that theſe were the firſt that were known in France. And Mezeray relates, that king Edward, by five or ſix pieces of cannon, ſtruck terror into the French army, it being the firſt time they had ſeen any of theſe thundering machines. The Germans carry the invention farther back, and attribute it to Albertus Magnus, a Dominican monk, about the year 1250. Voſſius rejects all theſe opinions, and finds cannon in China almoſt 1700 years ago. According to him, they were mounted by the emperor Kitey in the year of Chriſt 85.

For the caſting of cannon, ſee FOUNDERY.

CANNON, with letter-founders and printers, the name of a large ſize of letter they uſe.

CANNONADE, the application of artillery to the purpoſes of war, or the direction of its efforts againſt ſome diſtant object intended to be ſeized or deſtroyed, as a ſhip, battery, or fortreſs.

CANNULA, in ſurgery, a tube made of different metals, principally of ſilver and lead, but ſometimes of iron. They are uſed in tapping for the dropſy, and are introduced into hollow ulcers, in order to facilitate a diſcharge of pus or any other ſubſtance; or into wounds, either accidental or artificial, of the large cavities, as the thorax or abdomen: alſo in the operation of bronchotomy; and, by ſome, after cutting for the ſtone, as a drain for urine.

Other cannulas are uſed for introducing cauteries, either actual or potential, into hollow parts, in order to guard the parts from heat. See SURGERY.

CANOE, a kind of boat generally made with the trunk of a tree hollowed, and ſometimes of ſeveral pieces of the bark put together.

Canoes are of various ſizes, according to the uſes for which they may be deſigned, or the countries wherein they are formed. The largeſt are made of the cotton tree; ſome of them will carry between 20 and 30 hogſheads of ſugar or molaſſes. Some are made to carry ſail: and for this purpoſe are ſteeped in water till they become pliant; after which their ſides are extended, and ſtrong beams placed between them, on which a deck is afterwards laid that ſerves to ſupport their ſides. The other ſorts very rarely carry ſail, unleſs when going before the wind: their ſails are made of a ſort of ſhort ſilk graſs or ruſhes. They are commonly rowed with paddles, which are pieces of light wood ſomewhat reſembling a corn ſhovel. The American Indians, when they are under the neceſſity of landing to avoid a water-fall, or of croſſing the land from one river to another, carry their canoes on their heads, till they arrive at a place where they can lanch them again. This is the general conſtruction of canoes, and method of managing them: but ſome nations have veſſels going under the name of canoes, which differ conſiderably from the above; as the inhabitants of Greenland, Hudſon's Bay, Otaheite, &c. Specimens of the latter are in the Britiſh Muſeum preſented by Captain Cook.

CANON, a perſon who poſſeſſes a prebend, or revenue allotted for the performance of divine ſervice, in a cathedral, or collegiate church.

In the Romiſh church, when a perſon is promoted to the office of a canon, he muſt be preſented in a very ceremonious manner to the chapter, who aſſemble in the cathedral, in order to receive him.

Canons are of various kinds; as,

Cardinal CANONS, thoſe attached to a church, as a prieſt is to a pariſh. Domicillory canons, young canons, who, not being in orders, have no right in any particular chapters. Expectative canons, ſuch as, without having any revenue or prebend, have the titles and dignities of canons, a voice in the chapter, and a place in the choir, till ſuch time as a prebend ſhould become vacant. Foreign canons, ſuch as do not officiate in the canonries to which they belong. Regular canons, thoſe who ſtill live in community, and who have, to the practice of their rules, added a ſolemn profeſſion of vows. Tertiary canon, a perſon who had only a third part of the revenues of the canonicate.

CANON *of Maſs*, in the Romiſh church, the name of a prayer which the prieſt reads low to himſelf, the people kneeling.

Paſcal CANON, a table of the moveable feaſts, ſhewing the day of Eaſter, and the other feaſts, depending on it, for a cycle of 19 years.

CANON *of Scripture*, a catalogue or liſt of ſuch books of the bible as are called canonical.

In modern muſic, canon is a kind of fugue, called a perpendicular fugue, becauſe the different parts beginning one after the other, repeat inceſſantly the ſame air. The Engliſh catch and Italian canon are much the ſame. See ROSSEAU'S DICT.

CANON *Law*, a collection of eccleſiaſtical laws, ſerving as the rule and meaſure of church government.

The canon law, even when papal authority was at its height in England, was of no force when it was found to contradict the prerogative of the king, the laws, ſtatutes, and cuſtoms of the realm, or the doctrine of the eſtabliſhed church.

The eccleſiaſtical juriſdiction of the ſee of Rome in England, was founded on the canon law; and this created quarrels between kings and ſeveral archbiſhops and prelates who adhered to the papal uſurpation.

The old canons continued in full force till the reign of James I. when the clergy being aſſembled in convocation, the king gave them to treat and conſult upon canons; which they did, and preſented them to the king, who gave them the royal aſſent: theſe were a collection out of the ſeveral preceding canons and injunctions. Some of theſe canons are now obſolete. In the reign of Charles I. ſeveral canons were paſſed by the clergy in convocation.

CANONARCHA, or CANONARCHUS, a dignity in the Greek church, anſwering to the precentor in the Latin, or chanter in the Engliſh church.

A like officer we alſo find in the antient monaſteries, under the denomination *canonarcha*, whoſe buſineſs was to beat the ſemantrum, or wooden inſtrument, whereby the monks were called to choir to ſing canons. There appear to have been ſeveral canonarchæ in the ſame monaſtery.

CANONESS, in the Romiſh church, a woman who enjoys a prebend, affixed, by the foundation, to maids; without their being obliged to renounce the world, or make any vows.

There are few of theſe, except in Flanders and Germany; they are rather looked upon as a ſeminary and retreat of girls for marriage, than an engagement for the ſervice of God.

CANONICA, in philoſophical hiſtory, an appellation given by Epicurus to his doctrine of logic. It was called Canonica, as conſiſting of a few canons, or rules, for directing the underſtanding in the purſuit and knowledge of truth. Epicurus's Canonica is repreſented as a very ſlight and inſufficient logic, by ſeveral antients who put a great value on his ethics and phyſics. The ſtreſs of Epicurus's Canonica conſiſts in his doctrine of the criteria of truth.

All queſtions in philoſophy are either concerning words or things: concerning things we ſeek their truth; concerning words, their ſignification: things are either natural or moral; and the former are either perceived by ſenſe, or by the underſtanding. Hence, according to Epicurus, ariſe three criterions of truth, viz. ſenſe, anticipation or prænotion, and paſſion. The great canon, or principle, of Epicurus's logic is, that the ſenſes are never deceived; and therefore that every ſenſation, or perception of an appearance, is true.

CANONICAL, ſomething that belongs to, or partakes of the nature of a rule or canon.

Canonical, amounts to much the ſame with what we otherwiſe call regular, and is an appellation more peculiarly given to thoſe writings which have been received as the rule of our faith and practice, and comprehended in the canon or catalogue of the ſcriptures. In which ſenſe, canonical ſtands contradiſtinguiſhed from apocryphal.

The method or rule of living, preſcribed by the antient clergy who lived in community, was called a *canonical life*; ſubmiſſion to eccleſiaſtical laws and rules, *canonical obedience*; puniſhments which the church inflicted as penance, excommunication, &c. bore the appellation of *canonical puniſhment*.

CANONICUM a due of firſt-fruits, paid by the Greek laity to their biſhops, or, according to Du-Cange, to their prieſts. The canonicum is aſſeſſed according to the number of houſes, or chimnies, in a place.

CANONIST, a perſon ſkilled in, or who makes profeſſion of the ſtudy and practice of the canon law. Canoniſts and civilians are uſually combined in the ſame perſons. And hence the title of *doctor juris utriuſque*, or *legum doctor*, uſually expreſſed in abbreviature, LL. D. or J. U. D.

CANONIZATION, a ceremony in the Romiſh church, by which perſons deceaſed are ranked in the catalogue of the ſaints. It ſucceeds beatification.

Before a beatified perſon is canonized, the qualifications of the candidate are ſtrictly examined into, in ſome conſiſtories held for that purpoſe; after which, one of the conſiſtorial advocates, in the preſence of the pope and cardinals, makes the panegyric of the perſon who is to be proclaimed a ſaint, and gives a particular detail of his life and miracles: which done, the holy father decrees his canonization, and appoints the day.

On the day of canonization the pope officiates in white, and their eminences are dreſt in the ſame colour. St. Peter's church is hung with rich tapeſtry, upon which the arms of the pope, and of the prince or ſtate requiring the canonization, are embroidered in gold and ſilver. An infinite number of lights blaze all round the church, which is crouded with pious ſouls, who wait with devout impatience till the new ſaint has made his public entry as it were into paradiſe, that they may offer up their petitions to him without danger of being rejected.

The following maxim with regard to canonization is now obſerved, though it has not been followed above a century, viz. not to enter into the enquiries prior to canonization, till 50 years, at leaſt, after the death of the perſon to be canonized.

CANOPUS, in aſtronomy, a bright ſtar of the firſt magnitude in the rudder of Argo, a conſtellation of the ſouthern hemiſphere.

CANOPY, a kind of decoration, ſerving to cover, and crown an altar, throne, tribunal, pulpit, chair, or the like.

The word is formed from the barbarous Latin *canopium*, of κωνωπειον, a net ſpread over a bed to keep off the knats, from κωνωψ, *a knat*.

Canopies are alſo borne over the head in proceſſions of ſtate, after the manner of umbrellas.

The canopy of an altar is more peculiarly called Ciborium.

The Roman grandees had their canopies, or ſpread veils, called thenſæ, over their chairs: the like were alſo in temples over the ſtatues of the gods. The modern cardinals ſtill retain the uſe of canopies.

CANQUES, a ſort of cotton cloth made in China; with this cloth they make that firſt garment next their ſkin, which is properly their ſhirt.

CANSCHY, in botany, is the name of a tree in Japan, from which the inhabitants of that country make their paper.

CANSTRISIUS, an officer in the church of Conſtantinople, whoſe buſineſs is to take care of the patriarchs pontifical veſtments, aſſiſt in robing him, and during maſs to hold the incenſe pot, and ſprinkle holy water while the hymn of the Trinity is ſinging. The word is alſo written canſtrinſius, it is uſually derived from caniſtrum, a name which ſome ſuppoſe given to the incenſe pot, others to the kind of baſket in which the patriarch's veſtments were kept.

CANT, a quaint affected manner of ſpeaking, or writing.

Cant is originally derived ftom Andrew Cant, a Cameron preacher in Scotland, who by exerciſe, had obtained the faculty of talking in the pulpit in ſuch a tone and dialect as was underſtood by none but his own congregation.

Cant, or as it is now called *ſlang*, is not reſtrained to the ſtyle of gypſies, thieves, and beggars, but poſſeſſes a large department in the politer provinces of the Engliſh language. It is alſo a term uſed by carpenters, principally in ſhip-building; when a piece of timber comes the wrong way in their work, they ſay *cant* it; i. e. turn it over.

Accordingly, cant timbers are thoſe which are ſituated at the two ends of a ſhip: and they are ſo called, becauſe they are canted or raiſed obliquely from the keel, and are hereby diſtinguiſhed from thoſe whoſe planks are perpendicular to it.

CANTABRIAN, the antient language of the north-eaſtern part of Spain, in uſe before the country was ſubdued by the Romans. Dr. Wallis makes the Cantabrian the ancient language of Spain. It does not appear to have any affinity with any other known language, abating that ſome Spaniſh words have been adopted in it for things whoſe uſe the Biſcayans were antiently unacquainted with. Its pronunciation is not diſagreeable.

The Lord's prayer, in the Cantabrian tongue, runs thus: *Gure aita cervetan aicena, ſanctifica bedi hire icena, ethor bedi hire reſuma, eguin bedi hire vorondatea cervan becala lurrean ere, &c.*

CANTALIVERS, in architecture, pieces of wood framed into the front, or ſides of a houſe, to ſuſtain the mouldings and eaves over it. They are the ſame with modillions, except that the former are plain, and the latter carved.

CANTAR, or Cantaro, in commerce, a weight uſed in Italy, particularly in Leghorn, to weigh ſome ſorts of merchandiſes. There are three ſorts of cantari, or quintals; one weighs 150 pounds, another 151, and the third 160: the firſt ſerves to weigh alum and cheeſe; the ſecond is for ſugar, and the third for wool and cod-fiſh.

CANTATA, in muſic, a ſong or compoſition, intermixed with recitatives, airs, and different movements, chiefly intended for a ſingle voice, with a thorough baſs, though ſometimes for other inſtruments.

The cantata, when performed with judgment has ſomething in it very agreeable; the variety of the movements not clogging the ear, like other compoſitions. It was firſt uſed in Italy, then in France, whence it paſſed to England.

CANTEENS, are tin veſſels in the form of ſquare bottles, uſed for carrying water to ſupply the ſoldiers in camp.

CANTHARIDES, in entomology, meloe, a kind of poiſonous inſect, with wings and feet like beetles; much uſed as an epiſpaſtic for the raiſing of bliſters.

The ſtimulating power of cantharides is cauſed by a very acrid reſinous ſubſtance contained in theſe, inſects, two ſcruples of which Neumann extracted from four ounces of cantharides by ſpirit of wine.

There are various kinds of cantharides, but all of a greeniſh and golden hue; the beſt are thoſe which appear with different colours, having yellow lines running acroſs their wings, thick, and freſh. They are killed by expoſing them over a very ſtrong vinegar, which is made to boil for that purpoſe; after which they are dried, and may be preſerved a year or two.

Cantharides are much commended in fevers, as they raiſe and ſtrengthen a low trembling pulſe, give relief in delirious ravings, ſoporiferous ſtupors, loſs of reaſon, &c. (the common ſymptoms of high and dangerous fevers): they often alſo reduce continual fevers to regular and diſtinct remiſſions; and ſo make way for the bark; cleanſe and open the obſtructed glands and lymphatics; bring on critical ſweats, &c.

Dr. Morgan accounts for theſe effects of cantharides thus: "the ſubtile and volatile pungent parts, of which the cantharides conſiſt, being carried into the blood, and paſſing with the lymph or ſerum into the glandular pipes, act there by diſſolving, attenuating, and rarefying the viſcid coheſions of the lymph; and by ſtimulating the nervous coats of the veſſels, they throw off their ſtagnant viſcidities, and thus reſtore the circulation and free drain of lymph from the arteries to the veins; cleanſe the expurgatory glands, and bring on critical ſweats and urines. Thus, the extremely ſubtle, active, and pungent volatile ſalts, derived from the cantharides, purge the glands and lymphatics univerſally; much after the ſame manner as common cathartics do the guts."

Groenvelt has a treatiſe expreſs on the ſafe internal uſe of cantharides, wherein he recommends them, eſpecially againſt ulcers in the bladder; for which he ſuffered a perſecution from the college of phyſicians, though further experience has ſhewn he had juſtice on his ſide.

Their principal uſe, however, is in veſicatories, to raiſe bliſters on the ſkin; and by that means to turn off and diſcharge ſome flux of ill humours.

Cantharides are ſometimes applied to the temples for the tooth ach: the farriers uſe them in ſeveral diſeaſes of horſes. They muſt be choſen new, dry, and whole: they will not keep above two years, without ſpoiling or mouldering into a duſt, which is of no uſe.

CANTHARIS, the glow worm, a genus of inſects belonging to the order of inſecta coleoptera. The feelers of this genus are ſetaceous; the breaſt is marginated, and ſhorter than the head; the elytra, or wing caſes, are flexile; and the ſides of the belly are plated and papillous. Linnæus enumerates 27 ſpecies of the cantharis, moſt of them to be found in different parts of Europe. The cantharis uſed in making bliſtering plaſters, is ranked under a different genus, viz. the meloe, or cantharides.

CANTHARUS, in ichthyology, the name of a ſea fiſh much reſembling the ſparus and ſargus in ſhape, but of a duſkier and blacker colour, covered with ſmall ſcales, and not marked with the annular black ſpots which both thoſe fiſhes have near the tail. It is common in the Mediterranean, and is frequently brought to market in Rome, and eſteemed delicate food.

CANTHI, in anatomy, cavities at the extremities of the eye lids, commonly called the corners of the eye: the greater of them, or the greater canthus, is next the noſe; the leſſer of them, or the little canthus, lies towards the temple.

CANTICLES, a canonical book of the Old Teſtament, otherwiſe called the Song of Solomon; by the Jews, the Song of Songs, *Canticum Canticorum*.

The book of Canticles is uſually ſuppoſed to be an epithalamium compoſed by Solomon, on occaſion of his marriage with the king of Egypt's daughter. But thoſe who penetrate further into the myſtery, pretend to find it the marriage of Jeſus Chriſt with human nature, the church, and good men. On this principle the Canticles is held to be a continued allegory, wherein, under the terms of a common wedding, a divine and ſpiritual marriage is expreſſed.

The Jews themſelves, apprehending the book liable to be underſtood in a groſs and carnal manner, prudently prohibited the reading of it before the age of thirty, and the ſame uſage anciently obtained in the Chriſtian church.

Among the antients, Theodore Mopſuetanus rejected the book of Canticles, as not divine. Divers rabbins have alſo queſtioned its being written by inſpiration. It is alledged, that the name of God is not once found in it. Mr. Whiſton has a diſcourſe expreſs to prove, that the Canticles is not a ſacred book of the Old Teſtament. He alledges it indeed to have been written by king Solomon, the ſon of David, but aſſerts, that it was compoſed at the time when that prince, blinded by his concubines, was ſunk in filthy love, and even idolatry. For the myſtic ſenſe, he aſſerts it to be without any foundation.

Grotius, Nierembergius, the Dutch divines who criticiſed F. Simon, Menetries, Baſnage, and ſome others ſeem alſo to take the Canticles for a profane compoſition, on a footing with the love-pieces of Catullus or Ovid.

CANTO, a part or diviſion of a poem, anſwering to what is otherwiſe called a book.

The word is Italian, where it properly ſignifies ſong.

Taſſo, Arioſto, and ſeveral other Italians, have divided their longer or heroic poems into cantos. In imitation of them Boileau has divided his Lutrin, into chants, or ſongs. The like uſage has been adopted by ſome Engliſh writers, as Butler, who divides his Hudibras, and Dr. Garth his Diſpenſary, into cantos.

In the Italian muſic, canto ſignifies a ſong: hence *canto ſimplice*, is where all the notes or figures are equal, called alſo *canto fermo*.

CANTON, a quarter of a city, conſidered as ſeparated and detached from the reſt, although canton is alſo more frequently uſed for a ſmall country, or diſtrict, under its ſeparate government.

Such are the thirteen Swiſs cantons; each of which forms a republic apart; but all are leagued together, and conſtitute what is called the Helvetic body.

CANTON, in heraldry, is one of the nine honourable ordinaries; being a ſquare portion of the eſcutcheon parted from the reſt.

CANTONED, CANTONNE, or CANTONIZED, in heraldry, is when the four cantons, or ſpaces round a croſs, or ſaltier, are filled up with any pieces. He bears gules, a croſs argent, cantoned with four ſcallop ſhells.

The word is alſo uſed when there are little pieces in the cantons, or ſpaces, of any principal figure of an eſcutcheon. Thus the ſaltier of Lenox is cantoned with four roſes.

CANTONING, in the military art, is a method of quartering troops in a town, where the garriſon is ſo numerous, that ſeveral regiments muſt be quartered on the inhabitants for want of caſerns, or barracks, to contain them.

In this caſe they divide the town into as many parts as there are regiments to be ſo quartered, that the officers and ſoldiers of each may have a diſtinct part to themſelves. This, in the military phraſe, is called cantoning of a town.

CANTRED, or CANTREY, denotes a diſtrict or diviſion of an hundred towns or villages.

The word is Britiſh, compounded of *cant*, hundred, and *trev*, or *tref*, town or village.

In Wales, ſome counties are divided into cantreds; as thoſe in England are into hundreds. Angleſey, in particular, is divided into three cantreves or cantreds, which are each ſubdivided into ſix comots or commotes, each commote containing about ſixty trevs or townſhips. The general partition of Wales into cantrevs and comots is very antient.

CANVAS, a coarſe ſort of linen or hempen cloth, uſually woven open, and regularly, in little ſquares; ſerving for divers domeſtic purpoſes, and eſpecially for the ground of tapeſtry-work, and painting.

CANVAS alſo is the cloth on which painters uſually draw their pictures; the canvas being ſmoothed over with a ſlick ſtone, then ſized, and afterwards whited over, makes what the painters call their primed cloth, on which they draw their firſt ſketches with a coal or chalk, and afterwards finiſh with colours.

CANZONE, in muſic, ſignifies, in general, a ſong where ſome little fugues are introduced: but it is ſometimes uſed for a ſort of Italian poem, uſually pretty long, to which muſic may be compoſed in the ſtyle of a cantata. If this term be added to a piece of inſtrumental muſic, it ſignifies much the ſame as cantata; if placed in any part of a ſonata, it implies the ſame meaning as allegro, and only denotes that the part to which it is prefixed is to be played or ſung in a briſk and lively manner.

CANZONETTA, a diminutive of canzone, denoting a little ſhort ſong.

CAOUANNE, the name of a ſpecies of tortoiſe, very much reſembling the jurucua of the Braſilians, but having a thicker ſhell, and a harſh, tough, and ſtringy fleſh, of a very bad taſte.

CAOUTCHOUC, or KAOUTCHUCK, a reſin found in different parts of Aſia and South America, and poſſeſſed of the moſt ſingular properties. No ſubſtance is yet known which is ſo pliable, and at the ſame time ſo elaſtic; and it is farther a matter of curioſity as being capable of reſiſting the action of very powerful menſtrua. From the account of M. de la Condamine, we learn, that this ſubſtance ouſes out, under the form of a vegetable milk, from inciſions made in a certain ſpecies of tree in the country in which it is found. This liquor gradually dries, and is formed into a ſubſtance of the appearance of leather, which is in a very high degree pliable and elaſtic, while at the ſame time it poſſeſſes a conſiderable degree of ſolidity. On account of theſe properties, the Omaguas, a numerous nation on the banks of the river of the Amazons, employ this reſin, while yet in the ſtate of milk, for making ſeveral utenſils, as goblets, bottles, and the like. As the ſame properties would render it of ſingular utility for many other purpoſes in arts, philoſophers have long endeavoured to diſcover ſome method of diſſolving it in ſuch a manner, that it would aſſume different figures with equal eaſe as when in its original ſtate of milk. In the memoirs of the academy of ſciences for 1768 we have an account of ſeveral attempts for this purpoſe, and how it may be effected. The ſtate of vegetable milk in which the caoutchouc reſin is found when it comes from the tree, led Mr. Macquer to imagine that it was compoſed of an oil and a watery matter. Hence he thought it probable that it paſſed from a fluid to a ſolid form by the evaporation of the watery part, and that the oily ſolvents would reduce it to a ſoft ſtate. The firſt trials he made for diſſolving it were with lintſeed oil, eſſence of turpentine, and ſeveral others. But all he could obtain by means of theſe menſtrua was a viſcid ſubſtance incapable of being hardened, and totally void of elaſticity. The rectified eſſential oil of turpentine was employed ſeemingly with greater ſucceſs. To ſeparate from this menſtruum the caoutchouc which it had diſſolved, Mr. Macquer added ſpirit of wine: but the conſequence was, that part only of the oil united with the ſpirit; the reſt remaining obſtinately attached to the reſin which it had diſſolved, and thus preventing it from aſſuming a ſolid conſiſtence. The author next endeavoured to diſſolve it by means of heat in Papin's digeſter, which was ineffectual.

From the great volatility of ether, he was next induced to try it as a menſtruum; and, for this purpoſe, he prepared ſome with great attention. The caoutchouc, cut into little bits, and put into a proper veſſel with as much ether as was ſufficient to cover it, was perfectly diſſolved without any other heat than that of the atmoſphere. This ſolution was tranſparent, and of an amber colour. It ſtill preſerved the ſmell of ether, but mixed with the diſagreeable odour of the caoutchouc, and it was a little leſs fluid than pure ether.

The Indian method of forming bottles, goblets, &c. of the caoutchouc is, by making moulds of clay, which they cover with thin layers of the caoutchouc, taking care never to lay on a freſh one till the former is dry. After it has acquired the proper thickneſs, by an inſtrument fitted for that pupoſe, they take out the clay. The ſame proceſs may be followed in forming veſſels of the caoutchouc diſſolved in ether. But in forming ſmall veſſels, Mr. Macquer did not employ moulds made of clay, but of wax, which were eaſily removed, by throwing the veſſel after it was formed into boiling water.

Of this gum, it is ſaid, the Chineſe make elaſtic rings for laſcivious purpoſes. Among us, it is uſed by ſurgeons for injecting liquids, and by painters and others for rubbing out black lead pencil marks, and called Indian rubber.

CAP, a cover to the head.

The æra of caps and hats is referred to the year 1449, the firſt ſeen in theſe parts of the world being at the entry of Charles VII. into Rouen: from that time they began, by little and little, to take place of the hoods, or chaperoons, that had been uſed till then.

The Romans were many ages without any regular covering for the head: when either the rain or ſun was troubleſome, the lappet of the gown was thrown over the head; and hence it is that all the ancient ſtatues appear bareheaded, excepting ſometimes a wreath or the like. And the ſame uſage obtained among the Greeks, where, at leaſt during the heroic age, no caps were known.

The French clergy wear a ſhallow kind of cap, called calotte, which only covers the top of the head, made of leather, ſattin, worſted, or other ſtuff.

In the popiſh church, the red cap is a mark of dignity allowed only to thoſe who are raiſed to the cardinalate.

The ſecular clergy are diſtinguiſhed by black leathern caps, the regulars by knit and worſted ones.

The Chineſe have not the uſe of the hat, like us; but wear a cap of a peculiar ſtructure, which the laws of civility will not allow them to put off: it is different for the different ſeaſons of the year; that uſed in ſummer, is in form of a cone, ending at top in a point. It is made of a very beautiful kind of mat, much valued in that country, and lined with ſatin: to this is added, at top, a large lock of red ſilk, which falls all round as low as the bottom; ſo that, in walking, the ſilk fluctuating regularly on all ſides, makes a graceful appearance. In winter they wear a pluſh cap, bordered with martlet's, or fox's ſkin; as to the reſt, like thoſe for the ſummer. Nothing can be neater than theſe caps; they are frequently ſold for eight or ten crowns; but they are ſo ſhort that the ears are expoſed.

The cap or bonnet, is a mark, or ornament, of certain characters: thus churchmen, and the members of univerſities, ſtudents in law, phyſic, &c. as well as graduates, wear ſquare caps. In moſt univerſities, doctors are diſtinguiſhed by peculiar caps, given them in aſſuming the doctorate. Wickliffe calls the canons of his time bifurcati, from their caps. Paſquier obſerves, that in his time, the caps worn by the churchmen, &c. were called ſquare caps; though, in effect, they were round, yellow caps.

Cap *of Maintenance*, one of the regalia or ornaments of ſtate belonging to the kings of England, before whom it was carried at the coronation and other great ſolemnities; and alſo of the mayors of ſeveral cities in England. The word cap alſo implies ſeveral other matters generally coverings too well known to need deſcription.

CAPACITY, in a general ſenſe, is a quick underſtanding, an aptitude, or diſpoſition to retain or hold any thing in memory, that is read or ſpoken.

CAPE, in geography, a head land; or a piece of land running out from the reſt, into the ſea.

Sicily was called by the ancients Trinacria, by reaſon of its three capes, or promontories, repreſented on medals, by three mens legs joined together at the top of the thigh, and bent in the knee; which pretty nearly reſembles the triangular figure of that iſland.

CAPELLA, in aſtronomy, a bright ſtar of the firſt magnitude, in the left or preceding ſhoulder of the conſtellation auriga.

Capella, in ornithology, the lapwing.

CAPER Bush, *Capparis*, in botany, a genus of the monogynia order, belonging to the polyandria claſs of plants. There are ſeven ſpecies. The ſpinoſa, or common caper, is a low ſhrub, generally growing out of the joints of old walls, the fiſſures of rocks, and amongſt rubbiſh, in moſt of the warm parts of Europe.

Culture. This plant is very difficultly preſerved in Britain: it delights to grow in crevices of rocks, old walls, &c. and always thrives beſt in an horizontal poſture; ſo that, when planted either in pots, or in the full ground, they ſeldom thrive, though they may be kept alive for ſome years. They are propagated by ſeeds in the warm parts of Europe, but very ſeldom in Britain.

Uſes. The buds, pickled with vinegar, &c. are brought to Britain annually from Italy and the Mediterranean. They are ſuppoſed to excite appetite and aſſiſt digeſtion; and to be particularly uſeful as detergents and aperients in obſtructions of the liver and ſpleen.

In England capers are in great eſtimation in culinary purpoſes. The buds of the common broom are frequently pickled as a ſubſtitute, alſo the ſeeds of the ſturſheon, and if properly managed anſwer the purpoſe.

CAPI AGA, or Capi Agassi, a Turkiſh officer, who is governor of the gates of the ſeraglio; or grand maſter of the ſeraglio.

The capi aga is the firſt dignity among the white eunuchs: he is always near the perſon of the grand ſignior: he introduces embaſſadors to their audience: nobody enters, or goes out of the grand ſignior's apartment, but by his means. His office gives him the privilege of wearing the turban in the ſeraglio, and of going every where on horſeback. He accompanies the grand ſignior to the apartment of the ſultanas, but ſtops at the door without entering. His appointment is very moderate; the grand ſignior bears the expence of his table, and allows him at the rate of about ſixty French livres per day; but his office brings him in abundance of preſents; no affair of conſequence coming to the emperor's knowledge without paſſing through his hand. The capi aga cannot be baſhaw when he quits his poſt.

CAPIAS, a writ or proceſs, which is of two ſorts; one before judgment, called *Capias ad reſpondendum*; granted in an action perſonal, when the ſheriff, upon the firſt writ of diſtreſs, returns, *Nihil habet in balliva noſtra*.

The other is a writ of execution after judgment, which is alſo of various kinds; as, *Capias ad ſatisfaciendum*, *Capias pro fine*, *Capias utlagatum*, &c. Capias is alſo attached to various other legal inſtruments.

CAPIGI, a porter, or door-keeper of the Turkiſh ſeraglio. There are about five hundred capigis, or porters, in the ſeraglio, divided into two companies. Their buſineſs is to aſſiſt the janizaries in the guard of the firſt and ſecond gates of the ſeraglio.

CAPILLAMENT, literally ſignifies hair, for this reaſon it is applied to the fine fibres, or filaments, whereof the nerves are compoſed.

CAPILLARY, of the Latin *capillus, a hair*, is applied to ſeveral things, to intimate their exceeding ſmallneſs, or fineneſs, reſembling that of a hair.

Capillary *Veſſels*, in anatomy, are the leaſt, minuteſt, inſenſible ramifications of the veins and arteries, which, when cut, or broken, yield but very little blood.

The capillary veſſels ſhould be conceived finer than hairs: they are beſt compared to the threads of cobwebs, and are ſometimes called evaneſcent veſſels.

Capillary *Tubes*, in phyſics, are ſmall pipes of glaſs, whoſe canals are extremely narrow, their diameter being only a half, a third, or a fourth of a line.

The aſcent of water, &c. in capillary tubes, is a phenomenon that has long embarraſſed the philoſophers: let one end of a glaſs tube open at both extremities, be immerged in water, the liquor within the tube will riſe to a conſiderable height above the external ſurface: or if two or more tubes are immerged in the ſame fluid, one a capillary tube, and the other of a larger bore the fluid will aſcend higher in the former than in the latter; and this will be in a reciprocal ratio of the diameters of the tubes.

In order to account for this phenomenon, it will be neceſſary firſt to premiſe, that the attraction between the particles of glaſs and water is greater than the attraction between the particles of water themſelves: for if a glaſs tube be placed in a poſition parallel to the horizon, and a drop of water be applied to the under ſide of the tube, it will adhere to it; nor will it fall from the glaſs till its bulk and gravity are ſo far increaſed, as to overcome the attraction of the glaſs. Hence it is eaſy to conceive how ſenſibly ſuch a power muſt act on the ſurface of a fluid, not viſcid, as water, contained within the ſmall cavity or bore of a glaſs tube; as alſo that it will be proportionably ſtronger as the diameter of the bore is ſmaller; for it will be evident that the efficacy of the power is in the inverſe proportion of the diameter, when it is conſidered, that ſuch particles only as are in contact with the fluid, and thoſe immediately above the ſurface, can effect it.

Dr. Jurin's ſolution of this phenomenon, which is well ſupported by experiments. "The ſuſpenſion of the water (on that "gentleman's ſyſtem) is owing to the attraction of the periphery "of the concave ſurface of the tube, to which the upper ſurface "of the water is contiguous, and adheres;" this being the only part of the tube, from which the water muſt recede upon its ſubſiding; and conſequently the only one which, by the force of its coheſion and attraction, oppoſes the deſcent of the water. This he ſhews to be a cauſe proportional to the effect; becauſe the periphery, and the ſuſpended column, are both in the ſame proportion as the diameter of the tube. The ſuſpenſion thus accounted for, the ſeemingly ſpontaneous aſcent will eaſily be ſolved: for ſince the water that enters a capillary tube, as ſoon as its orifice is dipped therein, has its gravity taken off by the attraction of the periphery, with which its upper ſurface is in contact, it muſt neceſſarily riſe higher; partly by the preſſure of the ſtagnant water, and partly by the attraction of the periphery, immediately above that which is already contiguous to it. Phil. Tranſ. abr. vol. iv. p. 423, &c. N° 355.

Some doubt whether the law holds throughout, of the aſcent of the fluid being always higher as the tube is ſmaller; Dr. Hook's experiments, with tubes almoſt as fine as cobwebs, ſeem to ſhew the contrary. The water in theſe, he obſerves, did not riſe ſo high as one would have expected. The higheſt he ever found was at 21 inches above the level of the water in the baſon, which is much ſhort of what it ought to have been by the law above mentioned.

Capillary *Veſſels*. Many ſmall veſſels of animal bodies have been diſcovered by the modern invention of injecting the veſſels of animals with a coloured fluid, which upon cooling grows hard. But though moſt anatomiſts know the manner of filling the large trunks, few are acquainted with the art of filling the capillaries. Mr. Monro has given us what he, after many trials, has found moſt ſucceſsful, in the Medic. Eſſ. Edinb. vol. i. art. 9. where he enters into a very nice detail of the operation, to which we muſt refer the curious.

Diſtribution by CAPITA, in law, ſignifies the appointing to every man an equal ſhare of a perſonal eſtate; when all the claimants claim in their own rights, as in equal degrees of kindred, and not *jure repreſentationis*.

Succeſſion by Capita, where the claimants are next in degree to the anceſtor, in their own right, and not by the right of repreſentation.

CAPITAL, of the Latin *caput, the head*, is uſed on various occaſions, to expreſs the relation of a head, chief, or principal: thus,

Capital *Stock*, among merchants, bankers, and traders, ſignifies the ſum of money which individuals bring to make up the common ſtock of a partnerſhip when it is firſt formed. It is alſo ſaid of the ſtock which a merchant, or trading company, at firſt put into trade for their account.

We alſo ſay a capital crime, capital city, capital letter, which ſignifies the firſt, or moſt important of their kind.

Capital, in architecture, the uppermoſt part of a column, or pilaſter, ſerving as the head, or crowning thereof; placed immediately over the ſhaft, and under the entablature. See Syſtem of Architecture.

CAPITATION, a tax, or impoſition, raiſed on each perſon in conſideration of his labour, induſtry, office, rank, &c. This kind of tribute is very antient.

Capite, *cenſi*, in antiquity, the loweſt rank of Roman citizens, who in public taxes were rated the leaſt of all, being ſuch as were never worth above 365 aſſes.

They were ſuppoſed to have been thus called, becauſe they were rather counted and marſhalled by their heads than their eſtates.

CAPITOLINE *Games, ludi Capitolini*, were annual games, or combats, inſtituted by Camillus, in honour of Jupiter Capitolinus; and in commemoration of the capitol's not being ſurprized by the Gauls.

CAPITOULATE, an appellation given to the ſeveral quarters or diſtricts of the city of Tholouſe, each under the direction of a capitoul; much like the wards of London under their aldermen.

Tholouſe is now divided into eight capitoulates or quarters, which is ſubdivided into moulans, each of which has its tithing-man, whoſe buſineſs it is to inform the capitoul of what paſſes in his tithing, and to inform the inhabitants of the tithing, of the orders of the capitoul.

CAPITULA *Ruralia*, chapters held by the rural dean and clergy within the precincts of each deanry, antiently held every three weeks, then once a month, and more ſolemnly once a year.

CAPITULATION, a treaty made with the garriſon or inhabitants of a place beſieged; whereby they ſurrender themſelves up, on certain articles and conditions ſtipulated with the beſiegers.

Before a ſurrender the governor of the garriſon gives orders for beating the chamade, and for fixing one or more white colours on the rampart; one of which remains either on the breach or rampart, during the time of negotiation. When the chamade is beat, the fire ceaſes on both ſides, and the governor ſends ſome officer of diſtinction to the commander in chief of the beſiegers, who delivers to them the conditions on which the governor propoſes to ſurrender the town; and as a ſecurity for theſe officers, the beſiegers ſend a like number into the town. If the governor's conditions are not ſatisfactory to the general of the beſiegers, he preſcribes the conditions of ſurrender; threatening to allow no conditions, if thoſe propoſed are not complied with within a certain time. If the conditions are too hard, the officers return, and the drums are beat upon the ramparts for a commencement of hoſtilities. During the ſuſpenſion of arms, no work ſhould be done for the ſecurity either of the beſieged or beſiegers; however, ſtratagems are counted lawful, and ſhould be guarded againſt.

If the terms of capitulation are agreed upon, the governor ſends two or three of his principal officers into the camp, and the general ſends the ſame number, and of the ſame rank, into the town, as a ſecurity for accompliſhing the capitulation. When every thing is finiſhed, the hoſtages on both ſides return. The conditions of the beſieged are of various kinds, according to their circumſtances. A garriſon ſhould have proviſion and ammunition at leaſt for three days, to be entitled to a compoſition, without which they are to be made priſoners of war; but this ſhould be known before capitulation is ſigned. When the capitulation is ſettled, an officer of artillery from the beſiegers comes into the place with an officer of artillery from the garriſon, who takes an inventory of all the artillery and ammunition remaining: and a commiſſary of proviſions takes an account of the proviſions. When the beſieged have delivered a gate of the place to the beſiegers, the firſt regiment of the army enters and mounts guard. When the garriſon leaves the place, the army of the beſiegers is put under arms, and ranged in two files, at the head of which are the general and principal officers, between which the garriſon paſſes. See farther on this ſubject Muller's Math. &c. vol. vi. p. 197, &c.

The moſt honourable and ordinary terms of capitulation are, To march out at the breach with arms and baggage, drums beating, colours flying, a match lighted at both ends, and ſome pieces of cannon, waggons and convoys for their baggage and for their ſick and wounded.

CAPNICON, in antiquity, chimney-money, or a tax which the Roman emperors levied for ſmoke, and which of conſequence was due from all, even the pooreſt, who kept a fire. This was firſt invented by Nicephorus.

CAPNOMANCY, a kind of divination by means of ſmoke uſed by the antients in their ſacrifices.

CAPOC, a ſort of cotton ſo fine and ſo ſhort, that it cannot be ſpun. It is uſed in the Eaſt Indies to line palanquins, to make beds, matraſſes, cuſhions, pillows, &c.

CAPOLLIN, in botany, Mexicanorum Hernandez, ſeu ceraſus dulcis Indica. It is a tree of moderate bigneſs, with leaves like thoſe of an almond, or our country cherry-tree. It bloſſoms in the ſpring, and bears fruit all the ſummer; it requires a temperate climate, and grows in gardens and fields in Mexico, as well ſpontaneouſly as by cultivation.

The juice of the young buds mollifies the tongue when parched by heat. A decoction of the bark being expoſed to the ſun for fifteen days, and the weight of a dram of it taken, cures the dyſentery. The powder helps inflammations. There are three ſpecies of this tree, which differ only in fruit; but all of them hang in cluſters.

CAPON, a cock chicken caſtrated young, generally as ſoon as left by the hen. Like the ox, and other caſtrated animals, the male of poultry are greatly improved by thoſe means for the uſe of the table; the time of performing the operation is when the chick is about two months old.

CAPONIERE, or CAPONNIERE, in fortification, is a paſſage from one work to another, ten or twelve feet wide, covered on each ſide by a parapet, terminating in a ſlope or glacis. Caponieres are partly under ground, and partly above it. They are ſo well ſcreened at the top, that no bomb or carcaſs can penetrate them.

CAPOT, at picquet, is when one of the gameſters wins all, in which caſe he gains forty points.

CAPPANUS, in natural hiſtory, the name given by ſome authors to the ſea-worm which bores into the bottoms of ſhips.

In order to prevent the pernicious effects of this worm, ſeveral ſhips have lately been ſheathed with copper.

CAPPARIS, in botany, the caper buſh.

CAPRA *Trituratoria*, in antient huſbandry, was a kind of iron log, made in the figure of a goat, which was laid on the tribula, to make it more effectual in ſeparating the corn from the ears, the antient way of threſhing.

CAPRA, in tetrapodology, the goat.

CAPRA *Saltans*, in meteorology, a fiery meteor or exhalation ſometimes ſeen in the atmoſphere. It forms an inflected line, reſembling in ſome meaſure the caperings of a goat; whence it has its name.

CAPRARIA, in botany, a genus of the angioſpermia order, belonging to the didynamia claſs of plants. There is but one ſpecies, the biflora, which is a native of the warm parts of America. Being a troubleſome weed, and without beauty, it is never cultivated, except in botanic gardens for the ſake of variety.

CAPREOLATÆ *Plantæ*, are ſuch plants as turn, wind, and climb along the ſurface of the earth, and ſticks or trees, by means of their capreoli, or tendrils; as gourds, melons, cucumbers, &c.

CAPREOLUS, in anatomy, the helix, or outer ambit of the ear.

CAPREOLUS, in botany, the claſper, or tendril, by which vines, peas, and ſuch like creeping plants, faſten themſelves to thoſe things which ſtand near, or are deſigned to ſupport them.

CAPRICORN, in aſtronomy, one of the 12 ſigns of the zodiac. See Syſtem of ASTRONOMY, Sect. IX.

The ancients accounted capricorn the tenth ſign; and when the ſun arrived thereat, it made the winter ſolſtice with regard to our hemiſphere: but the ſtars having advanced a whole ſign towards the eaſt, capricorn is now rather the 11th ſign; and it is at the ſun's entry into ſagittary that the ſolſtice happens, though the ancient manner of ſpeaking is ſtill retained.

This ſign is repreſented on ancient monuments, medals, &c. as having the fore part of a goat and the hind part of a fiſh, which is the form of an Ægipan; ſometimes ſimply under the form of a goat.

Tropic of CAPRICORN, a leſſer circle of the ſphere, which is parallel to the equinoctial, and at 23° 30′ diſtance from it ſouthwards; paſſing through the beginning of capricorn.

CAPRIFICATION, a name given in the iſlands of the Archipelago to a peculiar method of propagating and ripening the fruits of the domeſtic fig trees, by means of inſects. Plin. Hiſt. Nat. lib. xv. cap. 19.

This method is ſtill practiſed every year in moſt of the Grecian iſlands. Caprification is formed from caprificus, the wild fig tree, from whoſe fruits the inſects are produced, which are the chief inſtruments of caprification. This tree bears three different ſpecies of fruit, called fornites, cratirites, and orni, which anſwer no other purpoſe but that of facilitating the above operation. The fornites appear in Auguſt, and contain little worms, hatched from eggs depoſited by flies; in October and November, theſe worms become flies, which pierce the ſecond figs called cratirites, which do not appear till the end of September: theſe figs continue to the month of May following, and furniſh a lodgment for the eggs of the ſecond claſs of flies. In May, the third ſpecies of figs, called orni, appear; and when they are grown to a certain ſize and begin to open at the eye, they are pierced by the flies produced by the cratirites, or winter figs. When the worms bred in theſe ſpring figs are transformed into flies, which happen in the months of May or July, the peaſants gather them, and tranſport them to the garden fig trees. The ſucceſs of the caprification depends on this circumſtance, and therefore they viſit their wild fig trees, and their garden fig trees every morning, to examine the eye of the fig; by which they judge when the flies are about to iſſue from the wild figs, and when they may be applied ſo as to pierce the garden figs. They are then depoſited on ſuch trees as are fit to receive them, and enter the fruit by the eye, where they lay eggs, the worms of which cauſe the garden figs to attain their proper degree of bigneſs and maturity. The conſequence of this operation is, that garden fig trees, which would ſcarcely yield twenty five pounds of ripe figs, and fit for drying, yield two hundred and eighty pounds.

As to the manner whereby the puncture of the flies contributes to the maturation of the fruit, poſſibly it may be by lacerating the veſſels, and extravaſating the nutritious juice when they depoſit their eggs; or when with the egg they alſo convey ſome liquor which gently ferments with the juice of the fig, and ſoftens its pulp. Even the Provence and Paris figs ripen much ſooner by wounding their buds with a ſtraw or feather dipped in oil-olive; plums and pears alſo wounded by inſects are found to ripen the ſooneſt, and in theſe the pulp about the wound is more exquiſite than the reſt.

CAPRIMULGUS, goat ſucker, or fern owl, in ornithology, a genus of birds belonging to the order of paſſeres. The beak is incurvated, ſmall, tapering, and depreſſed at the baſe; the mouth opens very wide. There are two ſpecies. 1. The Europæus, with the tubes of the noſtrils hardly viſible. It feeds on moths, gnats, dorrs or chaffers; from which Charlton calls it a dorr-hawk, its food being entirely of that ſpecies of beetle during the month of July, the period of that inſect's flight in this country. This bird migrates. It makes but a ſhort ſtay with us: appears the latter end of May; and diſappears, in the northern parts of our iſland, the latter end of Auguſt; but, in the ſouthern, ſtays above a month later. It inhabits all parts of Britain from Cornwall to the county of Roſs. Its notes are moſt ſingular. The loudeſt ſo much reſembles that of a large ſpinning wheel, that the Welſh call this bird *aderyn y droell*, or the wheel bird. It begins its ſong moſt punctually on the cloſe of day, ſitting uſually on a bare bough, with the head lower than the tail, the lower jaw quivering with the efforts. The noiſe is ſo very violent, as to give a ſenſible vibration to any little building it chances to alight on and emit this ſpecies of note. The other is a ſharp ſqueak, which it repeats often; this ſeems a note of love, as it is obſerved to reiterate it when in purſuit of the female among the trees. It lays its eggs on the bare ground; uſually two: they are of a long form, of a whitiſh hue, prettily marbled with reddiſh brown. The length of this bird is 10½ inches; extent 22. Plumage, a beautiful mixture of white, black, aſh-colour, and ferruginous, diſpoſed in lines, bars, and ſpots.

CAPSICUM, or Guinea Pepper, a genus of the monogynia order, belonging to the pentandria claſs of plants.

Species. 1. The annuum, with oblong fruit, is the common long podded capſicum, commonly cultivated in the gardens. There is one kind with red, and another with yellow fruit. 2. The tetragonum, commonly called bell pepper. The fruit of this is red, and is the only kind proper for pickling, the ſkin being tender; whereas thoſe of the other ſorts are thin and tough. 3. The ceraſiforme, with a round ſmooth fruit, does not grow ſo tall as the other ſorts. The fruit is of a beautiful red, and of the ſize of a cherry. 4. The pyramidale, is a native of Egypt, and hath much narrower leaves than the other ſorts. The pods always grow erect, the plants make a good appearance for three months in the winter. 5. The minimum, commonly called bird pepper, riſes with a ſhrubby ſtalk four or five feet high; theſe are ſmall, oval, and of a bright red; they are much more ſharp and biting than thoſe of the other ſorts. Beſides theſe ſpecies, botaniſts deſcribe as many more, viz. the cordiforme, with heart ſhaped fruit; the anguloſum, with angular heart ſhaped fruit; the olivaforme, with oval fruit; the conoide, commonly called hen pepper, with a conical fruit growing erect; and the fruteſcens, with ſmall pyramidal fruit growing erect, commonly called Barbary pepper. Theſe, however, have no remarkable properties different from the others.

Culture. The three firſt ſpecies are annual plants, and muſt be propagated by ſeeds ſown on a hot bed in the ſpring, and treated in the ſame manner with other exotics; they will however bear the open air, in ſpring and ſummer, after being inured to it by degrees. The plants of the ſecond ſort, whoſe fruit is uſed for pickling, ſhould be taken from the hot bed, and planted in a rich ſpot of ground in a warm ſituation about a foot and an half aſunder. They muſt be ſhaded till they have taken root, and afterwards duly watered in dry weather, which will greatly promote their growth and cauſe them to be more fruitful, and likewiſe enlarge the ſize of the fruit. By this management, three or four crops of fruit for pickling may be obtained the ſame year. The other ſorts are more tender.

Uſes, &c. The ſecond ſort, as already obſerved, produces fruit fit for pickling; for which purpoſe they muſt be gathered before they arrive at their full ſize, while their rind is tender. They muſt be ſlit down on one ſide to get out the ſeeds, after which they ſhould be ſoaked two or three days in ſalt and water; when they are taken out of this and drained, boiling vinegar muſt be poured on them in a ſufficient quantity to cover them, and cloſely ſtopped down for two months; then they ſhould be boiled in the vinegar to make them green; but they want no addition of any ſpice, and are the wholeſomeſt and beſt pickle in the world. The tenth pecies is uſed for making what is called cayan butter, or pepper pots, by the inhabitants of America; and in the Eaſt Indies, cayan pepper, and which they eſteem the beſt of all the ſpecies. The following is a receipt for making of a pepper pot. Take of the ripe ſeeds of this ſort of capſicum, and dry them well in the ſun: then put them into an earthen or ſtone pot, mixing flour between every ſtratum of pods; and put them into an oven after the baking of bread, that they may be thoroughly dried: after which they muſt be well cleanſed from the flour; and if any of the ſtalks remain adhering to the pods, they ſhould be taken off, and the pods reduced to a fine powder: to every ounce of this add a pound of wheat flour, and as much leaven as is ſufficient for the quantity intended. After this has been properly mixed and wrought, it ſhould be made into ſmall cakes, and baked in the ſame manner as common cakes of the ſame ſize: then cut them into ſmall parts, and bake them again, that they may be as dry and hard as biſcuit; which being powdered and ſifted, is to be kept for uſe. This preparation is prodigiouſly hot and acrimonious.

CAPSQUARES, in gunnery, ſtrong plates of iron, which cover the trunnions of a gun, and keep it in the carriage.

CAPSTAN, a large maſſy column, ſhaped like a truncated cone and placed perpendicularly on the deck of a ſhip, and turned by levers, or bars, which paſs through holes pierced in its upper extremity; ſerving, by means of a cable which winds round the barrel, to draw up burdens faſtened to the end of the cable. See Naval Architecture.

The word is alſo written *capſtand*, *capſtern*, and even *capſtone*. It is formed from the French *cabeſtan*, which ſignifies the ſame.

The power of the capſtan is reducible to that of the axis in peritrochio.

De Camus conſiders the capſtan as a perpetual lever.

By the capſtan veſſels are drawn aſhore, and hoiſted up to be refitted; anchors weighed, and ſails hoiſted, &c.

There are commonly two capſtans in a ſhip of war; the main capſtan placed behind the main maſt, ſtanding on the firſt deck, and reaching four or five feet above the ſecond: this is alſo called double capſtan, becauſe it has two drum heads, and ſerves two decks for drawing of anchors; and becauſe its force may be doubled by applying hands on each deck. It has bars, whelps, &c. for turning and ſtopping it. See Plate II. Naval Architecture. The jeer capſtan, or little capſtan, ſtands on the ſecond deck, between the main maſt and the mizen: its uſe is, chiefly, to heave upon the jeer rope, or to heave upon the viol, to hold off by when the anchor is weighed; and on other occaſion swhere a leſs force is required than to weigh the anchors, &c.

CAPSULA, in a general ſenſe, is a bag or receptacle.

Capsula, or *Capſule*, among botaniſts, a ſpecies of pericarpium compoſed of dry elaſtic valves, which uſually burſt open at the points: this kind of pericarpium ſometimes contains only one cell or cavity, ſometimes more; in the firſt caſe it is called unilocular; in the ſecond, bilocular, trilocular, &c. according to the number of cells in it for the reception of ſeeds.

Capsulæ *Atrabilariæ*, in anatomy, called alſo *renes ſuccenturiati*, and *glandulæ renales*, are two glands ſituate near the kidneys. See Syſtem of Anatomy, Part V. Sect. II.

CAPTAIN, a military officer, of which there are various degrees, diſtinguiſhed by their commands: as, captain of a company or troop.

In the horſe and foot guards, the captains are ſtyled colonels; being uſually perſons of rank, and general officers of the army. In the colonel's company of a regiment, i. e. the firſt company, or that of which he himſelf is captain, the commanding officer is called captain-lieutenant. The duty of this officer is to keep his company full of able-bodied ſoldiers, to viſit their tents and lodgings, to ſee what is wanting, pay them, cauſe them to keep themſelves neat and clean in their cloaths, and to keep their arms bright. He has power in his own company of making ſerjeants and corporals.

Lieutenant Captain, is he who commands a troop or company in the name or place of ſome other perſon, who has the commiſſion, with the title, honour, and pay thereof; but is diſpenſed withal, on account of his quality, from performing the functions of his poſt.

Thus, the lieutenant colonel, being captain of the firſt company of his regiment, the company is commanded by his deputy, under the title of lieutenant captain. So in England, France, &c. the king, prince, dauphin, &c. have uſually the titles, dignities, &c. of captains of the guards, *gens d'armes*, &c. the real duty of which offices is performed by captains lieutenant.

Captain *of a Ship*, is a ſea officer, of which there are two kinds; the one captain of a ſhip of war, the other of a trading veſſel; though, in propriety, the title captain belongs only to the commanders of ſhips of war.

The captain of a man of war is held equivalent to that of a colonel at land. The captain is accountable for the ſhip, if loſt or taken by his miſconduct; and his province extends to the military government, navigation, and equipment of the ſhip which he commands, and to the conduct of the inferior officers and men, which he is required to ſuperintend and regulate.

In admiral ſhips, and all ſhips of the firſt rate, the French have two captains, two lieutenants, and two enſigns.

The pay of ſea captains, in the Engliſh ſervice, was formerly ſmall, which defect was made up to them by indulging them in many privileges not now allowed, as plundering of prizes, taking convoy monies, and even carrying merchant goods, plate, &c. King James II. taking this laſt privilege away, in lieu thereof granted them an annual allowance of table monies, almoſt equal to their whole former pay. But this not taking place by reaſon of the abdication, king William III. in 1693, ordered the pay of the captains to be doubled, but the fund for this failing at the peace of Ryſwick, a new eſtabliſhment was made in 1700, whereby nearly one third was retrenched from the ſea-pay, and that of a firſt rate fixed at one 1l. of a ſecond rate at 16s. and a third rate 13s. 6d. of a fourth rate at 10s. of a fifth rate at 8s. of a ſixth rate at 6s. per day. See the Article Naval Tactics.

Captain *of a Merchant Ship*, is the maſter thereof; or he who has the command or direction of the ſhip, her crew, lading, &c. This officer is more uſually called the maſter; eſpecially in ſhort voyages.

On the Mediterranean he is called the patron, or patroon; and in long voyages, as the Eaſt Indies, South Sea, &c. the captain.

The proprietor of the veſſel appoints the captain, or maſter; and the captain is to form the crew, and chooſe and hire the pilots, mates, ſeamen, &c. though when the proprietor and maſter reſide on the ſame ſpot, this is uſually done in concert with the proprietor.

Captains *of Port*, in the French marine affairs, officers eſtabliſhed in ſome conſiderable ſea-ports where there are arſenals. To them belong the command of the guard of the place, the watching of the ſea, and the care and cuſtody of the veſſels brought into port.

There are ſuch captains at Toulon, Rochfort, Breſt, Havre, Dunkirk, and Port Lewis. They are to take care of mooring the king's ſhips, and oblige all to give the due ſalutes.

CAPTION, in law, is when a commiſſion is executed, and the commiſſioners names ſubſcribed to a certificate, declaring when and where ſuch commiſſion was executed.

In Scots law, a writ iſſuing under his majeſty's ſignet, in his majeſty's name, obtained at the inſtance of a creditor in a civil debt, commanding meſſengers at arms and other officers of the law to apprehend and impriſon the perſon of the debtor until he pay the debt.

CAPTIVE, a ſlave, or perſon taken by the enemy in war, or by a pirate or corſair.

Formerly captives in war became the ſlaves of thoſe who took them; and though ſlavery, ſuch as obtained among the ancients, be now aboliſhed, ſome ſhadow of it ſtill ſubſiſts in reſpect of priſoners of war, who are reputed the property of their captors, and have no right to liberty, but by conceſſion from them, or till their ranſom is paid. Negro ſervants likewiſe, who are purchaſed when captives, continue in ſome degree the property of the maſters who buy them; though the property conſiſts rather in the perpetual ſervice than in the body or perſon of the captive. Blackſt. Com. Vol. II. p. 402. The intereſts of humanity ſeem at this period to be arouſed in favor of thoſe wretched beings; and we hope a ſhort time will convince the world that the Britiſh empire, deemed the ſeat of liberty, will no longer ſanction a traffic ſo inconſiſtent with the rights of nature, and all ideas of freedom.

The Romans uſed their captives with great ſeverity; their necks were expoſed to the ſoldiers to be trampled on, and their perſons afterwards ſold by public auction.

Captives were frequently burnt in the funeral piles of the ancient warriors, as a ſacrifice to the infernal gods.

Thoſe of royal or noble blood had their heads ſhaven, and their hair ſent to Rome, to ſerve as decorations in female toys, &c.

CAPTURE, a prize taken; particularly that of a ſhip at ſea.

Captures made at ſea were formerly held to be the property of the captors after a poſſeſſion of twenty four hours; but the modern authorities require, that before the property can be changed, the goods muſt have been brought into port, and have continued a night *intra præſidia*, in a place of ſafe cuſtody, ſo that all hope of recovering them was loſt. Blackſt. Com. Vol. II. p. 461. See Prize and Privateer.

Capture alſo denotes an arreſt, or ſeizure of a criminal, debtor, &c. at land.

CAPUCHINS, religious of the order of St. Francis, in its ſtricteſt obſervance. The capuchins are thus called, from *capuce* or *capuchon*, a *ſtuff cap*, or *cawl*, wherewith they cover their heads; and which they added to the ordinary Franciſcan habit.

They are clothed with brown or grey; are always bare-footed; and never go in a coach, nor ever ſhave the head.

The capuchins are a reform made from the order of minors, commonly called cordeliers, ſet on foot in the ſixteenth century by Matthew de Baſſi, a religious obſervant of the monaſtery of Monteſiaſcone, who, being at Rome, ſaid he was advertiſed ſeveral times from Heaven, to practiſe the rule of St. Francis to the letter. Upon this he made application to pope Clement in 1525, who gave him permiſſion to retire into a ſolitude; and not only him, but as many others as would embrace the ſtrict obſervance; which ſome did accordingly. In 1528, they obtained the pope's bull. In 1529, the order was brought into complete form; Matthew was elected general, and the chapter made conſtitutions. In 1543, the right of preaching was taken from the capuchins by the pope; but in 1545, it was reſtored to them again with honour. In 1578, there were ſeventeen general chapters in the order of capuchins.

The capuchins were at firſt reſtrained from ſpreading out of Italy; but Charles IX. of France, writing to pope Gregory XIII. to demand ſome capuchins, that pope, by a bull, dated in 1575, took off the prohibition, and granted them leave to ſettle any where. The cardinal of Lorraine built them a convent at Meudon, and Henry III. another at Paris, in the rue St. Honore. F. Zach. de Boverio has written the annals of the Capuchins in Latin, in three volumes folio, from the year 1524 to 1634.

Capuchin is alſo the name of a particular ſpecies of pigeon, in ſhape and make much like the Jacobine or Jack, but ſomething larger than that; its beak alſo is longer; and it has a tolerable hood of feathers on the back part of its head, but it has no cravat or chain down the ſhoulders as that ſpecies has. Its marks are the ſame with the Jacobine, and it ſeems to be no other than a baſtard breed between that and a common pigeon.

CAPUENA, in ichthyology, the name of a fiſh caught in the American ſeas among the rocks, and about the ſhore, and eſteemed a very delicate one for the table. It is of a long round ſhape: its uſual length is about five inches.

CAPUT *Contuniens*, in anatomy, the name given by Douglas, and ſome others, to a muſcle, deſcribed by Albinus under the name of the *inter tranſverſarius colli*, among ſome others of the ſame nature, which he diſtinguiſhes according to their ſituation into *priores* and *poſteriores*: this being of the former number, Winſlow calls it *tranſverſalis ſecundus anterior*.

Caput *Mortuum*, in chemiſtry, the fæces remaining of any body, after all the volatile and humid parts, as the phlegm, ſpirit, ſalt, &c. have been extracted therefrom, by force of fire. As thoſe fæces, or reſidua, are very different, modern chemiſts ſpecify them more particularly, by adding a term expreſſive of their qualities; as earthy reſiduum, charry or ſaline reſiduum, &c.

What remains after diſtillation is properly called fæces. This, before it be *caput mortuum*, muſt likewiſe have paſſed the retort, or open fire.

The *caput mortuum*, called alſo *terra damnata*, is found in form of a friable, porous matter, without taſte or ſmell: it is ranked among the chemical elements; and ſuppoſed to conſtitute the dry, fixed, earthy, and ſolid part of all mixed bodies. As an element, it is more commonly expreſſed by the name earth.

CARABINE, a ſmall ſort of fire arm, ſhorter than a fuſil, and carrying a bullet of twenty in the pound; borne by the light horſe, hanging at a belt over the left ſhoulder. The carabine is a kind of medium between the piſtol and the muſquet; and bears a near affinity to the harquebuſs, only that its bore is ſmaller.

The barrel is two feet and a half long, and is ſometimes furrowed ſpirally within, which is ſaid to add to the force of the ſhot.

CARABINEERS, a ſort of light horſe, carrying longer carabines than the reſt; and uſed ſometimes as foot, like the dragoons. The French have formed entire corps of theſe carabineers, choſen out of the whole cavalry, and better paid than the reſt. There are but few of them in the Engliſh army.

CARABUS, in entomology, the name of a genus of four-winged flies, belonging to the Linnæan order of coleoptera, whoſe antennæ are oblong, ſlender, and ſetaceous; the thorax is ſomewhat convex, marginated, of a cordated figure, and truncated in the hinder part.

CARACARA, in ornithology, the name of a Braſilian bird of the genus of the hawk. It is properly of the ſparrow hawk kind, but of the ſize of a kite. They are great deſtroyers of the poultry.

CARACOLI, a metal of which the natives of the Caribbee iſlands make a kind of ornament, in form of caracoli, which is called creſcent. The metal is brought from the terra firma; and the common opinion is, that it is compoſed of gold, ſilver, and copper; but the mixture is ſo perfect, that a metal reſults from the whole which never ruſts nor tarniſhes. The Engliſh and French goldſmiths have made frequent attempts to imitate it. Thoſe who have ſucceeded beſt, uſe ſix parts of ſilver, three of purified copper, and one of gold. But the curious find all the imitations much inferior in beauty to the original metal of the ſavages.

CARACT, or **Carat**, a denomination given to the weight, which expreſſes the degree of goodneſs, fineneſs, and perfection, or imperfection of gold.

The word is alſo written *carract*, *carrat*, *karract*, and *karrat*.

Theſe carats are not real determinate weights, but only imaginary. The whole maſs, be the weight what it will, is conceived to be divided into 24 carats; and as many 24th parts as it contains of pure gold, it is called gold of ſo many carats, or ſo many carats fine. Thus, gold of 18 carats is a mixt, of which 18 parts are pure gold, and the other ſix an inferior metal, &c. This is the common way of reckoning in Europe, and at the gold mines in the Spaniſh Weſt Indies, but with ſome variation in the ſubdiviſion of the carat: among us, it is divided into four grains; among the Germans, into 12 parts; and by the French, according to Mr. Hellot, into 32. The Chineſe reckon by a different diviſion called touches, of which the higheſt number, or that which denotes pure gold, is 100; ſo that 100 touches correſpond to our 24 carats, &c.

Caract is alſo a certain weight which goldſmiths and jewellers uſe wherewith to weigh precious ſtones and pearls. This caract weighs four grains, but they are ſomething lighter than the grains of other weights. Each of theſe grains is ſubdi-divided in $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, &c.

CARAGACH, cotton that comes from Smyrna, by the way of Marſeilles.

CARAGROUCH, a ſilver coin of the empire, weighing nine drams, which does not quite amount to a French crown, of three livres Tournois. It goes at Conſtantinople for 120 aſpers.

CARAGUATA is a ſort of thiſtle which grows in Braſil, and in ſome other parts of America. The leaves of this plant being ſteeped in water, and afterwards well waſhed and rubbed, afford a kind of flax very fine and ſtrong, proper for ſeveral manufactures. The Americans make fiſhing nets of it.

CARAITES, a ſect among the antient Jews: of which there are ſtill ſubſiſting in Poland, Ruſſia, Conſtantinople, Cairo, and other places of the Levant; whoſe diſtinguiſhing tenet and practice it is, to adhere cloſely to the words and letter of the Scripture, excluſive of allegories, traditions, and the like. Their tenets are but little known.

Leo of Modena, a rabbin of Venice, obſerves, that of all the hereſies among that people, before the deſtruction of the temple, there is none now left but that of the Carraim, a name derived from Micra, which ſignifies the pure text of the Bible; becauſe of their keeping to the Pentateuch, obſerving it to the letter, and rejecting all interpretations, paraphraſes, and conſtitutions of the rabbins. Aben Ezra, and ſome other rabbins, treat the Caraites as Sadducees; but Leo de Juda calls them, more accurately, Sadducees reformed; becauſe they believe the immortality of the ſoul, paradiſe, bell, reſurrection, &c. which the antient Sadducees denied. He adds, however, that they were doubtleſs originally real Sadducees, and ſprung from among them.

M. Simon, with more probability, ſuppoſes them to have riſen hence; that the more knowing among the Jews oppoſing the dreams and reveries of the rabbins, and uſing the pure text of Scripture, to refute their groundleſs traditions, had the name of Carraim given them; which ſignifies as much as the barbarous Latin, *ſcripturarii*, i. e. people attached to the text of Scripture. The other Jews give them the odious name of Sadducees, from their agreement with thoſe ſectaries on the head of traditions. Scaliger, Voſſius, and Spanheim, rank the Caraites among the Sabeans, Magi, Manichees, and Muſſelmen, but by miſtake: Wolfgang, Fabricius, &c. ſay that the Sadducees and Eſſeni were called Caraites, in oppoſition to the Phariſees: others take them for the doctors of the law ſo often mentioned in the goſpel: but theſe are all conjectures. Joſephus and Philo make no mention of them; which ſhews them to be more modern than either of thoſe authors. In all probability, this ſect was not formed till after the collection of the ſecond part of the Talmud, or the Gemera; perhaps not till after the compiling of the Miſchna in the third century. The Caraites themſelves pretend to be the remains of the ten tribes led captive by Shalmaneſer. Wolfius, from the memoirs of Mardacheus, a Caraite, refers their origin to a maſſacre among the Jewiſh doctors, under Alexander Jannæus, their king, about one hundred years before Chriſt: becauſe Simeon, ſon of Schetach, and the queen's brother, making his eſcape into Egypt, there forged his pretended traditions; and, at his return to Jeruſalem, publiſhed his viſions; interpolating the law after his own fancy, and ſupporting his novelties on the notices which God, he ſaid, had communicated by the mouth of Moſes, whoſe depoſitary he was: he gained many followers: and was oppoſed by others, who maintained, that all which God had revealed to Moſes was written. Hence the Jews became divided into two ſects, the Caraites, and Traditionites: among the firſt, Juda, ſon of Tabbai, diſtinguiſhed himſelf; among the latter Hillel. Wolfius reckons not the Sadducees, but alſo the Scribes, in the number of Caraites. But the addreſs of the Phariſees prevailed againſt them all; and the number of Caraites decreaſed: Anan, indeed, in the eighth century, retrieved their credit a little; and rabbi Schalomon, in the ninth. They ſucceeded pretty well till the fourteenth; but ſince that time they have been declining.

The modern Caraites, Leo of Modena obſerves, have their ſynagogues, and ceremonies; they pretend to be the ſole proper Jews, or obſervers of the laws of Moſes; calling the reſt by the term Rabbanim, or followers of the Rabbins: theſe hate the Caraites mortally; refuſing to ally, or even to converſe with them, and treating them as mamzerim, or baſtards; becauſe of their rejecting the conſtitutions of the rabbins relating to marriages, repudiations, purifications of women, &c. This averſion is ſo great, that if a Caraite would become a rabbiniſt, he would never be received by the other Jews.

The Caraites, however, do not abſolutely reject all kind of traditions; but only ſuch as do not appear well grounded. Selden, who is very expreſs on this point, in his Uxor Hebraica, obſerves, that beſides the mere text, they have certain interpretations, which they call hereditary, and which are proper traditions. Their theology only ſeems to differ from that of the other Jews, in that it is purer, and clearer of ſuperſtition: they give no credit to the explications of the Cabbaliſts, chimerical allegories, nor to any conſtitutions of the Talmud, but what are conformable to the Scripture, and may be drawn from it by juſt and neceſſary conſequences.

Peringer obſerves of the Caraites in Lithuania, that they are very different, both in aſpect, language, and manners, from the rabbiniſts, wherewith that country abounds. Their mother tongue is the Turkiſh; and this they uſe in their ſchools and ſynagogues. In viſage they reſemble the Mahometan Tartars. Their ſynagogues are placed north and ſouth; and the reaſon they give for it, is, that Shalmaneſer, brought them northward: ſo that, in praying, to look to Jeruſalem, they muſt turn to the ſouth. He adds, that they admit all the books of the Old Teſtament; contrary to the opinion of many of the learned, who hold that they reject all the Pentateuch.

Caleb, a Caraite, reduces the difference between them and the rabbiniſt to three points: 1. In that they deny the oral law to come from Moſes, and reject the Cabbala. In that they abhor the Talmud. 3. In that they obſerve the feaſts, as the ſabbath, &c. much more rigorouſly than the rabbins do. To this may be added, that they extend the degrees of affinity, wherein marriage is prohibited, almoſt to infinity. See on this ſubject, Relandi Antiq. Hebræor. part ii. cap. 9. ſect. 12. Trigland. de Secta Karæoram. Beſnage's Hiſt. of the Jews, book ii. chap. 8, 9.

CARANNA, a hard, brittle, reſinous gum, brought from ſome parts of the Weſt Indies, as Carthagena and New Spain; of an aromatic flavour; and ſometimes uſed in medicine as a cephalic.

The Americans make a balm of it, which they pretend to be a ſovereign remedy for the cure of wounds, and hæmorrhoids or piles.

CARAPO, in ichthyology, the name of a fiſh, of which there are two kinds caught in many parts of the lakes of America. The firſt has a long and thin body, of the ſhape of a knife blade, the back being thick, the belly very thin and narrow; the tail is pointed; and the uſual ſize of the fiſh is a foot in length, and two fingers broad in the broadeſt part. The head is flat and pointed, and the lower jaw runs out a little farther than the upper; the mouth is very narrow, and the bottom jaw is furniſhed with very ſmall and ſharp teeth, the upper is toothleſs; its eyes are very ſmall; and it is covered with little ſcales. It is of a brown colour, with a faint admixture of red, and the back and head are ſomewhat blackiſh; there runs a duſky line all along the ſides in their middle, and under this the fiſh is ſpeckled with black ſpots of the ſize of a ſeed of muſtard.

The ſecond kind no way differ from the firſt, but that it is much narrower in proportion to its length, and has no ſpots. They are both eatable.

CARAPOPEBA, the name of a ſmall ſpecies of lizard, common in the Braſils. Its body is of a liver colour, and has ſeveral white ſpots.

CARASSIUS, in itchthyology, the name of a genus of leather mouthed fiſhes of the carp or bream kind, of which there are three ſpecies. It is a ſmall freſh water fiſh, of about three, four, or five inches long, with a flatted body, and a riſing back; it reſembles the bream indeed in ſhape very nearly, but is ſomewhat thicker; its colour is a pale yellow, and its belly of a deeper yellow, without any redneſs. The mouth is ſmall and round; and the eyes ſmall, and ſunk in their orbit.

CARAVAN, or CARAVANNE, in the Eaſt, a troop or company of travellers, merchants, and pilgrims, who for their greater ſecurity march in a body through the deſerts and other dangerous places, infeſted with Arabs and robbers.

The word comes from the Arabic *cairawan*, or *cairoan*; and that from the Perſian *kervan*, or *cârvân*, negotiator, a trader or dealer. Vid. Peritiſ. Itin. Mund. ed. Hyde, p. 61.

There is a chief, or aga, who commands each caravan, and has under him a number of janizaries, or other forces, ſufficient for their defence. The caravans encamp every night near wells, or rivulets known to the guides; and obſerve a diſcipline as regular as in war. They chiefly uſe camels for their vehicles, becauſe of their enduring much fatigue, eating little, and paſſing three or four days without drinking.

The grand ſignior gives one fourth part of the revenue to Egypt, to defray the expence of the caravan that goes yearly to Mecca, to viſit Mahomet's tomb: the devotees, in this caravan, are from forty thouſand to ſeventy thouſand; accompanied with ſoldiers to protect them from the pillage of the Arabs, and followed with eight or nine thouſand camels, laden with all neceſſary proviſions for ſo long a paſſage acroſs deſerts.

There are four regular caravans which go yearly to Mecca; the firſt from Damaſcus, compoſed of the pilgrims from Europe and Aſia; the ſecond from Cairo, for the Mahometans of Barbary; the third from Zibith, a place near the mouth of the Red Sea, where thoſe of Arabia and India meet; the fourth from Babylon, where the Perſians aſſemble. Moſt of the inland commerce in the Eaſt is carried on by caravans. The late czar, Peter the Great, eſtabliſhed a trade between Ruſſia and China by means of a caravan.

In the heavy caravans, to five hundred elephants there are a thouſand dromedaries, and at leaſt two thouſand horſes, eſcorted by four thouſand cavaliers. Two men are required to lead each elephant; five to three dromedaries; and ſeven to twelve camels. Such a number of ſervants, joined with the officers and paſſengers, the number whereof is not limited, renders the body very formidable; the paſſengers indeed are not obliged to fight, but in caſe they refuſe, proviſion will ſcarce be allowed them afterwards, even for their money.

As few of the Arab princes have any other ſubſtance than what they can get by pillage, they keep continually ſpies on foot, to give them intelligence of the departure and motions of caravans, which they frequently attack with ſuperior forces: in caſe of a repulſe they come to an accommodation; but if the caravan be beaten, it is abſolutely plundered, and the whole guard made ſlaves; though more indulgence is ſhewed to ſtrangers. The taking of a ſingle caravan ſometimes enriches a prince for ever.

Any dealer, or merchant, is at liberty to form a company, in order to make a caravan. He, in whoſe name it is raiſed, is conſidered as the caravan-bachi, or chief of the caravan, unleſs he appoint ſome other in his place. If there be ſeveral merchants equally concerned, they elect a caravan-bachi; after which they appoint officers to conduct the cavavan, and decide all controverſies which may ariſe during the journey.

Heavy CARAVANS are compoſed of elephants, dromedaries, camels, and horſes.

CARAVANSERA, or KARAVANSERA, a place appointed for receiving and loading the caravans.

It is commonly a large ſquare building, in the middle of which there is a very ſpacious court; and under the arches or piazzas that ſurround it there runs a bank, raiſed ſome feet above the ground, where the merchants, and thoſe who travel with them in any capacity, take up their lodgings as well as they can; the beaſts of burden being tied to the foot of the bank. Over the gates, that lead into the court, there are ſometimes little rooms, which the keepers of the caravanſeras let out at a very high price to ſuch as have a mind to be private.

The caravanſeras in the Eaſt are ſomething of the nature of the inns in Europe; only that you meet with little accommodation either for man or beaſt, but are obliged to carry almoſt every thing with you: there is never a caravanſera without a well, or ſpring of water. Theſe buildings are chiefly owing to the charity of the Mahometans; they are eſteemed ſacred dwellings, where it is not permitted to inſult any perſon, or to pillage any of the effects that are depoſited there.

CARAVANSERASKIER, the director, ſteward, or intendant of a caravanſera.

CARAVEL; thus they call a ſmall veſſel on the coaſt of France, which goes to fiſh for herring on the banks. They are commonly from twenty-five to thirty tons burden. Thoſe which are deſigned for the ſame fiſhery in the Britiſh channel, are called by the French *trinquarts:* theſe are from ten to twelve tons burden.

CARAUNA, in ichthyology, the name of a ſmall Braſilian fiſh, in many reſpects approaching to the turdus kind. Its colour is a fine bright red, all over ſpotted with very ſmall black ſpots.

CARAWAY, carum, in botany, a genus of the digynia order, belonging to the pentandria claſs of plants.

Species, &c. 1. The caraway of the ſhops grows naturally in many places of Britain. It is a biennial plant, which riſes from ſeeds one year, flowers the next, and periſhes ſoon after the ſeeds are ripe. From the root ariſes one or two ſmooth, ſolid, channelled ſtalks, about two feet high, garniſhed with winged leaves, having long naked foot-ſtalks. 2. The hiſpanicum is alſo a biennial, and is a native of Spain. It riſes with a ſtronger ſtalk than the former, which ſeldom grows more than a foot and half high; but is cloſely garniſhed with fine narrow leaves like thoſe of dill. Both theſe plants are propagated by ſeeds, which ought to be ſown in ſpring. Parkinſon ſays, the young roots of caraway are better eating than parſneps. The ſeeds have an aromatic ſmell, and a warm pungent taſte. They are diſtilled with ſpirituous liquors, for the ſake of the flavour they afford.

The common caraway, whoſe ſeed is uſed both medicinally and in the kitchen, grows naturally in ſome of the rich meadows in Lincolnſhire and Yorkſhire, and is ſometimes found in paſtures near London.

It is one of the greater hot ſeeds, and is eſteemed ſtomachic, and diuretic; it diſpels wind, and ſtrengthens digeſtion, &c. The Engliſh and Germans make great uſe of it; particularly in biſcuits, comfits, ſeed cakes, and other foods, and confections.

CARBENSIS *Aqua*, in the materia medica, the name of a mineral water of Germany, of which Hoffman from Petzlerns has given the following account. All about the place of its origin, and along the canals through which it paſſes, it depoſits an earthy and ferruginous matter, which concretes into a ſtony hardneſs. When any alcaline liquor, whether fixed or volatile, is added to theſe waters, they become turbid, and precipitate a whitiſh earthy matter to the bottom of the veſſel; after the evaporation of the water they leave a ſal enixum, and an alcaline earth; two quarts of them yield two ſcruples and ten grains of the earth, and twelve grains of the ſalt. If it be kept for any time in a glaſs, or earthen veſſel, it depoſits a ſediment of a yellow ochreous earthy matter, and when immediately taken from the ſpring, it changes to a bluiſh brown colour, on being mixed with galls. It contains a very large portion of a ſubtile mineral ſpirit; for if a long necked veſſel be filled half full with it, and the orifice ſtopped with the thumb, the whole, on a little ſhaking, ſends up a froth to the top; and when the thumb is taken off, the water ſquirts out to ſeveral feet diſtance. It makes an efferveſcence on mixing oil of vitriol with it; but this laſts but a very little time. From the whole, it ſeems to contain a large quantity of calcareous earth, and ſome ſmall portion of ferruginous matter; whence it purges both by ſtool and urine, though moſtly the latter way: the former operation, which is pretty conſtant, is owing to this alcaline earth meeting with an acid in the prima via, and being by it changed into a bitter purging ſalt, of the nature of Glauber's.

CARBONADE, or CARBONADO, in cookery, fleſh, fowl, or the like, ſeaſoned, and broiled on the coals.

CARBUNCLE, in medicine, is a malignant tumor, generally accompanying the plague, ariſing ſometimes on one part, and ſometimes on another: together with a painful heat, mortification, lividneſs, and at laſt a blackneſs of the part. It is alſo a term in heraldry; ſee that Syſtem.

CARCAPOU, in tetrapodology, a ſpecies of quadrupeds in North America; ſmall, but very ſtrong and furious.

CARCAPULI, in botany, the Indian yellow orange of Malabar. This is a tall ſpreading tree; the trunk as much in compaſs two men can encircle with their arms.

This fruit, according to Acoſta, as to ſize and ſhape, is like a quince with the rind taken off, and conſiſts in like manner of grumous parts, but not ſeparable, as in the quince; it is covered with a thin, light, and ſhining rind. It is dried, and exported from Malabar to other countries.

It is commonly eaten, and the inhabitants commend it much for medicinal uſes.

CARCASE, the corpſe, or body, of a dead animal. Thus, we ſay, the carcaſes of the ſoldiers, horſes, &c. were ſeen long afterwards on the field of battle.

CARCASE, in architecture, is the ſhell, or ribs of a houſe; containing the partitions, floors, rafters, &c. In war, a kind of bomb, either oblong, oval, or circular; conſiſting of a ſhell, or caſe, ſometimes of iron, with holes; but more commonly of a coarſe ſtrong canvaſs, pitched over, and girt with iron hoops; filled with combuſtible matters, as hand granadoes, ends of muſkets, loaded piſtols, and preparations of gunpowder, &c. Its uſe is to be thrown out of a mortar, to ſet houſes on fire, and do other execution.

CARCINUM *Opalinum*. a new genus of marine animal, diſcovered by Mr. Banks and Dr. Solander, in their paſſage to Madeira, which ſhone in the water with colours that exceeded in variety and brightneſs any thing they had ever ſeen. The beautiful colouring and ſplendour of theſe animals were equal to thoſe of an opal; and from their reſemblance to that gem, they gave this denomination to the genus. One of them lived ſeveral hours in a glaſs of ſalt water, ſwimming about with great agility, and diſplaying at every motion a change of colours almoſt infinitely various.

They are of an angular figure, about three inches long, and one thick, with a hollow paſſing quite through it, and a brown ſpot at one end, which they conjectured to be its ſtomach; four of theſe adhered together by their ſides, when they were taken, and were thought at firſt to be one animal; but on being put into a glaſs of water they ſoon ſeparated, and ſwam about briſkly. Several ſpecimens of them were taken, adhering together, ſometimes to the length of a yard or more.

CARD, among artificers, an inſtrument conſiſting of a block of wood, beſet with ſharp teeth, ſerving to arrange the hairs of wool, flax, hem, and the like: there are different kinds of them, as hand cards, ſtock cards, &c.

CARDS, little pieces of thin paſteboard, of an oblong figure.

The moulds and blocks for making cards are exactly like thoſe that were uſed for the firſt printed books. They lay a ſheet of wet or moiſt paper on the block, which is firſt ſlightly done over with a ſort of ink made of lamp black diluted in water, and mixed with ſome ſtarch to give it a body. They afterwards rub it off with a round liſt. The court cards are coloured by means of ſeveral patterns, ſtyled ſtane files. Theſe conſiſt of papers cut through with a penknife; and theſe apertures, they apply ſeverally the various colours, as red, black, &c. Theſe patterns are painted with oil colours, that the bruſhes may not wear them out; and when the pattern is laid on the paſteboard, they ſlightly paſs over it a bruſh full of colour, which, leaving it within the openings, forms the face or figure of the card.

Among ſharpers, divers ſorts of falſe and fraudulent cards are contrived.

Cards were invented about the year 1390, to divert Charles VI. of France, who had fallen into a melancholy diſpoſition. The inventor propoſed, by the figures of the four ſuits or colours, as the French call them, to repreſent the four claſſes of men in the kingdom. For a deſcription of games on cards. See the various HEADS.

CARDAMINE, in botany, a genus of the tetradynamia ſiliquoſa claſs: lady's ſmock. There are ten ſpecies. This plant is alſo known by the name of cuckow flower, and meadow creſſes. It is a kind of naſturtium, and is pungent and diſcuſſive; but is not uſed either in compoſition, or common preſcription. Dr. Baker recommends it to the trial of phyſicians as an antiſpaſmodic remedy, in the Medical Tranſact. Vol. I. p. 442.

CARDAMUM, or CARDAMON, medicinal ſeeds of the aromatic kind, and uſed in the compoſition of Venice treacle, and many other medicines. Their pungency and aromatic ſmell are cauſed by an eſſential oil.

CARDIA, in concology, a genus of ſhell-fiſh, the ſhell of which is formed of two ovals, and reſembles the figure of a hart at cards: the valves are equal and gibboſe. Of this genus were ſeveral ſpecies; under it are comprehended the cockles, ark ſhells, &c. together with the pectines inauriti, or ſcallops without ears.

CARDIALGIA, Cardialgy, in medicine, a violent ſenſation of heat, or acrimony, attended with a conſtrictory pain, felt towards the upper or left orifice of the ſtomach, though ſeemingly at the heart; ſometimes accompanied with palpitations of the heart, fainting, and a propenſion to vomit: better known by the name of cardiac paſſion, or heart-burn.

CARDINAL, in a general ſenſe, an appellation given to things on account of their pre-eminence; thus we ſay cardinal virtues, &c. Cardinal Signs in the zodiac, are, Aries, Libra, Cancer and Capricorn. Cardinal Points, in coſmography, are the eaſt, weſt, north, and ſouth.

Cardinal, an eccleſiaſtical prince in the Romiſh church, being one who has a voice in the conclave at the election of a pope. The cardinals were originally no more than deacons, to whom was intruſted the care of diſtributing the alms to the poor in the ſeveral quarters of Rome: and as they held aſſemblies of the poor in certain churches of their ſeveral diſtricts, they took the title of theſe churches. They began to be called cardinals in the year 300, during the pontificate of St. Sylveſter, by which appellation was meant the chief prieſts of a pariſh, and next in dignity to a biſhop. This office grew more conſiderable afterwards, and by ſmall degrees arrived at its preſent height, in which it is the reward of ſuch as have ſerved his holineſs well, even princes thinking it no diminution of their honour to become members of the college of cardinals.

At the creation of a new cardinal, the pope performs the ceremony of opening and ſhutting his mouth, which is done in a private conſiſtory. The ſhutting his mouth implies the depriving him of the liberty of giving his opinion in congregations; and the opening his mouth, which is performed 15 days after, ſignifies the taking off this reſtraint. However, if the pope happens to die during the time a cardinal's mouth is ſhut, he can neither give his voice in the election of a new pope, nor be himſelf advanced to that dignity.

The cardinals are divided into ſix orders or claſſes, conſiſting of ſix biſhops, 50 prieſts, and 14 deacons, making in all 70; which conſtitute the ſacred college.

The privileges of cardinals are very great. They have an abſolute power in the church during the vacancy of the holy ſee: they have a right to elect the new pope, and are the only perſons on whom the election can fall. The dreſs of a cardinal is a red ſoutanne, a rocket, a ſhort purple mantle, and the red hat.

CARDIOSPERMUM, in botany, the name by which Linnæus calls that genus of plants, named corindum, by Tournefort and other authors.

CARDIUM, in vermiology, a genus of worms in the Linnæan ſyſtem, belonging to the order of teſtacea.

CARDUELIS, in ornithology, a well known bird, called in Engliſh the goldfinch.

CARDUUS, the thiſtle; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants. Of this genus there are 26 ſpecies, ten of which are natives of Britain. To extirpate this weed, ſee Syſtem of Agriculture, Sect. XXIX.

CAREENING, in the ſea language, the bringing a ſhip to lie down on one ſide, in order to trim and caulk the other ſide.

A ſhip is ſaid to be brought to the careen, when, the moſt of her lading being taken out, ſhe is hulled down on one ſide, by a ſmall veſſel, as low as neceſſary; and there kept by the weight of the ballaſt, ordnance, &c. as well as by ropes, leſt her maſts ſhould be ſtrained too much; in order that her ſides and bottom may be trimmed, ſeams caulked, or any thing that is faulty under water mended. Hence when a ſhip lies on one ſide when ſhe ſails, ſhe is ſaid to ſail on the careen.

Ships of war are generally careened every three years. The half careen is when they can only careen half the ſhip; not being able to reach ſo low as the bottom of the keel. This ſhould be done with great caution, as ſhips are ſometimes loſt in careening, which was the occaſion of that unfortunate circumſtance the loſs of the Royal George at Portſmouth.

CAREER, in falconry, is a flight or tour of the bird, about one hundred and twenty yards.

CARET, in grammar, a character marked thus ʌ, ſignifying that ſomething is added on the margin, or interlined, which ought to come in where the caret ſtands.

CAREX, in botany, a word uſed by Linnæus as the name of a genus of plants, of the monoecia triandria claſs: comprehending thoſe called cyperoides by Tournefort and others, and the ſcirpoides of other authors.

The characters of the genus are theſe: it produces male and female flowers, in moſt ſpecies, on the ſame plant; the male flowers are digeſted into a long ſpike; the cup is an oblong and imbricated omentum, conſiſting of acute, hollow, and lanceolated ſcales, each containing one flower; there is no corolla; the ſtamina are three erect, ſetaceous filaments, of the length of the cup; the antheræ are oblong, and not pendulous, but erect.

In the female flowers the cup is the ſame as in the male; there are no petals, but there is an inflated oblong nectarium; the germen is three-ſquare, and is placed within the nectarium; the ſtyle is very ſhort; the ſtigmata are ſometimes three, ſometimes but two; they are long, crooked, pointed, and hoary. The nectarium grows larger when the flower is fallen, and contains the ſeed in it; the ſeed is ſingle, of an acute, and ſomewhat oval form, three-cornered, and has one of its angles uſually much ſmaller than the others. There are thirty-eight ſpecies.

CARDAGORS, a name given by the Dutch to a kind of brokers who make it their ſole buſineſs to find freight for ſhips which want loading, and veſſels for merchants or paſſengers who want conveyance to ſuch or ſuch a place.

CARGO, the lading or freight of a ſhip.

Sortable **Cargo**, is that which contains ſomething of every ſort neceſſary to furniſh the tradeſmen of the place it is ſent to, with parcels fit to fill their ſhops, and invite their cuſtomers.

Officers and ſailors on board a veſſel are allowed to carry a ſmall cargo or pacotille, not exceeding a certain bulk or weight, for their own account, without paying any freight.

Cargo is ſometimes alſo uſed for an invoice of the goods wherewith a ſhip is laden.

CARIAMA, in ornithology, the name of a Braſilian bird of the ſize of the heron, and, like that bird, frequenting watery places. It makes a loud noiſe like the turky, and is a very valuable and well taſted fowl.

CARICA, the papaw; a genus of the decandria order, belonging to the diœcia claſs of plants.

Species. 1. The papaya riſes with a thick, ſoft, herbaceous ſtem, to the height of 18 or 20 feet, naked till within two or three feet of the top. The leaves come out on every ſide, upon very long footſtalks.

2. The proſopoſa, differs from the other in having a branching ſtalk, the lobes of the leaves entire, the flower of a roſe colour, and the fruit ſhaped like a pear.

Theſe plants being natives of hot countries, cannot be preſerved in Britain, unleſs conſtantly kept in a warm ſtove, which ſhould be of a proper height to contain them.

CARICATURA, in painting, exaggerating the defects of an object repreſented, with a concealment of the beauties or advantages of it; yet ſo as ſtill to preſerve a reſemblance.

The word is Italian, formed of *carica*, a load, burden, or the like.

CARICOUS, or Carycous *Tumor*, a ſwelling reſembling the figure of a fig; ſuch as are frequently found in the piles.

CARICUM, in pharmacy, a catharectic medicine, which deterges ſordid ulcers, and eats away proud fleſh.

It is prepared of black hellebore, ſandarach, ſquama æris, waſhed lead, ſulphur, orpiment, and cantharides: theſe being mixed, are made up with oil of cedar into a liquid medicine. Sometimes there is added arum, in decoction or juice, or the powder of it mixed with honey. The dry medicine, or powder, for the ſame purpoſe, is prepared of the ſame ingredients, omitting the oil of cedar, and the honey: it is alſo made of black hellebore, and ſandarach only.

CARIES, in medicine, a ſolution of continuity in a bone, attended with a waſte of its ſubſtance, occaſioned by ſome acrimonious matter corroding it.

The caries is a kind of rottenneſs, or putrefaction, peculiar to the hard, or bony parts of the body; anſwering to a gangrene or mortification in the ſoft, or fleſhy part; or according to others, to an abſceſs, or ulcer.

Caries ariſe either from a conſtant afflux of viſcous humours, or from their extreme acrimony; or from a bruiſe, compound fracture, luxation, ulcer, venereal diſorder, corroſive medicines, or from their being ſtripped or laid bare of their fleſh, and long expoſed to the air, &c. This diſorder, if not quickly remedied, ſpreads and communicates itſelf to the neighbouring parts of the bone, and makes the ſame progreſs that ulcers do in the ſofter parts.

There are ſeveral ſpecies of caries in the bones. The learned Dr. Monro, mentions ſeven, which he has ſeen. Theſe he diſtinguiſhes by the appellations of, 1. The dry or gangrenous caries. 2. The worm-eaten caries, or ulcer of the bones. 3. The carnous caries, or ulcer of the bones with hyperſarcoſis. 4. The phagedenic caries, with hyperſarcoſis. 5. The ſcrophulous caries. 6. The ſcirrho-cancrous caries. 7. The ſpreading cancrous caries.

He enters into a curious detail of the ſeveral natures of theſe kinds of caries, and of the topical management. A ſpeedy and ſafe ſeparation of all the corrupted part is the principal indication to be purſued. See Medic. Eſſ. Edinb. vol. v. art. 24. Abridg. vol. ii. p. 150, ſeq. where he ſhews the analogy between theſe diſeaſes of the bones to thoſe of other parts of the body. This is not ſurpriſing, ſince bones have the ſame general texture, and are only diſtinguiſhed from other parts by a greater ſolidity or firmneſs.

A caries differs from a ſpina ventoſa, in that the latter begins within the ſubſtance of the bone, and proceeds outward; whereas the former begins on the ſurface, and proceeds inward.

Caries are divided into idiopathic and ſymptomatic.

Anatomiſts, in diſſecting of bodies, frequently find carious bones; particularly thoſe of the jaws, legs, &c. where nothing of that kind was ſuſpected during the perſon's life-time; nor any diſorder felt therefrom. Mr. Cheſelden conjectures, that the cure of a carious bone might be directly attempted, without waiting, as our ſurgeons uſually do, for an exfoliation.

CARILLONS, muſical chimes on bells and clock work.

CARIPI, a kind of cavalry in the Turkiſh army. The caripi, to the number of about 1000, are not ſlaves, nor bred up in ſeraglios or ſeminaries, like the reſt: but are generally Moors, or renegado Chriſtians, who having followed adventures, and being poor, and having their fortune to ſeek, by their dexterity and courage have arrived at the rank of horſe-guards to the grand ſignior. They march with the Ulufagi on the left hand, behind him: their pay is twelve aſpers per day.

CARLIN, Carline, or Caroline, a ſmall ſilver coin, current in Naples and Sicily, equivalent to about four pence Engliſh.

CARLINA, or Carolina, a plant of the thiſtle kind, of the polygamia æqualis order, belonging to the ſyngeneſia claſs. There are ſeven ſpecies, one is a native of Britain, i. e. the vulgaris; the others of Italy; but may be propagated in this country.

CARLINES, or Carlings, in a ſhip, two pieces of timber lying fore and aft, along from one beam to another, directly over the keel; ſerving as a foundation for the whole body of the ſhip. On theſe the ledges reſt, whereon the planks of the deck and other matters of carpentry, are made faſt.

CARLOCK, a ſort of fiſh glue, or iſinglaſs, imported from Archangel. It is made with the ſturgeon's bladder; and is uſed for clarifying beer, and wine, as alſo in dying. The beſt comes from Aſtracan, a city in Muſcovy, at the mouth of the river Wolga, where they catch great quantities of ſturgeon.

CARMELITES, a religious order, making one of the four tribes of mendicants or begging friars; and taking its name from mount Carmel, formerly inhabited by Elias, Eliſha, and the children of the prophets; from whom this order pretends to deſcend in an uninterrupted ſucceſſion.

The habit of the Carmelites was at firſt white, and the cloak laced at the bottom with ſeveral liſts. But pope Honorius IV. commanded them to change it for that of the Minims. Their ſcapulary is a ſmall woollen habit of a brown colour, thrown over their ſhoulders. They wear no linen ſhirts; but inſtead of them linſey-wolſey, which they change twice a week in the ſummer, and once a week in the winter.

If a monk of this order lies with a woman, he is prohibited ſaying maſs for three or four years, is declared infamous, and obliged to diſcipline himſelf publicly once a week. If he is again guilty of the ſame fault, his penance is doubled; and if a third time, he is expelled the order.

The Carmelites came into England in the year 1240, and erected a great number of monaſteries. Their firſt houſes were at Alnwick in Northumberland, and Ailesford in Kent. In England and Wales they had about forty houſes. This order is eminent for the devotion of the ſcapulary, for its miſſions, and for the great number of ſaints with which it has ſtocked the Romiſh church. In the laſt century, there were four canonizations in this order, viz. of S. Thoreſa, S. Andrew Corſin, S. Mag. de Pazzi, and S. J. de la Croix.

CARMEN, an ancient term among the Latins, uſed, in a general ſenſe, to ſignify a verſe; but in a more peculiar ſenſe, to ſignify a ſpell, charm, or cure of a diſeaſe, without any application. We have had of late, many of theſe pretenders in England, who have undertook to cure patients by animal magnetiſm; we have at this preſent time a celebrated artiſt, Mr. Lutherburg, who has deſerted his pencil, and is ſaid to have done wonderful cures; but with what truth, we muſt leave thoſe to aſſert whoſe credulity has been ſufficiently operated on as to fancy they have been relieved by his magic ſecret; however, this we know for a fact, that he has upwards of two hundred patients in a morning who attend him. It is not to be wondered, that men of this deſcription ſhould have a number of advocates; for admitting they have only 150 patients every day, and in the courſe of each day only five get well out of the 150, they immediately aſcribe their cure to the charm of theſe pretenders, though, in fact, nature does the buſineſs. Therefore, that ſuch men ſhould have a number of people to ſpread their fame is not in the leaſt ſurprizing; we could relate many wonderful circumſtances relative to this aſtoniſhing man, exceeding thoſe exhibited by Katterfelto; but as it is the plan of the Royal Encyclopædia to omit all uſeleſs narration, we ſhall ſay no more on the ſubject.

CARMENTALIA, a feaſt among the old Romans, celebrated annually on the 11th of January, in honour of Carmenta, or Carmentis, a propheteſs of Arcadia, mother of Evander, with whom ſhe came into Italy, ſixty years before the Trojan war.

The ſolemnity was alſo repeated on the 15th of January, which is marked in the old calendar by *carmentalia relata*.

CARMINATIVES, in medicine, are remedies, whether ſimple or compound, uſed in colics, and other flatulent diſtempers, to diſpel the wind.

The four carminative flowers are thoſe of camomile, melilot, motherwort, and dill: beſide angelica, fennel, mint, lovage, aniſe, caraway, coriander, cummin, &c. which all agree in their carminative qualities; and are therefore uſed in compoſitions of that intention.

CARMINE, a bright red or crimſon colour, bordering ſomewhat on purple, uſed by painters in miniature; and ſometimes by painters in oil, though rarely by reaſon of its exceſſive price, and becauſe it will not mix with oil, ſo to have the due effect in this kind of painting.

CARNATIONS, in botany. Theſe flowers are propagated two ways, the one by ſeed, the other by layers; the firſt of theſe methods is the way to raiſe new flowers, the other is the way to preſerve and multiply thoſe of former years.

To raiſe ſeedlings, great care muſt be taken to procure good ſeed.

When they are in the flower the fineſt kinds ſhould be marked, and all the layers that can be, ſhould, during the time of their flowering, be laid down from them: toward the latter end of Auguſt theſe will have taken root, and they are then to be taken off, and planted out into pots, two in each pot. The method of laying them is this. Slip off the leaves from the lower part of the ſhoot intended to be laid, and cut a ſlit in one of the middle joints, and cut off the tops of the leaves, and cut out the ſwelling part of the joint, where the ſlit is made; then raiſe the earth about the place a little, and bend down the ſlit part of the joint into it, keeping the top upright, and faſten it in its place by a hooked ſtick, ſtuck into the ground over it, and cover it with the earth; then give it a gentle watering, as often as is neceſſary, and in ſix weeks the layers will have taken ſo much root as to be ready to tranſplant.

They require ſhelter in the winter ſeaſon; in the middle of February they may be tranſplanted into the pots or borders they are to flower in: theſe in April ſhould be ſet out upon a ſtage of boards, open to the ſouth eaſt, but defended from the weſt winds, and not too near trees, walls, or buildings, where they are to bloſſom.

CARNEDDE, in Britiſh antiquity, are heaps of ſtone ſuppoſed to be druidical remains, and thrown together on occaſion of confirming and commemorating a covenant. They are very common in the iſle of Angleſey: and were alſo uſed as ſepulchral monuments, in the manner of tumuli: for Mr. Rowland found a curious urn in one of theſe carnedde. Whence it may be inferred, that the Britons had the cuſtom of throwing ſtones on the deceaſed. From this cuſtom is derived the Welſh proverb, *Karn ardyben*, ill betide thee. Rowland's Mona Antiqua Reſtaurata.

Stonehenge is the moſt conſpicuous temple for Druidical worſhip now remaining in Britain, and, as we verily believe, (to uſe the expreſſion) the archiepiſcopal ſeat of that worſhip, conſiſts of the remains of two circular and two oval ranges of rough ſtones, having one common center. The outer circle is 108 feet in diameter, and, when perfect, conſiſted of thirty upright ſtones, ſeventeen of which are ſtill ſtanding, and ſeven more lying on the ground, ſome whole, and others broken. The upright ſtones are from 18 to 20 feet high, from ſix to ſeven feet broad, and about three feet thick, placed about three feet from each other. At the top they are joined by impoſts, with tenons fitted to mortiſes for keeping them in due poſition.

The upright ſtones are wrought with a chiſſel, and tapered towards the top, but the impoſts are plain, having no ſort of decorations. The inner circle is about eight feet from the outward one, and conſiſted originally of forty ſtones, of which there are about nineteen left, eight of which are fallen down, and the remaining eleven ſtanding. Between theſe two circles is a walk of about three hundred feet in circumference, and from which the temple being viewed, it has a moſt ſurprizing and awful effect on the ſpectator.

The name (Stonehenge) being purely Saxon, has occaſioned many diſputes among the learned; but although the famous Inigo Jones has endeavoured to prove it to be a Daniſh monument, yet that aſſertion of his only remains a proof that he was utterly unacquainted with hiſtory, a fault too common among thoſe who have made great proficiency in other ſciences. Others have as ignorantly ſuppoſed that it was erected by Ambroſius Aurelius the famous Britiſh commander, when the Saxons firſt invaded this iſland; but thoſe who are acquainted with the circumſtances under which that hero laboured, and the religion of which he was a zealous profeſſor, will not heſitate one moment in declaring this notion to be ſuch a miſtake as has no foundation in the nature or reaſon of things, nor even corroborated by oral tradition.

Dr. Stukely, whoſe great knowledge in antiquities will hardly be queſtioned, tells us, that it was called by the antient Britons, Choir-gaur, which he imagines muſt ſignify the great church; but with all deference to the opinion of that great man, we muſt beg leave to obſerve, that there is no ſuch word as Choir in the antient Britiſh language, although it might have been given to this monument by the Romans, and from them adapted by the natives towards the decline of the empire.

During the barbarous times of Monkiſh ignorance, it was called Chorea Gigantum, or the Giants Dance, but this was only one of their idle dreams to impoſe on the credulity of their votaries.

There is no doubt, but we may ſafely aſſert, without hazarding a conjecture, that it was erected long before the antient inhabitants entered into a correſpondence or commerce with either the Phœnicians or Belgians, and probably about the time they began to join human inventions to the ſimplicity of patriarchal worſhip and government.

In the reign of Henry VIII. ſome labourers digging near the place, found a plate of ſolid tin, which Dr. Stukely ſuppoſes, from there being ſome engraved characters upon it, the time when it was erected might be aſcertained, as well as the purpoſe for which it was firſt deſigned. But in this we think the doctor miſtaken, for had the characters been Britiſh, and as antient as the ſtructure itſelf, it would have contradicted what we are told by Cæſar, Tacitus, and all the other Roman writers, that the Britons did not know the uſe of letters, and that the accounts of their different atchievements were conveyed to poſterity by tradition.

The whole that we are able to learn concerning this famous plate is, that the labourers who diſcovered it ſaw ſome rude characters engraven on it, and, not knowing its value, threw it away as of no manner of uſe. Poſſibly it was not, and we are firmly perſuaded that, if the tablet had any characters engraven on it, they were either Phœnician hieroglyphics, or, which is far more probable, Gothic letters, and depoſited in the place in memory either of ſome perſon or event, which has not been tranſmitted to us by hiſtory.

Such is our opinion of the famous tablet, and we leave the reader to form what notion he pleaſes, only that according to all the accounts we have heard, it is now irrecoverably loſt.

The temple is encloſed by a deep trench, near 30 feet broad, and about 100 feet from the center circle. It has three entrances over this trench, one of which is apparently the moſt conſiderable, and, if we may be allowed the expreſſion, the portico faces the north-eaſt. The number of ſtones of which this antient temple is compoſed, is about 140; and being of an enormous ſize, many wild conjectures have been formed in what manner they were brought here, and placed in their preſent poſition, as the adjoining plain has not any quarries, nor (as we are told) was the uſe of geometrical machines known among the antient inhabitants of Britain.

Some have conſidered them to be a compoſition of what is now called artificial ſtone; but this conjecture is ſo wild and extravagant, that it only requires ocular demonſtration to diſprove it. Others (particularly Dr. Stukely) have imagined, with more reaſon, that the antients were acquainted with the mechanical powers, and that theſe ſtones were brought from Anbury near Marlborough.

It is beyond a doubt that the Druids were not ignorant of geometry, but as for the ſtones being brought from Anbury, we muſt differ in opinion with that learned gentleman, becauſe, upon the moſt critical examination of the nature and texture of the Anbury quarries, and comparing the ſtones with thoſe of this temple, there is a very material difference, the former being extremely hard, and thoſe of the latter reſembling Purbeck marble; nay, while we were on the ſpot, a learned gentleman ſcraped ſome part of one, when it appeared to be of the ſame nature, and; as he ſaid, there was not the leaſt doubt but the ſtones had been originally brought from that peninſula by machines conſtructed for that purpoſe, although the knowledge of that valuable art might have been loſt long before the arrival of Julius Cæſar in this iſland.

Stones of as great a magnitude were raiſed for the building of Solomon's temple on mount Moriah; and if the people of the Eaſt were acquainted with geometry, there is no doubt but the inhabitants of the weſtern parts were ſo likewiſe; eſpecially as we may reaſonably conclude they both derived their knowledge from the ſame original fountain.

Dr. Stukely imagines, indeed, that the Tyrians, Phœnicians, or, as they are called in the Paraleponeam, Philiſtines, inſtructed the Druids how to raiſe thoſe ſtones, and place them in their preſent poſitions. But had he conſidered that the Tyrians only came into this iſland for the purpoſes of commerce, and that their ſtay muſt have been no longer than what was neceſſary to purchaſe the goods they came for, he would have been ſatisfied in his own mind that they had no time to convey the knowledge of the ſciences. But there is a ſtronger argument againſt the doctor's opinion, namely, the preſent practice of all the commercial ſtates of Europe.

There is no doubt but many of our readers are well acquainted with the trade carried on in the Eaſt Indies, on the coaſt of Guinea, to Hudſon's Bay, and many other parts of the habitable world. But do we uſe any means whatever to make thoſe people acquainted with the arts and ſciences? No; thoſe who are intent on promoting commerce have ſeldom any views beyond that of intereſt; and as avarice is the predominant principle, ſo they imagine, that were thoſe people with whom they correſpond, and from whom they obtain their affluence, once made acquainted with the uſeful, or polite arts, they would know their own importance, and, as rational creatures, enjoy thoſe advantages to which they are entitled with the reſt of mankind.

For ſome diſtance round this famous monument are great numbers of ſepulchres, or as they are called barrows, being covered with earth, and raiſed in the form of a bell. They extend to a conſiderable diſtance from the temple, but they are ſo placed as to be all in view of it. Such as have been opened were found to contain either human ſkeletons, or aſhes of burnt bones, together with warlike inſtruments, and ſuch other things as the deceaſed uſed when alive.

In one of them, opened in 1723 by Dr. Stukely, was an urn, containing aſhes, ſome bones, and other matters, which had reſiſted the violence of the fire, and by the collar bone, and one of the jaw bones which were ſtill entire, it was judged that the perſon buried muſt have been about fourteen years old, and there being ſeveral female trinkets, the doctor ſuppoſed it was a girl. There was alſo in the grave the head of a javelin, which induced the ſame learned gentleman to conclude that the female had been an heroine. The trinkets conſiſted of a great number of glaſs and amber beads of different ſhapes, ſizes, and colours, together with a ſharp bodkin, round at one end, and pointed at the other.

In others of thoſe ſepulchres the doctor found human bones, together with thoſe of horſes, deer, dogs, and other animals, and in one was a braſs ſword, together with one of thoſe antient inſtruments called a celt, ſuppoſed to have been uſed by the Druids in cutting off the miſletoe from the oak.

Among other curioſities dug up in one of the barrows was a curious piece of ſculpture in alabaſter, of an oval form about two feet in length, and one in the broadeſt part of the diameter. In the middle is repreſented a woman, habited as a queen, with her globe, ſceptre, crown, and mantle of ſtate: in a compartment over her head are three figures, ſuppoſed to repreſent the three perſons of the Holy Trinity; and round the ſides are angels intermixed with ſome of the apoſtles. The exquiſite workmanſhip of the woman, who ſeems intended for the Virgin Mary; the ſtrong, as well as tender expreſſion in her features, and the elegance of the drapery, ſhew it to be the work of a very ſkilful artiſt. This curioſity was ſeen by the perſon who deſcribes it, in a publick houſe at a ſmall village called Shrawton, about ſix miles to the north weſt of Stonehenge. But if theſe figures have any relation to the myſteries of the Chriſtian religion, it is evident this work is much more modern than many of the antiquities found in Saliſbury Plain, and probably of a much later date than the barrow in which it was found.

From theſe ſepulchres being within ſight of the temple, we may conclude, that like Chriſtians of the preſent age, the antient Britons thought it was moſt proper to bury their dead adjoining to thoſe places where they worſhipped the Supreme Being. Indeed, all worſhip indicates a ſtate of futurity, and they might reaſonably imagine that no place was ſo proper for depoſiting the relics of their departed friends, as the ſpot dedicated to the ſervice of that Being with whom they hoped to live for ever. The ſentiment is altogether natural, no objection can be made againſt it, while the depoſitories of the dead are detached from populous towns or cities; but no man can excuſe the preſent mode of crouding corrupted bodies into vaults under churches, adjoining to the moſt public ſtreets, when the noxious effluvia may be attended with fatal conſequences to the ſurvivors.

CARNELIA, in antiquity, a feſtival in honour of Apollo, ſurnamed Corneus, held in moſt cities of Greece, but eſpecially at Sparta, where it was firſt inſtituted.

CARNELIAN, or CORNELIAN, a ſtone, of which there are three kinds, diſtinguiſhed by three colours, a red, a yellow, and a white. The red is very well known among us; is found in roundiſh or oval maſſes, much like our common pebbles; and is generally met with between an inch and two or three inches in diameter: it is of a fine, compact, and cloſe texture; of a gloſſy ſurface; and, in the ſeveral ſpecimens, is of all the degrees of red, from the paleſt fleſh colour to the deepeſt blood red. It is generally free from ſpots, clouds, or variegations: but ſometimes it is veined very beautifully with an extremely pale red, or with white; the veins forming concentric circles, or other leſs regular figures, about a nucleus, in the manner of thoſe of agates. The pieces of carnelian which are all of one colour, and perfectly free from veins, are thoſe which our jewellers generally make uſe of for ſeals, though the variegated ones are much more beautiful. The carnelian is tolerably hard, and capable of a very good poliſh: it is not at all affected by acid menſtruums: the fire diveſts it of a part of its colour, and leaves it of a pale red; and a ſtrong and long continued heat will reduce it to a pale dirty gray.

The fineſt carnelians are thoſe of the Eaſt Indies: but there are very beautiful ones found in the rivers of Sileſia and Bohemia; and we have ſome not deſpicable ones in England.

CARNIFEX, among the Romans, the common executioner. By reaſon of the odiouſneſs of his office, the carnifex was expreſly prohibited by the laws from having his dwelling houſe within the city.

CARNIVAL, or CARNAVAL, a time of rejoicing, a ſeaſon of mirth, obſerved with great ſolemnity by the Italians, particularly at Venice, holding from the twelfth-day till Lent.

Feaſts, balls, operas, concerts of muſic, intrigues, marriages, &c. are chiefly held in carnival time. The carnival begins at Venice the ſecond holiday in Chriſtmas: then it is they begin to wear maſks, and open their play-houſes and gaming-houſes; the place of St. Mark is filled with mountebanks, jack-puddings, pedlars, whores, and ſuch like mob, who flock thither from all parts. There have been no leſs than ſeven ſovereign princes and 30,000 foreigners here to partake of theſe diverſions.

CARNIVOROUS, an epithet applied to thoſe animals which naturally ſeek and feed on fleſh.

It is a diſpute among naturaliſts, whether or no man be naturally carnivorous? Some contend that the fruits of the earth were intended as his ſole food; and that it was neceſſity in ſome places, and luxury in others, that firſt prompted him to feed upon his fellow animals.

Thoſe who take the negative ſide of the queſtion, inſiſt chiefly on the ſtructure of our teeth, which are moſtly inciſores or molares; not ſuch as carnivorous animals are furniſhed with, and which are proper to tear fleſh in pieces: to which it may be added, that, even when we do feed on fleſh, it is not without a preparatory alteration by boiling, roaſting, &c. To theſe arguments Dr. Wallis ſubjoins another; which is, that all quadrupeds which feed on herbs or plants, have a long colon, with a cœcum at the upper end of it, or ſomewhat equivalent, which conveys the food by a long and large proceſs, from the ſtomach downwards, in order to its ſlower paſſage and longer ſtay in the inteſtines; but that, in carnivorous animals, ſuch cœcum is wanting, and inſtead thereof there is a more ſhort and ſlender gut, and a quicker paſſage through the inteſtines. In man, the cœcum is very viſible; a ſtrong preſumption that nature, who is ſtill conſiſtent with herſelf, did not intend him for a carnivorous animal. It is true cœcum is but ſmall in adults, and ſeems of little or no uſe; but in a fœtus it is much larger in proportion: and it is probable, our cuſtomary change of diet, as we grow up, may occaſion this ſhrinking.

To theſe arguments, Dr. Tyſon replies, that if man had been by nature deſigned not to be carnivorous, there would doubtleſs have been found, ſomewhere on the globe, people who do not feed on fleſh; which is not the caſe. Neither are carnivorous animals always without a colon and cœcum: nor are all animals carnivorous which have thoſe parts: the opoſſum, for inſtance, hath both a colon and cœcum, and yet feeds on poultry and other fleſh; whereas the hedge-hog, which has neither colon nor cœcum, and ſo ought to be carnivorous, feeds only on vegetables. Add to this, that hogs, which have both, will feed upon fleſh when they can get it; and rats and mice, which have large cœcums, will feed on bacon as well as bread. In fine, ſince man has all manner of teeth, fit for the preparation of all ſorts of food, ſhould it not rather ſeem that nature intended we ſhould live on all? And as the alimentary duct in the human kind, is fitted for digeſting all ſorts of food, may we not rather conclude that nature did not intend to deny us any?

CARNIUS, in chronology, the Syracuſian name for the Athenian month metagitnion; which was the ſecond of their year, and anſwered to the latter part of our July and beginning of Auguſt.

CAROLUS, an ancient Engliſh broad piece of gold, ſtruck under king Charles I. whoſe image and name it bears. Its value has been eſtimated at twenty-three ſhillings ſterling: though at the time when it was coined it is ſaid to have been only rated at twenty ſhillings. It is now only to be found in the cabinets of the curious.

CAROPI, in botany, a name given by the inhabitants of the Philippine iſlands to a plant more uſually known among authors by the name of tugus; a plant greatly eſteemed by the natives, and ſuppoſed by Camelli to be the true amomum of the Greeks, ſo much valued in thoſe ancient times.

CAROTIDS, in anatomy, two arteries of the neck, on each ſide, ſerving to convey the blood from the aorta to the brain. See Syſtem of ANATOMY, Part IV. Sect. I.

CAROUGE, in botany, a ſiliquous fruit, ſweet, and good to eat, when arrived at a proper degree of maturity. The tree which bears it grows in Spain, and in ſeveral places of the Mediterranean. The fruit is of great uſe when given to animals of labour.

CARP, in ichthyology: this fiſh was brought into England by Leonard Maſchal, about the year 1514, it is valuable for ſtocking of ponds, becauſe of its quick growth and great increaſe. The carp ſpawns three times a year, ſo that the increaſe is very great. The female does not begin to breed till eight or nine years old; ſo in breeding ponds a ſupply muſt be kept of carp of that age. The beſt judges allow, that, in ſtocking a breeding pond, four males ſhould be allowed to twelve females. The uſual growth of carp is two or three inches in length in a year; but, in ponds which receive the fattening of common ſewers, they have been known to grow from five inches to eight in one year. A feeding pond of one acre extent will very well feed 300 carp of three years old, 300 of two years, and 400 of one year old. Carp delight greatly in ponds that have marley ſides; they love alſo clay ponds well ſheltered from the winds, and grown with weeds and long graſs at the edges, which they feed on in the hot months. Carp and tench thrive very faſt in ponds and rivers near the ſea, where the water is a little brackiſh; but they are not ſo well taſted as thoſe which live in freſh water. Grains, blood, chicken guts, and the like, may at times be thrown in carp ponds, to help to fatten the fiſh. To make them grow large and fat, the growth of graſs under the water ſhould by all means poſſible be encouraged. For this purpoſe, as the water decreaſes in the ſummer, the ſides of the pond left naked and dry ſhould be well raked with an iron rake, to deſtroy all the weeds, and cut up the ſurface of the earth: hay ſeed ſhould then be ſown plentifully in theſe places; and more ground prepared in the ſame manner, as the water falls more and more away. Carp ſpawn in May, June, or July, according to the warmth of the ſeaſon, and for this purpoſe they ſwim to a ſhady, warm, ſheltered place, where they gently rub their bodies againſt the ſandy ground, graſs, or oſiers, and by this preſſure the ſpawn iſſues out. At the ſpawning ſeaſon all kinds of fowl ſhould be kept from the ponds. The young fry, hatched from the ſpawn by the genial influence of the ſun, are left in this pond through the whole ſummer, and even the next winter, if the pond is deep enough to prevent their ſuffocation under ice in a ſevere winter; otherwiſe the breeders and the fry are put into ſeparate ponds, more convenient for their wintering.

The curious have three ponds, i. e. for breeding ſtore fiſh and perfecting their growth. If a pond is not over ſtocked, carp will grow to the weight of four or five pounds in two years, and will live to be 100 years old.

The beſt ſeaſons for ſtocking the main ponds are ſpring and autumn: carp continue to grow for a long time, and to a very conſiderable ſize and weight. Mr. Forſter mentions one which he had ſeen in Pruſſia above a yard long, and of twenty five pounds weight; and two or three hundred between two and three feet long, and which, he was told, were between fifty and ſixty years old. Ponds ſhould be well ſupplied with water during the winter, and when they are covered with ice, holes ſhould be opened every day for the admiſſion of freſh air, through want of which carp frequently periſh.

CARPENTER, an artificer whoſe buſineſs is to cut, faſhion, and join timber and other wood for the purpoſes of building, and other purpoſes.

The word is formed from the French *charpentier*, which ſignifies the ſame, formed of *charpente*, which denotes timber; or rather from the Latin *carpentarius*, a maker of *carpenta*, or carriages.

A Ship CARPENTER, is an officer at ſea, whoſe buſineſs is to have things in readineſs for keeping the veſſels in repair; and to attend the ſtopping of leaks, fiſhing maſts or yards, alſo caulking, careening, breaming, and the like. He is to watch the timber of the veſſel that it does not rot, conſult frequently with other officers on the ſtate of the maſts, yards, &c. and in time of battle he is to have plugs, tompions, and planks ready, for repairing breaches made by the enemy's cannon.

The carpenter has a mate under him, and a crew or gang to command on neceſſary occaſions.

CARPENTRY, the art of cutting, framing, and joining large pieces of wood for the uſes of building.

Carpentry is one of the arts ſubſervient to architecture, and is divided into two branches, houſe carpentry, and ſhip carpentry; the firſt employed in raiſing, framing, roofing, flooring, &c. of houſes, &c.

The ſecond in the conſtruction of veſſels for ſea; as ſhips, barks, barges, boats, &c.

The rules and practices in carpentry, as to plaining, ſawing, morteſſing, tenanting, ſcribing, paring, moulding, &c. are much the ſame as thoſe in joinery: ſo likewiſe are the tools, or inſtruments, and the ſtuff is the ſame in both; all the difference between the two arts conſiſting in this, that joinery is uſed in the ſmaller and more curious works; and carpentry in the larger, ſtronger, and coarſer.

CARPET, a ſort of covering, worked either with the needle, or on a loom; to be ſpread on a table, trunk, an eſtrade, a paſſage, or a floor.

Perſian and Turkey carpets are thoſe moſt prized; eſpecially the former. Engliſh carpets, eſpecially thoſe of Axminſter, and thoſe manufactured by Mr. Moor, are much valued, and in beauty of deſign, and colouring, excel thoſe of any other country; carpets are made with wool, and in ſome countries with a mixture of wool, hair, and ſilk; Perſia carpets are frequently ſilk ornamented with ſilver or gold.

Among jockeys, to *ſhave the carpet*, is to gallop very cloſe, or near the ground; a fault foreigners charge on Engliſh horſes. Figuratively, an affair, propoſal, &c. are ſaid to be brought on the carpet, or tapis, when they are under conſideration, &c.

CARPINUS, the horn-beam; a genus of polyandria order, belonging to the monœcia claſs of plants. There are four ſpecies, of which only one is a native of Britain.

CARPOBALSAM, the fruit of the tree which yields the true oriental balm, or balſam; very much reſembling, both in figure, ſize and colour, that of turpentine.

CARR, carrus, a kind of rolling throne, uſed in triumphs, and at the ſplendid entries of princes.

The word is from the ancient Gauliſh, or Celtic, carr; mentioned by Cæſar, in his Commentaries, under the name *carrus*.

Plutarch relates, that Camillus having entered Rome in triumph mounted on a carr, drawn by four white horſes, it was looked on as too haughty an innovation.

CARRAGO, in antiquity, a kind of fortification, or defence about a camp, compoſed of carts, waggons, and the like vehicles, chained or faſtened together.

CARRARA *Marble*, the name of a ſpecies of white marble, which is called marmor lunenſe, and liguſtrium by the ancients: it is diſtinguiſhed from the Parian, now called the ſtatuary marble, by being harder and leſs bright.

CARRIAGE, a vehicle for the conveyance of perſons, goods, &c. from one place to another.

CARRIAGE *of a Cannon*, is the frame, or timber-work, whereon it is mounted; ſerving to point and direct it for ſhooting; and to convey it from place to place; of which there are three ſorts, viz. thoſe uſed in garriſons, aboard ſhips, and in the field.

CARRIAGE alſo denotes the money or hire paid to a carrier, or other bearer of goods. Thus we ſay pay the carriage.

A common carrier having the charge and carriage of goods, is to anſwer for the ſame, or the value, to the owner Co. Lyt. 78. And where goods are delivered to a carrier, and he is robbed of them, he ſhall be charged, and anſwer for them, becauſe of the hire. 1 Roll. Abr. 3, 38.

Where goods are ſtolen from a carrier, he may bring an indictment againſt the felon, as for his own goods, though he has only the poſſeſſory, and not the abſolute property; and the owner may alſo prefer an indictment againſt the felon. Kel. 39. If a carrier is robbed of goods, alſo either he or the owner may bring an action againſt the hundred to make it good.

CARRIAGE *by Sea*, is denominated freight.

CARRIER, is a perſon that carries goods for others for hire. A common carrier having the charge and carriage of goods, is to anſwer for the ſame, or the value, to the owner. And where goods are delivered to a carrier, and he is robbed of them, he ſhall be charged and anſwer for them, becauſe of the hire. If a common carrier who is offered his hire, and who has convenience, refuſes to carry goods, he is liable to an action, in the ſame manner as an inn-keeper who refuſes to entertain a gueſt.

If a common carrier loſes goods which he is intruſted to carry, a ſpecial action on the caſe lies againſt him, on the cuſtom of the realm, and not trover: and ſo of a common carrier by boat. An action will lie againſt a porter, carrier, or barge-man, upon his bare receipt of the goods, if they are loſt through negligence. Alſo a lighter-man ſpoiling goods he is to carry, by letting water come to them, action of the caſe lies againſt him, on the common cuſtom.

CARRIER *Pigeon*, a ſort of pigeon uſed, when properly trained, to be ſent with letters from one place to another.

Though you carry theſe birds hood-winked, 20, 30, nay, 60 or 100 miles, they will find their way in a very little time to the place where they were bred. They are trained to this ſervice in Turkey and Perſia; and are carried firſt, while young, ſhort flights of half a mile, afterwards more, till at length they will return from the fartheſt part of the kingdom. Every baſhaw has a baſket of theſe pigeons bred in the ſeraglio, which, upon any emergent occaſion, as an inſurrection, or the like, he diſpatches, with letters braced under their wings, to the ſeraglio; which proves a more ſpeedy method, as well as a more ſafe one, than any other; he ſends out more than one pigeon, however, for fear of accidents. Lithgow aſſures us, that one of theſe birds will carry a letter from Babylon to Aleppo, which is 30 days journey, in 48 hours. Carriers are frequently uſed in England, but chiefly for gambling purpoſes.

CARROT, daucus, in botany, a genus of the pentandria digynia claſs.

Carrots were introduced into this kingdom by the Flemings, in the reign of queen Elizabeth, and firſt ſown about Sandwich in Kent. There are two or three ſorts of this plant cultivated for the uſe of the kitchen; and theſe may be ſown at ſeveral different ſeaſons of the year, to afford a ſupply of young roots, in ſucceſſion for the table.

The ſeaſon for ſowing them, for the earlieſt crop, is in February. They ſhould be ſown in an open ſituation, but near a wall.

Carrots delight in a warm ſandy ſoil, which ſhould be light, and well dug to a good depth, that the roots may meet with no obſtruction in running down, which makes them grow forked, and ſhoot out lateral branches, eſpecially when the ground has been too much dunged the ſame year that the ſeeds were ſown, which will alſo occaſion their being worm-eaten. The hairyneſs of theſe ſeeds make them apt to ſtick together in ſmall cluſters, and renders it difficult to ſow them equally: they ſhould therefore be always ſown on a calm day, when there is no wind ſtirring to blow them together, and be well rubbed between the hands to ſeparate them thoroughly: when they are ſown they ſhould be trod in with the feet, and the ground raked level over them.

When they firſt come up, they ſhould be hoed out to four inches diſtance; and a month after this, they muſt be cleared again; and ſhould be left at ſix inches diſtance from each other.

The ſecond ſeaſon for ſowing carrots is in March. This muſt be done under a wall or hedge, and on warm banks; but thoſe which are to be in open large quarters, ſhould not be ſown till the latter end of March.

In July they may be ſown again for an autumnal crop, and finally in the end of Auguſt for thoſe which are to ſtand the winter. Theſe laſt will be fit for uſe in March, before any of the ſpring ones; but they are ſeldom ſo tender or well taſted.

In order to preſerve carrots for uſe all winter, they are to be dug up in the beginning of November, and laid in a dry place in ſand; and theſe roots being planted again in February, will ripen ſeeds in Auguſt for ſucceeding crops: the longeſt and ſtraighteſt roots are to be choſen for this purpoſe.

The cultivation of carrots are lately become a conſiderable branch of AGRICULTURE. See that Syſtem, Sect. IV.

Wild CARROT, or Daucus Sylveſtris. The ſeeds of this plant are eſteemed one of the moſt powerful diuretics we are acquainted with, of our own growth. They are alſo given in diſorders of the breaſt and lungs, in pleuriſies, in ſtranguries, and in the ſtone and gravel. An infuſion of them in white wine is excellent in hyſteric complaint. Many inſtances are related, in which tea made of the heads or ſeeds of the wild carrot, has given great relief in theſe complaints. Ale may be made of it, by adding to nine ounces of the ſeed, eighteen ounces of raiſins of the ſun. Theſe muſt be put into a bag, and hung in a veſſel of ſix gallons of good ale, after fermentation. After eight days it will be fine, and it may be drank in the quantity of three pints a day.

CART, a vehicle, mounted on two wheels, drawn by horſes uſed for the carriage of heavy goods.

CARTE *Blanche*, a ſort of white paper, ſigned at the bottom with a perſon's name, and ſometimes alſo ſealed with his ſeal, giving another perſon power to ſuperſcribe what conditions he pleaſes. Much like this, is the French *blanc ſigne*, a paper without writing, except a ſignature at the bottom, given by contending parties to arbitrators or friends, to fill up with the conditions they judge reaſonable, in order to end the difference.

CARTEL, an agreement between two ſtates for the exchange of their priſoners of war; it ſignifies alſo a letter of defiance, or a challenge to decide a controverſy either in a tournament or a ſingle combat.

CARTEL denotes a treaty of agreement between two princes or generals, relating to the exchange of priſoners taken in war.

There are alſo cartels ſettled between princes in time of war, for what relates to commerce, that it may be carried on without interruption, notwithſtanding other hoſtilities.

CARTEL is alſo uſed for a ſhip commiſſioned, in time of war, to exchange the priſoners of any two hoſtile powers; or to carry any requeſt or propoſal from one to another. The officer who commands her is ordered to carry only a ſingle gun, for the purpoſe of firing ſignals.

CARTESIAN *Philoſophy*, the ſyſtem of philoſophy advanced by Des Cartes, and maintained by his followers, called Carteſians.

The Carteſian philoſophy is founded on two great principles, the one metaphyſical, the other phyſical. The metaphyſical principles is this, *I think, therefore I am*. This principle has been attacked and defended, with great ſpirit, zeal, and partiality, on both ſides: for, though it be true that we are ſure by an inward perception or conſciouſneſs, that we exiſt, as that we think; yet it is true, too, that the concluſion of this reaſoning, *I am*, is drawn from the antecedent *I think*: ſince *to think*, ſuppoſes *to be*, or *exiſt*; and the mind ſees clearly the neceſſary connection between thinking and being.

From our having the idea of a Being infinitely perfect and neceſſarily exiſting, Des Cartes concludes that he actually is, upon whoſe will he makes the certainty of ſelf-evident propoſitions, and of all neceſſary truths to depend. From the knowledge thus eſtabliſhed, he proceeds to deduce a complete knowledge of his effects by neceſſary ſteps; and he rejects all final cauſes from philoſophy. He infers the reality of material objects from the veracity of the Deity.

The phyſical principle of Carteſianiſm is this, that nothing exiſts but ſubſtances: which appears a dangerous principle to the divines; and is accordingly controverted every day in the ſchools of the catholics; who endeavour to prove that there are abſolute accidents.

Subſtances he makes of two kinds; the one a ſubſtance that thinks, the other a ſubſtance extended. Actual thought, therefore, and actual extenſion, are the eſſence of matter: ſo that the thinking ſubſtance cannot be without actual thought; nor can any thing be retrenched from the extenſion of a thing, without taking away ſo much of its ſubſtance.

The eſſence of matter being thus fixed in extenſion, the Carteſians conclude that there is no vacuum, nor any poſſibility thereof in nature; but that the univerſe is abſolutely full: mere ſpace is excluded by this principle; becauſe, extenſion being implied in the idea of ſpace, matter is ſo too. Upon theſe principles, Des Cartes, and his diſciples, took upon them to explain mechanically how the world was formed, and how the preſent celeſtial phenomena came to take place.

CARTHUSIANS, a branch of the Benedictines, an order of religious, inſtituted by St. Bruno, about the year 1084, remarkable for the auſterity of their rule, which obliges them to a perpetual ſolitude; a total abſtinence from fleſh, even at the peril of their lives; and to feed on bread, water, and ſalt, one day in every week; and abſolute ſilence, except at certain ſtated times.

The word is formed from *Carthuſianus*, or *Carthuſienſis*, a denomination given them in Latin, from a village in Dauphiné, called Chartreuſe, in Latin *Cureuſium, Caturſium*, as ſome ſay, where the firſt monaſtery of this kind was erected. Hence the French call the religious of this order Chartreu, and their convents Chartreuſes; an appellation which alſo appears to have antiently obtained in England; whence the name of that celebrated hoſpital, or rather college, in London, the Charter-houſe.

There are few nuns of this order. There have, however, been ſome female Carthuſian convents; but the increaſe of them was prohibited in 1368; and there remain only five at this day, four in France, and one at Bruges in Flanders. They were brought into England by Henry II. about the year 1180, and had only nine houſes; their firſt houſe being at Witham, in Somerſetſhire.

CARTILAGE, in anatomy, a ſmooth, ſolid, uniform, flexible, elaſtic part of an animal; ſofter than a bone, but harder than any other part. See Syſtem of ANATOMY, Part I. Sect. XIII.

CARTILAGINOUS, in ichthyology, a title given to all fiſh whoſe muſcles are ſupported by cartilages inſtead of bones; and comprehends the ſame genera of fiſh to which Linnæus has given the name of amphibia nantes: but the word amphibia ought properly to be confined to ſuch animals as inhabit both elements; and can live without inconvenience, for a conſiderable time, either on land or in water; ſuch as tortoiſes, frogs, and ſeveral ſpecies of lizards; and, among the quadrupeds, hippopotami, &c. &c.

Many of the cartilaginous fiſh are viviparous, being excluded from an egg, which is hatched within them. The egg conſiſts of a white and a yolk; and is lodged in a caſe formed of a thick tough ſubſtance, not unlike ſoftened horn; ſuch are the eggs of the ray and ſhark kind. Some again differ in this reſpect, and are oviparous; ſuch is the ſturgeon, and others.

They breathe either through certain apertures beneath, as in the rays; on their ſides, as in the ſharks, &c. or on the top of the head, as in the pipe fiſh: for they have not covers to their gills like the bony fiſh.

Cartilages cover the extremities of bones joined together by moveable articulations, increaſe the volume of ſome of them after the manner of epiphyſes, unite others very cloſely together, and have no immediate adheſion or connexion with others. The cartilages which belong to the bones, differ from each other in ſize, figure, ſituation, and uſe, and may all be ranked under two general heads; thoſe which are cloſely united to bones, and thoſe which are not immediately connected with them. The cartilages united to bones are of four kinds: ſome cover both ſides of the moveable articulations, and are very ſmooth and ſlippery; ſome unite the bones to each other, either ſo firmly as to allow no ſenſible motion, as in the ſymphyſis of the oſſa pubis, and ſtill more in that by which the epiphyſes are joined to the bones; or in ſuch manner as to allow of different motions, as in thoſe by which the bodies of the vertebræ are connected. The firſt eaſily grow hard, but the others appear in ſome degree viſcid, and retain their flexibility.

Some increaſe the ſize and extent of bones, as the cartilaginous portions of almoſt all the true ribs: theſe are articulated with bones; others with cartilages, as the ſeptum marium; others ſerve only for borders, as thoſe of the baſis of the ſcapula, and of the chriſta of the os ilium, the ſupercilia of cavities, and thoſe of the ſpinal and tranſverſe proceſſes of the vertebræ. Some, in fine, have a ſingular form, as thoſe of the ears, and moſt of thoſe of the noſe; in which laſt, their elaſticity appears moſt ſenſibly. The cartilages belonging to the ſecond general claſs, or thoſe not immediately joined to bones, are for the moſt part placed in the moveable joints; and theſe may likewiſe be ſubdivided into ſeveral kinds. Some lie altogether looſe, being neither joined to the articulated bones, nor to the cartilages which cover them, but ſlide freely between them in different directions; as thoſe which are placed in the articulation of the tibia with the os femoris; and in that of the lower jaw with the oſſa temporum; and in that of the clavicle with the ſternum. Thoſe between the clavicle and acromium, and between the firſt and ſecond vertebræ of the neck, are of the ſame kind. Some are partly joined to other cartilages, and partly ſlide between the cartilaginous extremities of the articulated bones, as the cartilage at the lower extremity of the radius. There may alſo be reckoned among the cartilages, though not ſo properly, ſeveral of the ſmall ſeſamoide bones, which remain long cartilaginous; and alſo the cartilaginous portions of tendons, which do the ſame office with the ſeſamoide bones.

It is commonly held, that all bones in their original were only cartilages, and arrived at the hardneſs of bones by a gradual induration.

Hence it is, that in ſome caſes the cartilages themſelves have been found oſſified; of which a famous inſtance happened ſome years ago at Milan, where a malefactor was judged innocent, and ſaved, becauſe, his aſpera materia being turned bony, he was not ſuffocated by the hangman's rope.

CARTON is uſed for a deſign coloured, for working in moſaic, tapeſtry, &c. The cartoons formerly preſerved at Hampton court, but now in the queen's palace at Buckingham houſe, are deſigns of Raphael Urbin, intended for a tapeſtry. See Richardſon, in his Eſſay on Painting; where he ſpends a great part of a chapter on the colouring of the cartoons.

CARTOUCH, a wooden caſe about three inches thick, girt with marlin, and loaded with two or three hundred muſket balls, beſides ſix or eight balls of iron of a pound weight; to be fired out of a ſmall ſort of mortar, chiefly for the defence of a paſs, or the like.

In cannon of caſemates, or other poſts, which defend the paſſage of the ditch, or the like, cartouches have a terrible effect: ſince, burſting aſunder, they ſpread the ſhot they are loaden with far and wide. There are divers other forms and compoſitions of cartouches, and ſome made for guns.

The word is alſo uſed for what is more frequently called a cartridge.

CARTOUCHES, in heraldry, a name given to a ſort of oval ſhields, much uſed by the popes and ſecular princes in Italy, and others, both clergy and laity, for painting or engraving their arms on. Many ſuppoſe this form derogatory to the honour of the perſon; but though the ſquare ſhield, with the rounded and pointed bottom is more in uſe with us, as alſo with the French and Germans, yet this is ſuppoſed more truly the figure of the Roman ſhield worn by the ſoldiery, and therefore more ancient and honourable than either that or the indented ſhield of the Germans.

CARTRIDGE, in the military art, the charge or load of a fire arm, wrapped up in a thick paper, paſte board, or parchment; to be the more readily charged, or conveyed into the piece.

CARTRIDGE *Box*, a wooden or iron caſe, covered with leather, holding a dozen or more muſket cartridges, borne by the ſoldier on his belt, hanging a little below the right pocket hole.

CARVING, in a general ſenſe, the art or act of cutting or faſhioning a hard body, by means of ſome ſharp inſtrument, eſpecially a chiſſel. In this ſenſe carving includes ſtatuary and engraving, as well as cutting in wood.

CARVING, in a more particular ſenſe, is the art of engraving or cutting figures in wood. In this ſenſe carving, according to Pliny, is prior both to ſtatuary and painting.

To carve a figure or deſign, it muſt be firſt drawn or paſted on the wood; which done, the reſt of the block, not covered by the lines of the deſign, are to be cut away with little narrow-pointed knives. The wood fitteſt for the uſe is that which is hard, tough, and cloſe, as beech, or pear tree, but eſpecially box: to prepare it for drawing the deſign on, they waſh it over with white-lead tempered in water; which better enables it either to bear ink or the crayon, or even to take the impreſſion by chalking. When the deſign is to be paſted on the wood, this whitening is omitted, and they content themſelves with ſeeing the wood well planed. Then wiping over the printed ſide of the figure with gum tragacanth diſſolved in water, they clap it ſmooth on the wood, and let it dry; which done, they wet it ſlightly over, and fret off the ſurface of the paper gently, till all the ſtrokes of the figure appear diſtinctly. This done, they fall to cutting, or carving, as above.

CARVING alſo implies performing the honors of the table, or cutting and diſtributing meat at dinner or other meals.

In the great families at Rome, the carver was an officer of ſome figure. There were maſters to teach them the art regularly, by means of figures of animals cut in wood. In the primitive times, the maſter of the feaſt carved for all his gueſts. Thus in Homer, when Agamemnon's ambaſſadors were entertained at Achilles's table, the hero himſelf carved the meat. Of later times, the ſame office on ſolemn occaſions was executed by ſome of the chief men of Sparta.

CARUNCULÆ, caruncle, a term in anatomy, properly ſignifying a little piece of fleſh, being a diminutive of the Latin *caro*, fleſh.

CARUNCULÆ *Myrtiformes*, in anatomy, are four little caruncles, or fleſhy knobs, about the ſize of myrtle-berries, whence their name; found adjoining to, or rather in the place of the hymen, in the parts of generation in women. See Syſtem of ANATOMY, Part V. Sect. XIII.

CARUS, in medicine, a ſudden deprivation of ſenſation and motion, and an acute fever.

CARYATIDES, in architecture, a kind of order of columns, or pilaſters.

CARYOCATACTES, in ornithology, the name of a bird of the magpye kind, of a browniſh colour, all over beautifully variegated with white triangular ſpots, and very full of white feathers about the anus and origin of the tail. It is common in the mountainous parts of Germany.

CARYOPHYLLEI, in botany, the name of a very numerous family, or order, in the Linnæus's fragments of a natural method.

CARYOPHYLLUS, in botany, the pink.

CARYOPHYLLUS *Aromaticus*, in botany, the clove tree.

CASCABLE, the knob or button of metal behind the breech of a cannon, as a ſort of handle whereby to elevate and direct the piece.

CASCADE, a ſteep fall of water from a higher into a lower place. Caſcades are either natural, as that of Tivoli, &c. or artificial, as thoſe of Verſailles, Chatſworth, &c. and either falling

ing with a gentle deſcent, as thoſe of the Sceaux; in form of a buffet, as at Trianon; or down ſteps, in form of a perron, as at St. Clou, and Stanway in the county of Glocester.

CASCANS, in fortification, are holes and cavities in form of wells, made in the terreplein, near a rampart; from whence a gallery dug in like manner, under ground, is conveyed, to give air to the enemies mine.

CASE, among grammarians, implies the different inflections or terminations of nouns, ſerving to expreſs the different relations they bear to each other, and to the things they repreſent. See GRAMMAR.

CASE alſo denotes a receptacle for various articles; as a caſe of knives, of lancets, of piſtols, &c.

A printer's caſe is a large flat oblong frame placed aſlope, divided into ſeveral compartments, or little ſquare cells; in each of which are lodged a number of types, or letters, of the ſame kind, whence the compoſitor takes them out, each as required to compoſe his matter. See Art of PRINTING.

CASE is alſo uſed for a certain numerous quantity of divers things. Thus a caſe of crown glaſs contains uſually 24 tables, each table being nearly circular, and about three feet ſix inches diameter; of Newcaſtle glaſs, 35 tables; of Normandy glaſs, 25.

CASE *Hardening of Iron*, is a ſuperficial converſion of that metal into ſteel, by the ordinary method of converſion, namely by cementation with vegetable or animal coals. Old ſhoes are generally preferred. This operation is generally practiſed upon ſmall pieces of iron wrought into tools and inſtruments, to which a ſuperficial converſion is ſufficient; and it may be performed conveniently by putting the pieces of iron to be caſe-hardened, together with the cement, in an iron box, which is to be cloſely ſhut and expoſed to a red heat during ſome hours. By this cementation a certain thickneſs from the ſurface of the iron will be converted into ſteel, and a proper hardneſs may be afterwards given by ſudden extinction of the heated pieces of converted iron in a cold fluid.

CASEI *di Cavallo*, the name of a peculiar cheeſe, famous in Italy and many other places, and made of the milk of the buffalo, that ſpecies being as commonly tamed and kept there, as the ox and heifer with us.

CASEMENT, or CASEMATE, in architecture, hollow moulding, with ſome architects make one ſixth of a circle, and others one fourth.

CASEMENT is alſo uſed in building, for a little moveable window, uſually within a larger, being made to open or turn on hinges.

CASERN, in fortification, lodgings built in garriſon towns, generally near the rampart, or in the waſte places of the town, for lodging ſoldiers of the garriſon. There are uſually two beds in each caſern for ſix ſoldiers to lie, who mount the guard alternately; the third part being always on duty.

CASH, in a commercial ſtyle, ſignifies the ſtock of money which a merchant, trader, or banker, has at his diſpoſal in order to trade.

In a general ſenſe it implies money, or bills negociable without diſcount.

CASH BOOK. See BOOK-KEEPING. Sect. IV.

CASHIER, the caſh keeper; he who is charged with the receiving and paying the debts of a ſociety.

In the generality of foundations, the caſhier is called treaſurer.

CASHIERS *of the Bank*, are officers who ſign the notes that are iſſued out, examine and mark them when returned for payment, &c.

CASHOO, a medicinal and aromatic drug, which is reckoned among perfumes, is extracted from a tree which is called catee in the country where it grows, which is a province of Indoſtan called Behar, the capital of which is Patna. There are two ſorts of ſimple caſhoo, the rough, and the purified or refined; the latter is a compoſition of purified caſhoo, mixed with aromatic drugs, and made into lozenges. This caſhoo is made for the uſe of the Indians, who chew it either alone, or mixed with pinang or areca. What is ſent into Europe, however, is moſtly purified; for caſhoo is not uſed rough any where.

It is much valued in medicine: among other effects aſcribed to it, is the ſtopping of a cough, and ſtrengthening the ſtomach; beſides which it ſweetens the breath, when being reduced to an impalpable powder, mixed with ambergriſe, and mucilages of gum adragant, it is made into paſtils. Caſhoo muſt be choſen of a tanned red on the outſide, of a bright red within, very ſhining, and not burnt. The women are very fond of it, and uſe a great deal to faſten the teeth, &c.

CASIA, in botany, the name of a genus of plants, of which there are two ſpecies: 1. The Montpelier poetic caſia, called the berry bearing ſhrub oſyris. 2. The tall myrtle leaved Spaniſh caſia.

CASING, among hunters, denotes the ſtripping off the ſkin of a hare, or fox. They ſay, flay a deer, caſe a hair, and all ſorts of vermin.

CASK, in heraldry, the ſame as helmet.

CASK is alſo uſed as a common name for veſſels of divers kinds; thus, a caſk of cyder, ale, &c.

CASKET, in a general ſenſe, a little coffer, or cabinet.

CASSADA, or CASSAVA, jatropa, in botany, a genus of the monœcia monodelphia claſs.

All theſe plants are natives of the warm parts of America, and are too tender to thrive in the open air in England. The firſt ſort is cultivated in the Weſt Indies for food; where it is propagated by cutting the ſtalks into lengths of ſeven or eight inches, which take root when planted.

CASSAMUNAIR, or CASSUMUNIAR, in medicine, an aromatic vegetable drug, brought from the Eaſt Indies, highly valued as a nervine and ſtomachic, and reputed a ſpecific in convulſive diſeaſes; ſome call it hengalle.

CASSANDRA, in fabulous hiſtory, the daughter of Priam and Hecuba, was beloved of Apollo, who promiſed to beſtow on her the ſpirit of prophecy, provided ſhe would conſent to his love.

CASSAON, in ichthyology, the name of a ſmall fiſh of the ſhark kind, but leſs miſchievous, called cucuri by the Braſilians.

CASSETTES, or COFFINS, in the manufacture of china ware, are utenſils made of Stourbridge or other good Potter's clay with a third of ſand, in which the china ware is baked. They are generally made of a round form, with a flat bottom. They are either turned or formed in a mould.

CASSIA, Wild Senna, in medicine and pharmacy, a purgative fruit brought from the Eaſt, being the produce of a tree of the ſame name, called in Engliſh the pudding-pipe tree. Miller enumerates ſixteen ſpecies. It is a genus of the decandria Monogynia claſs.

There are four kinds of caſſia, alike in properties, and nearly in figure; being all in long black pods: but very different, if conſiered with regard to the trees that produce them. Theſe are, the caſſia of the Levant, that of Egypt, that of Braſil, and that of the Antilles iſlands.

CASSIA *Lignea*, or XYLOCASSIA, is the bark of a tree much like that which bears the cinnamon; growing promiſcuouſly with it in the iſland of Ceylon: but more properly the cinnamon of Sumatra, Java, and Malabar.

The two barks are gathered and dried in the ſame manner; in ſmell and taſte are nearly alike; they are equally ſweet, poignant, and agreeable; and their colour, form, and thickneſs ſcarce differ at all. But the caſſia is the fatter and more mucilaginous; and in chewing diſſolves in the mouth, without leaving any thing woody behind; whereas the woody part of cinnamon ſtill remains, though ever ſo well chewed.

CASSIDA, in entomology, the name given by Dr. Hill to a genus of beetles, called in Engliſh the tortoiſe-beetles, but comprehended by Linnæus under the order of coleptera, in the claſs of inſects.

Under this genus are comprehended all the clypeated beetles, or thoſe covered with a hard cruſt; of which there are a great many ſpecies; for which ſee the Syſtem.

CASSIDONY, Stæchas, in botany. Linnæus has joined this genus to lavendula or lavender. The flowers of the ſtæchas are much uſed in medicine, in diſeaſes of the head and nerves, eſpecially in ſuch as are ſuppoſed to ariſe from cold cauſes. They alſo promote the evacuation by urine, and by the menſes; and in ſome places are eſteemed one of the greateſt antidotes, and given in large doſes againſt the effect of poiſons, and the bites of venomous animals.

The ſeveral ſpecies of ſtæchas are propagated by ſowing the ſeeds in March, in a bed of dry light earth; when the young plants are about three inches high, they muſt be removed into other beds, and placed at about ſix inches diſtance, watering and ſhading them till they have taken root. The poorer the ſoil is, in which they are planted, the better they will ſtand the winter, and the more fragrant will be their flowers. They may be propagated by cuttings planted in ſpring, but the ſeeds ripening very well with us, the raiſing of them from thoſe is the much better way.

CASSILI, in natural hiſtory, a name given by the inhabitants of the Philippine iſlands to a ſpecies of water raven, called alſo colcolo.

CASSINE, in the military language. is a farm-houſe, where a number of ſoldiers had poſted themſelves, in order to make a ſtand againſt the approaches of an enemy.

CASSIOBURY *Buſh*, caſſine, in botany, a genus of the pentandria trigynia claſs. There are two ſpecies, natives of warm climates.

In South Carolina, it is called caſſena, or South-ſea tea. The inhabitants of that country do not make ſo great uſe of this tea, as thoſe of Virginia and North Carolina; in the laſt of which the white people have it in as great eſteem as the Indians, and make as conſtant uſe of it. The caſſine is deemed of a poiſonous quality, and only uſed as an emetic.

CASSIOPEA, in aſtronomy, one of the conſtellations of the northern hemiſphere, ſituate next to Cepheus.

CASSITERIA, in natural hiſtory, the name of a genus of cryſtals. The word is derived from κασσιτ ϱος, *tin*; and expreſſes cryſtals which are influenced in their figures by an admixture of the particles of that metal.

Theſe are all pyramidal, without columns, and compoſed only of four ſides or planes. Of this genus there are only two known ſpecies.

CASSOCK, a kind of ſurtout, or long upper garment, worn over the reſt of the habit: particularly by the clergy, and antiently likewiſe by the laity. The word comes from the French *caſaque*, a horſeman's coat.

CASSOWARY, in ornithology, Struthio, the name of an African bird of the oſtrich kind, but not quite ſo tall, though larger bodied; called alſo by many authors *emeu*, *eme*, or *ema*, and *caſoarius*. It has a crown on the middle of its head; and its head and neck are almoſt naked, having only few hairs, which are ſet ſtraggling; the ſkin is of a purpliſh blue, but toward the bottom of the neck on the hinder part, it is a little reddiſh. At the bottom of the neck, there are alſo two fleſhy protuberances which hang over the breaſt; its mouth opens very wide; its legs are very long, and very robuſt; it has three toes on each foot, all placed before; it has the rudiments of wings, but they are very ſhort, and have only five quills each, which are almoſt naked. It has no tail; its body is large, and is thinly covered with browniſh feathers, which have more the appearance of briſtles than of real feathers, to a ſlight obſerver. It is very common in Africa, and is caught alſo in many parts of the Eaſt Indies. It feeds on fleſh or vegetables, and is eaſily made tame.

CASSUMUNAR, in the materia medica, a root approaching to the nature of zedoary, though belonging to a different ſpecies of plants.

It has a fragrant aromatic ſmell; and is a very famous medicine in nervous caſes, being accounted an excellent cardiac and ſudorific. It is alſo given as a ſtomachic and carminative with ſucceſs, and is moſtly preſcribed in powder, boluſes, or infuſions. The doſe is from five to fifteen grains.

CAST is particularly uſed to denote a figure, or ſmall ſtatue of bronze, or other metal. It is alſo applied by various artificers to implements uſed in caſting; Plumbers call a braſs funnel through which they pour the metal for caſting pipes, a caſt.

Cast, or Caste, in ſpeaking of the Eaſtern affairs, denotes a tribe, or number of families, of the ſame rank and profeſſion.

The diviſion of a nation into caſts is chiefly obſerved in the empire of the Great Mogul, kingdom of Bengal, iſland of Ceylon, and the great peninſula of India oppoſite thereto. In each of theſe, there are four principal caſts, viz. the caſt of the bramins, which is the firſt and moſt noble; the caſt of the rajas, or princes, who pretend to be deſcended from divers royal families: the caſt of the choutres, which comprehends all the artificers; and that of the parias, the loweſt and moſt contemptible of all.

Every art and trade is confined to its proper caſt, nor is allowed to be exerciſed by any but thoſe whoſe fathers profeſſed the ſame. So that a taylor's ſon can never riſe to be a painter, nor a painter's ſon fall to be a taylor.

CASTANETS, a kind of muſical inſtrument, which the Moors, Spaniards, and Bohemians, accompany their dances, ſarabands, and guittars. It conſiſts of two little round pieces of wood dried, and hollowed in manner of a ſpoon, the concavities whereof are placed on one another, faſtened to the thumb, and beat from time to time with the middle finger, to direct their motion and cadences. The caſtanets may be beat eight or nine times in the ſpace of one meaſure, or ſecond of a minute.

CASTELLAN, the name of a dignity or office in Poland. The caſtellans are ſenators of the kingdom, but ſenators of the lower claſs; and in diet, ſit on low ſeats behind the palatines, or great ſenators. They are a kind of lieutenants of provinces, and command a part of a palatinate under the palatine.

CASTILLAN, a gold coin, current in Spain, valued at fourteen rials and a half.

Castillan alſo denotes a weight uſed by the Spaniards in the weighing of gold, containing the hundredth part of a Spaniſh pound. What is commonly called a weight of gold in Spain, is always underſtood of the caſtillian.

CASTING, in foundery, the running a metal into a mould, prepared for that purpoſe.

Casting *of Metals, of Letters, Bells, &c.* See the article Foundery.

Casting *in Sand or Earth*, is the running of metals between two frames or moulds, filled with ſand or earth, wherein the figure that the metal is to take has been impreſſed *en creux*, by means of the pattern.

Casting, among ſculptors and modellers implies the taking of caſts and impreſſions of figures, buſts, medals, leaves, &c.

The method of taking of caſts of figures and buſts is moſt generally by the uſe of plaſter of Paris, i. e. alabaſter calcined by a gentle heat. The advantage of uſing this ſubſtance preferably to others, is, that notwithſtanding a ſlight calcination reduces it to a pulverine ſtate, it becomes again a tenacious and cohering body, by being moiſtened with water, and afterwards ſuffered to dry; by which means either a concave or a convex figure may be given by a proper mold or model to it when wet, and retained by the hardneſs it acquires when dry: and from theſe qualities, it is fitted for the double purpoſe of making both caſts and molds for forming thoſe caſts. The particular manner of making caſts depends on the form of the ſubject to be taken. Where there are no projecting parts, it is very ſimple and eaſy; as likewiſe where there are ſuch as form only a right or any greater angle with the principal ſurface of the body: but where parts project in leſſer angles, or form a curve inclined towards the principal ſurface of the body, the work is more difficult.

The firſt ſtep to be taken is the forming the mould. In order to this, if the original or model be a baſs relief, or any other piece of a flat form, having its ſurface firſt well greaſed, it muſt be placed on a proper table, and ſurrounded by a frame, the ſides of which muſt be at ſuch a diſtance from it as will allow a proper thickneſs for the ſides of the mould. As much plaſter as will be ſufficient to cover and riſe to ſuch a thickneſs as may give ſufficient ſtrength to the mould, as alſo to fill the hollow betwixt the frame and the model, muſt be moiſtened with water, till it be juſt of ſuch conſiſtence as will allow it to be poured upon the model. This muſt be done as ſoon as poſſible; or the plaſter would concrete or ſet, ſo as to become more troubleſome in the working, or unfit to be uſed. The whole muſt then be ſuffered to remain in this condition, till the plaſter has attained its hardneſs; and then the frame being taken away, the preparatory caſt or mould thus formed may be taken off from the ſubject entire.

Where the model or original ſubject is of a round or erect form, a different method muſt be purſued; and the mould muſt be divided into ſeveral pieces: or if the ſubject conſiſts of detached and projecting parts, it is frequently moſt convenient to caſt ſuch parts ſeparately, and afterwards join them together.

Where the original ſubject or mould forms a round, or ſpheroid, or any part of ſuch round, or ſpheroid, more than one half the plaſter muſt be uſed without any frame to keep keep it round the model; and muſt be tempered with water to ſuch a conſiſtence, that it may be wrought with the hand like very ſoft paſte: but though it muſt not be ſo fluid as when prepared for flat figured models, it muſt yet be as moiſt as is compatible with its cohering ſufficiently to hold together: and being thus prepared, it muſt be put upon the model, and compreſſed with the hand, or any flat inſtrument, that the parts of it may adapt themſelves, in the moſt perfect manner, to thoſe of the ſubject, as well as be compact with reſpect to themſelves. When the model is ſo covered to a convenient thickneſs, the whole muſt be left at reſt till the plaſter be ſet and firm, ſo as to bear dividing without falling to pieces, or being liable to be put out of its form by ſlight violence; and it muſt then be divided into pieces, in order to its being taken off from the model, by cutting it with a knife with a very thin blade; and being divided, muſt be cautiouſly taken off, and kept till dry: but it muſt be always carefully obſerved, before the ſeparation of the parts be made, to notch them croſs the joints, or lines of the diviſion, at proper diſtances, that they may with eaſe and certainty be properly conjoined again; which would be much more precarious and troubleſome without ſuch directive marks. The art of properly dividing the moulds, in order to make them ſeparate from the model, requires more dexterity and ſkill than any other thing in the art of caſting; and does not admit of rules for the moſt advantageous conduct of it in every caſe. Where the ſubject is of a round or ſpheroidal form, it is beſt to divide the mould into three parts, which will then eaſily come off from the model: and the ſame will hold good of a cylinder or any regular curve figure.

The mold being thus formed, and dry, and the parts put together, it muſt be firſt greaſed, and placed in ſuch a poſition that the hollow may lie upwards, and then filled with plaſter mixed with water, in the ſame proportion and manner as was directed for the caſting the mould: and when the caſt is perfectly ſet and dry, it muſt be taken out of the mould and repaired, where it is neceſſary; which finiſhes the whole operation.

This is all that is required with reſpect to ſubjects where the ſurfaces have the regularity above mentioned: but where they form curves which interſect each other, the conduct of the operation muſt be varied with reſpect to the manner of taking the caſt of the mould from off the ſubject or model; and where there are long projecting parts, ſuch as legs or arms, they ſhould be wrought in ſeparate caſts. Lead and other metals may be caſt in this manner, obſerving to dry the mould ſufficiently before the hot metal is poured in. Caſt of medals may be taken in the ſame manner, but brimſtone is preferable.

Dr. Letſom recommends tin foil for taking off caſts from medals. The thinneſt kind is to be uſed. It ſhould be laid over the ſubject from which the impreſſion is to be taken, and then rubbed with a bruſh, the point of a ſkewer, or a pin, till it has perfectly received the impreſſion. The tin foil ſhould now be pared cloſe to the edge of the medal, till it is brought to the ſame circumference: the medal muſt then be reverſed, and the tin foil will drop off into a chip box or mould placed ready to receive it. Thus the concave ſide of the foil will be uppermoſt, and upon this plaſter of Paris prepared in the uſual manner, may be poured. When dry, the whole is to be taken out, and the tin foil ſticking on the plaſter, will give a perfect repreſentation of the medal, almoſt equal in beauty to ſilver. If the box or mould is a little larger than the medal, the plaſter running round the tin foil, will give the appearance of a white frame or circular border; whence the new made medal will appear more neat and beautiful.

Caſts may be made likewiſe in the following manner: "Take any iron bar, or piece of a ſimilar form; and having heated it red-hot, hold it over a veſſel containing water, and touch it very ſlightly with a roll of ſulphur, which will immediately diſſolve it, and make it fall in drops into the water. As much iron as may be wanted being thus diſſolved, pour the water out of the veſſel;

and pick out the drops formed by the melted iron from thoſe of the ſulphur, which contain little or no iron, and will be diſtinguiſhable from the other by their colour and weight." The iron will, by this means, be rendered ſo fuſible, that it will run with leſs heat than is required to melt lead; and may be employed for making caſts of medals, and many other ſuch purpoſes, with great convenience and advantage.

Casting alſo implies quitting or throwing any thing aſide; thus deer caſt their horns, ſnakes their ſkins, birds their feathers, &c. When domeſtic animals bring forth their young before the time appointed by nature, we ſay the cow has caſt her calf, the mare her foal, &c.

CASTLE, a fortreſs, or place rendered defenceable either by nature or art. It frequently ſignifies with us the principal manſion of noblemen. In the time of Henry II. there were no leſs than 1115 caſtles in England, each of which contained a manor.

Castle, in ancient writers, denotes a town or village ſurrounded with a ditch and wall, furniſhed with towers at intervals, and guarded by a body of troops. The word is originally Latin, *caſtellum*, a diminutive from eaſtrum. Caſtellum originally ſeems to have ſignified a ſmaller fort for a little garriſon: though Suetonius uſes the word where the fortification was large enough to contain a cohort. The caſtella, according to Vegetius, were often like towns, built on the borders of the empire, and where there were conſtant guards and fences againſt the enemy. Horſley takes them for much the ſame with what were otherwiſe denominated ſtations.

Castle, or *Caſtle Steed*, is alſo an appellation given by the country people in the north to the Roman caſtella, as diſtinguiſhed from the *caſtra ſtativa*, which they uſually call *cheſters*. Horſley repreſents this as an uſeful criterion, whereby to diſcover or diſtinguiſh a Roman camp or ſtation.

Castle, in ſea language, is an elevation on the deck of a veſſel; or a part of the deck, fore and aft, raiſed above the reſt, called the fore caſtle, hind caſtle, or poop.

CASTOR, or Beaver, in tetrapodology, a genus belonging to the order of glires. There are three ſpecies of caſtor, viz. 1. The fiber, with a plain ovated tail, is found on the banks of the rivers in Europe, Aſia, and America. It has ſhort ears hid in the fur; a blunt noſe; the fore feet ſmall, the hinder large: its length from noſe to tail about three feet, tail about one foot. It is from the inguinal glands of this animal that the caſtor is obtained; it is contained in cods or pouches reſembling a dog's teſticles. Nothing equals the art with which theſe animals conſtruct their dwellings. They chuſe a level piece of ground, with a ſmall rivulet running through it. This they form into a pond, by making a dam acroſs; firſt by driving into the ground ſtakes of five or ſix feet in length, placed in rows, wattling each row with pliant twigs, and filling the interſtices with clay, ramming it down cloſe. The ſide next the water is ſloped, the other perpendicular; the bottom is from ten to twelve feet thick; but the thickneſs gradually diminiſhes to the top, which is about two or three: the length of theſe dams is ſometimes not leſs than 100 feet.

Their houſes are made in the water collected by means of the dam, and are placed near the edge of the ſhore. They are built on piles; are either round or oval; but their tops are vaulted, ſo that their inſide reſembles an oven, the top a dome. The walls are two feet thick, made of earth, ſtones, and ſticks, moſt artificially laid together; and the walls within as neatly plaſtered as if with a trowel. In each houſe are two openings, the one into the water, the other towards the land. The height of theſe houſes above the water is eight feet. They often make two or three ſtories in each dwelling, for the convenience of change in caſe of floods. Each houſe contains from 20 to 30 beavers. Each beaver forms its bed of moſs; and each family forms its magazine of winter proviſions, which conſiſt of bark and boughs of trees. Thoſe they lodge under water, and fetch into their apartments as occaſion requires.

Beavers vary in their colour, the fineſt are black, but the general colour is a cheſnut brown; the ſkins are a prodigious article of trade, being the foundation and ſupport of the fine hat manufactory. It requires a great deal of art to catch or deſtroy thoſe animals; their ſegacity often eludes human invention. Would our limits permit we could with pleaſure dwell on the hiſtory of this ingenious and ſeemingly rational tribe of brutes.

2. The moſchatus, with a long, compreſſed, lanceolated tail, and palmated feet. It has a long ſlender noſe like that of a ſhrew mouſe; no external ears, and very ſmall eyes. Length from noſe to tail, ſeven inches; of the tail, eight. It is the water rat of Cluſius; and inhabits Lapland, Ruſſia, the banks of the rivers Wolga, and the Yaick. It never wanders far from the ſides; is very ſlow in its pace: makes holes in the cliffs, with the entrance far beneath the loweſt fall of the water; works upwards, but never to the ſurface, only high enough to be beyond the higheſt flow of the river; feeds on fiſh.

3. The zibethicus or muſk rat, with a long compreſſed, lanceolated tail, and the toes of the feet ſeparated from each other. Length from noſe to tail, one foot; of the tail, nine inches. This ſpecies inhabits North America, breeds three or four times in a year, and brings from three to ſix young ones at a time: during ſummer the male and female conſort together: at the approach of winter they unite in families, and retire into ſmall round edifices covered with a dome, formed of herbs and reeds cemented with clay: at the bottom are ſeveral pipes through which they paſs in ſearch of food; for they do not form magazines like the beaves during winter.

Castor, or *Caſtoreum*, in the materia medica, the inguinal glands of the beaver, it was formerly thought it lodged in the teſticles, but male and female produce it. The beſt ſort of caſtor comes from Ruſſia, the inferior from America; the former will ſell for two guineas per pound, when the latter is worth no more than eight ſhillings and ſixpence. The Ruſſia is in large hard round cods, which appear when cut full of a brittle liver coloured ſubſtance; has a diſagreeable ſtrong ſmell, and a bitter nauſeous taſte: water extracts the nauſeous part with little of the finer bitter; rectified ſpirit extracts the laſt without much of the nauſceous; proof ſpirit both. Water elevates the whole of its flavour in diſtillation; rectified ſpirits bring over nothing. Caſtor is eſteemed one of the capital nervine antihiſteric medicines.

The Ruſſian way of curing caſtoreum is deſcribed in the Philoſophical Tranſactions thus: "to prepare the matter of the bea-
" ver's ſtones (the bags it ſhould be), boil a proper quantity
" of water, with half a ſhovel full of wood aſhes, tie the bags
" in couples, and put them in the boiling water for half a quarter
" of an hour. Lay birch bark on the fire, and ſmoke the bags
" well over it for an hour, till they be well dried; hang them up
" for a week or more, till perfectly dry and hard; they may then
" be packed up for uſe or exportation."

CASTRATION, the operation of gelding, i. e. of cutting out the teſticles, and putting a male animal out of a capacity of generation.

Caſtration is much in uſe in Aſia, eſpecially among the Turks, who practiſe it on their ſlaves, to prevent any commerce with their women. The Turks often make general amputation.

Caſtration is uſed in Italy with a view to preſerve the voice for ſinging.

The Perſians, and other Eaſtern nations, have divers methods of making eunuchs, different from thoſe practiſed in Europe: we ſay, of making eunuchs, for it is not always done among them by cutting, or even colliſion. Cicuta and other poiſonous herbs do the ſame office, as is ſhewn by Paulus Ægineta. Theſe eunuchiſed in this manner are called *thlibiæ*. Beſides which there is another ſort named *thlaſiæ*, in whom the genitals are left entire, and only the veins which ſhould feed them are cut; by which means the parts do indeed remain, but ſo lax and weak, as to be of no uſe.

The virility of various kinds of females of the brute creation is deſtroyed by caſtration, or the uſe of the knife, commonly called ſpaying.

Caſtration was for ſome time the puniſhment of adultery.

Castration is uſed figuratively for the art of retrenching, or cutting away any part of a thing from its whole.

CASTREL, a kind of hawk reſembling the lanner in ſhape, but the hobby in ſize. The caſtrel, called alſo keſtrel, is of a ſlow and cowardly kind.

CASU *Conſimili*, in law, a writ of entry, where a tenant by courteſy, or for life, aliens in fee, or in tail, or for another's life.

Casu *Proviſoe*, a writ of entry given by the ſtatute of Glouceſter, in caſe where a tenant in dower aliens in fee, or for term of life, in tail; and lies for him in reverſion againſt the *aliens*.

CASUAL, ſomething that happens fortuitouſly, or without any deſign, or meaſures taken to bring it to paſs.

CASUIST, a perſon who profeſſes to reſolve caſes of conſcience. Eſcobar has made a collection of the opinions of all the caſuiſts before him.

To caſuiſtry belong the deciſion of all difficulties ariſing about what a man may conſcientiouſly do, or not do; what is ſin, or not ſin; what things a man is obliged to do in order to diſcharge his duty, and what he may let alone without breach of it.

CAT, in tetrapodology, claſſed by Linnæus in the 3d Order and the 12th Genera.

The domeſtic cat is diverſified with an almoſt infinite variety of colours and ſtreaks; but the natural colour, in a wild ſtate, is a brown tawny, variegated with ſtreaks of a pale whitiſh colour. In France the cats are all of a bluiſh lead colour, and in the north of Europe they are all white.

Cat, in ſea language, denotes a ſhip formed on the Norwegian model, and employed in the coal trade. It is diſtinguiſhed by a narrow ſtem, projecting quarters, a deep waiſt, and by having an ornamental figure on the prow. Theſe veſſels uſually carry from four to ſix hundred tons. Two ſhort beams projecting almoſt horizontally over the ſhip's prow are called catheads.

Cat *Harpings*, are ſmall ropes running in blocks from one ſide of the ſhrouds to the other near the deck.

Cat *Gut*, a denomination given to ſmall ſtrings for fiddles, and other inſtruments, made of the inteſtines of ſheep or lambs, dried and twiſted, either ſingly, or ſeveral together.

Theſe are ſometimes coloured red, ſometimes blue, but are commonly left whitiſh or browniſh, the natural colour of the gut. They are uſed alſo by watchmakers, cutlers, turners, and other artificers. Great quantities are imported into England, and other northern countries, from Lyons and Italy.

Cat *of Mountain*, the name of a beaſt or prey approaching to the leopard kind.

CATACAUSTIC *Curves*, in the higher geometry, the ſpecies of cauſtic curves formed by reflexion. See Fluxions.

CATACHRESIS, in rhetoric, a trope which borrows the name of one thing to expreſs another. Thus Milton, deſcribing Raphael's deſcent from the empyreal heaven to paradiſe, ſays,

> " Down thither prone in flight,
> " He ſpeeds, and through the vaſt etherial ſky
> " Sails between worlds and worlds."

CATACOMBS, denote grottos, or ſubterraneous cavities, for the burial of the dead.

The Catacombs in Italy, are an aſſemblage of ſubterraneous ſepulchres about Rome, chiefly at about three miles from that city in the Via Appia.

Each catacomb is three feet broad, and eight or ten high; running in form of an alley, or gallery, and communicating with others: in many places, they extend within a league of Rome. There is no maſonry or vaulting therein, but each ſupports itſelf: the two ſides, which we may look on as the parietes, or walls, were the place where the dead were depoſited; which were laid lengthwiſe, three or four rows over one another, in the ſame catacomb, parallel to the alley. They were commonly cloſed with large thick tyles, and ſometimes pieces of marble, cemented in a manner inimitable by the moderns.

Dr. Monro, in the Philoſophical Tranſactions, ſuppoſes the catacombs to have been originally the common ſepulchres of the firſt Romans, and dug in conſequence of theſe two opinions; that ſhades hate the light, and they love to hover about the places where the bodies are laid. The catacombs of Rome have made the greateſt noiſe in the world; but there are ſuch belonging to many other cities. Biſhop Burnet deſcribes thoſe of Naples, which he ſays are without the city, and much more noble and ſpacious than thoſe of Rome. The like are alſo to be in the neighbourhood of all the great towns in that part of Italy: and others have been diſcovered at Syracuſe and Catanea in Sicily, and in the iſland of Malta.

There are men kept conſtantly at work in the catacombs. As ſoon as theſe labourers diſcover a grave, with any of the ſuppoſed marks of a ſaint about it, intimation is given to the cardinal Camerlingo, who immediately ſends men of reputation to the place, where finding the palm, the monogram, the coloured glaſs, &c. the remains of the body are taken up with great reſpect, and tranſlated to Rome. After the labourers have examined a gallery, they ſtop up the entry that leads into it; ſo that moſt of them remain thus cloſed: there being only a few left open, to keep up the trade of ſhewing them to ſtrangers.

The method of preſerving the dead in catacombs ſeems to have been common to a number of the ancient nations. The catacombs of Egypt are ſtill extant, about nine leagues from the city of Grand Cairo, and two miles from the city of Zaccara. They extend from thence to the pyramids of Pharaoh, which are about eight miles diſtant. They lie in a field covered with a fine running ſand, of a yellowiſh colour. The country is dry and hilly; the entrance of the tomb is choaked up with ſand; there are many open, but more that are ſtill concealed.

The bodies found in catacombs, eſpecially thoſe of Egypt, are called mummies; and as their fleſh was formerly reckoned an efficacious medicine, they were much ſought after. In this work the labourers were often obliged to clear away the ſand for weeks together, without finding what they wanted. Upon coming to a little ſquare opening of about 18 feet in depth, they deſcend into it by holes for the feet, placed at proper intervals; and there they are ſure of finding a mummy. Theſe caves, or wells, as they call them there, are hollowed out of a white free ſtone, which is found in all this country a few feet below the covering of ſand. When arrived at the bottom, which is ſometimes 40 feet below the ſurface, there are ſeveral ſquare openings on each ſide, into paſſages of 10 or 15 feet wide; and theſe lead to chambers of 15 or 20 feet ſquare. Theſe are all hewn out into the rock; and in each of the catacombs are to be found ſeveral of theſe apartments communicating with one another. They extend a great way under ground, ſo as to be under the city of Memphis, and in a manner to undermine its environs. In ſome of the chambers the walls are adorned with figures and hieroglyphics; in others the mummies are found in tombs, round the apartment hollowed out in the rock.

CATAGOGION, Κἀlαγωγιον, a heathen feſtival at Epheſus, celebrated on the twenty-ſecond of January, in which the devotees run about the ſtreets dreſſed in divers antic and unſeemly manners, with huge cudgels in their hands, and carrying with them the images of their gods.

CATALEPSIS, *Catalepſy*, from καlαλαμϐανειν, to occupy, in medicine, a kind of apoplexy: or drowſy diſeaſe, wherein the patient is taken ſpeechleſs, ſenſeleſs, and fixed in the ſame poſture, wherein the diſeaſe firſt ſeized him; and his eyes open, without ſeeing, or underſtanding.

CATALOGUE, a liſt or enumeration of the names of ſeveral books, furniture, or other thing; diſpoſed according to a certain order.

CATALLIS *Reddendis*, in law, a writ that lies where goods being delivered to perſons to keep till a certain day, are not on demand delivered on that day.

CATALS, *Catalla*, goods or chattels.

CATAMENIA, from κατα and μην, month, in medicine, women's monthly purgations, called alſo menſes.

CATANACHE, in botany, candia lion's foot.

CATAPELTA, an inſtrument of puniſhment, in uſe among the ancients. It conſiſted of a kind of a preſs, compoſed of planks, between which the criminal was cruſhed to death.

CATAPHORA, in a theme of the heavens, an appellation given to the houſes falling from the third, ſixth, ninth, and twelfth angles. In which ſenſe the word ſtands oppoſed to anaphora.

CATAPHRACTA, among ſurgeons, denotes a bandage of the thorax; thus denominated from its reſemblance to a Roman breaſt plate, called cataphracta.

CATAPHRACTUS, denotes a thing defended or covered on all ſides with armour.

The cataphracta equites were a ſort of cuiraſſiers, not only fortified with armour themſelves, but having their horſes guarded with ſolid plates of braſs or other metals uſually lined with ſkins, and wrought into plumes of other forms. Their uſe was to bear down all before them, to break in upon the enemies ranks, and ſpread terror and havock wherever they came, as being themſelves invulnerable and ſecure from danger. But their diſadvantage was their unwieldineſs, by which, if once unhorſed, or on the ground, they were unable to riſe, and thus fell a prey to the enemy.

CATAPLASM, popularly called poultice, an external medicine, in form of a pulp; of a ſoft conſiſtence, like an unguent, or cerat; compoſed of various liquors, parts of plants, oils, unguents, &c. according to the variety of intentions.

The word comes from the Greek καταπλασσω, *illino*, I ſmear or apply outwardly.

Its ordinary uſes are to aſſuage pain, and ſoften, reſolve, diſcuſs, or ſuppurate matter collected in the external parts of the body.

The common cataplaſm for theſe intentions, is compoſed of white bread, milk, yolks of eggs, ſaffron, and oil of roſes.

Cataplasma *è Cymino*, the cummin ſeed cataplaſm, a form of medicine preſcribed in the late London Diſpenſatory, and meant as a ſubſtitute for the London treacle of former Diſpenſatories, which has of late been uſed only externally, and for ſuch purpoſes as it is thought this will better ſerve for. The compoſition is this: take cummin ſeeds, half a pound; bay berries and leaves of ſcordium dried, of each three ounces; of cloves, one ounce; honey, three times the weight of the whole: mix all together into a cataplaſm.

Cataplasma *Maturans*, a form of medicine in the late London Pharmacopœia ordered to be made in the following manner: take dried figs, four ounces; yellow baſilicon, one ounce; ſtained galbanum, half an ounce: beat well the figs in a little wine or ſtrong ſtale beer, and then carefully mix in the ointment, firſt melted with the galbanum.

CATAPULTA, in antiquity, a military engine contrived for the throwing of arrows, darts, and ſtones upon the enemy. Some of theſe engines were of ſuch force that they would throw ſtones of an hundred weight. Joſephus takes notice of the ſurprizing effects of theſe engines, and ſays, that the ſtones thrown out of them beat down the battlements, knocked off the angles of the towers, and would level a whole file of men from one end to the other, was the phalanx ever ſo deep.

CATARACT, in hydrography, a precipice in the channel of a river, cauſed by rocks, or other obſtacles, ſtopping the courſe of the ſtream, from whence the water falls with a greater noiſe and impetuoſity: ſuch are the cataracts of the Nile, the Danube, Rhine, and the famous one of Niagara in America.

Cataract, in medicine and ſurgery, a diſorder of the humours of the eye, by which the pupilla, that ought to appear tranſparent and black, looks opaque, blue, grey, brown, &c. by which viſion is variouſly impeded, or totally deſtroyed.

CATARACTA, in ornithology, the name of a bird of the larus, or ſea gull kind, very much approaching to the nature of our gannet, but ſmaller, and with ſhorter and weaker claws. It much reſembles the goſhawk. Its back and wings are variegated with brown, yellow, and white; its breaſt and belly are white, variegated with brown ſpots; its wings are long, and, when folded, reach to the end of the tail; its legs are grey; its feet webbed, and its claws crooked and ſmall.

CATARACTES, in ornithology, a name by which ſome authors have called the large ſea gull; called in Cornwall, where it is very common, the gannet.

CATARRH, in medicine, an extraordinary diſtillation, or defluxion of a ſharp, ſerous humour, from the glands, eſpecially about the head and throat, upon the parts ſubjacent.

The word is formed from κατaῤῥεω, *defluo, I flow down*. Caſarrhs are generally occaſioned by a diminution of inſenſible perpiration on taking cold; the effect whereof is, that the lymph, that ſhould paſs by the ſkin, ouſes out upon thoſe glands; and being thus extravaſated, occaſions irritations, coughs, and all the uſual ſymptoms.

Degory deduces all diſeaſes from catarrhs, which he looks upon as the ſeminary of moſt diſorders of the body.

When during the diſorder the fæces are indurated, and the patient coſtive, beſides water gruel, decoctions of manna, prunes, and raiſins, nothing is more proper than emollient clyſters. When the cough is violent and racking, it is to be allayed with recent oil of ſweet almonds, mixed with ſyrup of maidenhair.

Grown perſons are ſooner taken off by this diſeaſe than young children, with whom it ſometimes continues above a week or a fortnight. In old people, the fatal event of the diſeaſe is ſo ſudden, that it is often dubious whether it were this diſorder, or an apoplexy; and in general it ſeems probable, that many of the perſons, ſaid to die of apoplexies, die, in reality, of the violent attacks of this terrible diſeaſe.

CATARRHAL *Fever*, a ſecondary or ſymptomatic fever, by means whereof nature endeavours to correct the vitious quality of the lymph, and expel it from the body.

There is alſo a malignant catarrhal fever, nearly akin to the petechial fever.

CATASTROPHE, in dramatic poetry, the fourth and laſt part in the ancient drama, or, that immediately ſucceeding the cataſtaſis: or according to others, the third only; the whole drama being divided into protaſis, epitaſis, and cataſtrophe; or, in the terms of Ariſtotle, prologue, epilogue, and exode.

The cataſtrophe clears up every thing, and is nothing elſe but the diſcovery or winding up of the plot. It has its peculiar place: for it ought entirely to be contained, not only in the laſt act, but in the very concluſion of it; and when the plot is finiſhed, the play ſhould be ſo alſo.

Boſſu divides the cataſtrophe, at leaſt with regard to the epopea, into the unravalling, or denouement, and the achevement, or finiſhing; the laſt of which he makes the reſult of the firſt, and to conſiſt in the hero's paſſage out of a ſtate of trouble and agitation, to reſt and quiet. This period is but a point without extent, or duration; in which it differs from the firſt, which comprehends every thing after the knot, or plot laid. He adds, that there are ſeveral knots, which beget one another: the finiſhing is the end of the laſt unravelling.

CATCH, in the muſical ſenſe of the word, a fugue in the uniſon, wherein, to humour ſome conceit in the words, the melody is broken, and the ſenſe interrupted in one part, and caught again or ſupported by another; as in the catch in Shakeſpeare's play of the Twelfth Night, where there is a catch ſung by three perſons, in which the humour is, that each who ſings, calls and is called knave in turn.

CATCH LAND, ſuch land, particularly in Norfolk, with reſpect to which it is not certainly known to what pariſh it belongs; ſo that the perſon who firſt get the tythes there, enjoys it for that year, by right of preoccupation.

CATCH WORD, among printers, denotes the firſt word of a page, which is put alſo at the bottom of the preceding page, in order to ſhew how the leaves and ſheets follow each other, and facilitate the folding and binding.

CATECHISM, *Catechiſmus*, in its primary ſenſe, an inſtruction or inſtitution in the principles of the Chriſtian religion, delivered *viva voce*, and ſo as to require frequent repetitions from the diſciple or hearer of what had been ſaid.

Anciently the candidates of baptiſm were only to be inſtructed in the ſecrets of their religion by tradition, *viva voce*, without writing; as had alſo been the uſage among the Egyptian prieſts, and the Britiſh and Gauliſh druids, who only communicated the myſtery of their theology by word of mouth. Shafteſbury, Charact. Vol. III. p. 241. not.

CATECHISM is more frequently uſed in modern times, for an elementary book, wherein the principal articles of religion are ſummarily delivered in the way of queſtion and anſwer.

CATECHIST, *Catechata*, he that catechiſes, i. e. inſtructs novices in the principles of religion.

CATECHIST more particularly denotes a perſon appointed by the church to inſtruct thoſe intended for baptiſm, by word of mouth, in the fundamental articles of the Chriſtian faith.

The chatechiſts of churches were miniſters uſually diſtinct from the biſhops and preſbyters, and had their auditories or catechumena apart. Their buſineſs was to inſtruct the catechumens, and prepare them for the reception of baptiſm. But the catechiſts did not conſtitute any diſtinct order of the clergy, but were choſen out of any other order.

CATECHU, a medicinal aromatic ſubſtance brought from the Eaſt Indies; called alſo cachew, and japan earth, and when prepared, ranked in the number of perfumes. It is of a dark purple colour; very auſtere upon the palate, ſeeming to melt in the mouth, and leaving ſomewhat of a ſweetiſh taſte behind it.

Cachew, or catechu, is of much eſteem in medicine. It is famous for ſtopping fluxes of all kinds; and among other effects attributed to it, it is ſuppoſed to ſtop a cough; and fortiſy the ſtomach; beſides its ſweetening and perſuming the breath, when taken in an impalpable powder, mixed with gum tracanth.

CATEGORICAL, in a general ſenſe, is applied to thoſe things ranged under a category.

CATEGORICAL, alſo imports a thing to be abſolute, and not reſtrained to conditions.

In which ſenſe it ſtands oppoſed to hypothetical and conditional. We ſay a categorical propoſition, a categorical ſyllogiſm.

A categorical anſwer denotes an expreſs and pertinent anſwer, made to any queſtion or objection propoſed.

CATEGORUMENUM, denotes the predicate, or that part of a propoſition which is affirmed of the ſubject.

Some miſtakenly call this categorema.

CATEGORY, in logic, a ſyſtem, or aſſemblage, of all the beings contained under any genus, or kind; ranged in order. The word category was borrowed by the ſchools from the forum, or courts of juſtice: for as, in a trial, the plaintiff, or proſecutor, in accuſing the criminal, or priſoner, muſt charge him expreſly, or affirm that he did this or that, in poſitive terms: whence the word category, viz. from κατηγορειν, to aver, or declare a charge of accuſation: ſo in the doctrine of categories every higher may be expreſly and abſolutely predicated, or affirmed, of every lower.

The ſchool philoſophers, diſtribute all beings, all the objects of our thoughts or ideas, into certain genera, or claſſes, in order to get a more diſtinct and preciſe notion thereof; which claſſes the Greeks call *categories*, and the Latins *predicaments*.

The ancients, after Ariſtotle, generally make ten categories: under the firſt, all ſubſtantives are compriſed; and all the accidents under the nine laſt; viz. quantity, quality, relation, action, paſſion, time, place, ſituation, and habit; which are uſually expreſſed, or ſignified, by the following technical diſtich:

Arbor, ſex, ſervos, ardore, refrigerat, uſtos,
Ruri, cras, ſtabo, nec tunicatus ero.

But as theſe ten categories of Ariſtotle, which logicians make ſuch myſteries of, are arbitrary, they are now almoſt excluded. Accordingly, ſome philoſophers think all nature may be better conſidered under theſe ſeven things, ſpirit, matter, quantity, ſubſtance, figure, motion, and reſt: and others make but two categories, ſubſtance and attribute, or ſubject and accident. See on the ſubject, and in vindication of the categories of Ariſtotle, Harris's Philoſophical Arrangements, chap. ii.

CATERPILLAR, eruca, in entomology. The caterpillar ſtate is that through which every butterfly muſt paſs before it arrives at its perfection and beauty, and in the ſame manner all the known winged animals, except only the puceron, paſs through a reptile ſtate, none of them, except this, being produced in the winged form. When the animal lies in what is called the nymph or cryſalis ſtate, in appearance only a lump of unenlivened matter. There is a ſettled and determined time for each of theſe changes in every ſpecies; but in the ſeveral different kinds the periods are very different. Some caterpillars are produced from the eggs of their parent butterfly in ſpring, as ſoon as the trees, on whoſe leaves they are to feed, begin to bud; after a life of thirteen days, they paſs into their chryſalis ſtate; and, after remaining at reſt three weeks in that, they iſſue forth with wings, with all the beauty of their parents.

As ſoon as they arrive at this their final ſtate, their wings are ſcarce dry before they ſeek to copulate or propagate their ſpecies; this done, the male dies, and the female only lives to depoſit her eggs, and then follows him. This is their whole buſineſs; nature never intending that they ſhould eat in this ſtate, has given them no organs for that purpoſe: ſo that they muſt neceſſarily die of hunger ſoon, could they eſcape their natural death, or the great devourers of them the birds. Many ſpecies of theſe ſpring butterflies have no farther being, except in the embryo included in the egg, till the ſucceeding ſpring: they lay their eggs very carefully, and in extremely nice order, round about the ſtalk of a perennial plant, or the young branch of a tree, and there they remain through the heats of the ſummer, and colds of the winter, and are never hatched till the ſucceeding ſpring; and though thus expoſed, it is obſervable that the ſevereſt winters do them no harm. Other ſpecies of theſe are ſooner hatched from the egg, and live the remainder of the ſummer on the leaves of the trees. They, after this, paſs the whole winter in the caterpillar ſtate, uſually hiding themſelves in ſome ſheltered place, covered with webs of their own ſpinning. Theſe remain torpid all the winter, and, at the return of ſpring, leave their webs as the others do their eggs, and feed a few weeks longer, after which they paſs through the chryſalis ſtate to their perfect form. The butterfly of this ſpecies, therefore, enjoys a much longer time of life than the other which remains ſo long in the egg; though the ultimate duration of the animal, from its excluſion from the parent, till its death, is much the ſame; ſo great a part of it being paſſed in the egg-ſtate by the one, and ſo ſmall a part by the other.

Other ſpecies of theſe animals remain the whole winter in the chryſalis ſtate, and are butterflies in ſpring, and, after paſſing the middle of ſummer in the egg, are caterpillars in the autumn. The difference of this ſtage of life is remarkably great, in proportion to the whole duration of the animal; in ſome ſpecies it does not exceed a fortnight, and in others continues eleven months.

There is no ſign of ſex in the animal, while in the caterpillar ſtate; the propagation of the ſpecies is the buſineſs of the creature in its ultimate perfection, and, till that, theſe parts are never excluded. One female butterfly, when ſhe has been impregnated by the male, will produce three or four hundred eggs, or even more.

The males, however, have a ſort of beards, more beautiful than the antennæ, or horns of the females; the female is much ſtronger, as well as bigger, than the male, and not unfrequently, at the approach of danger or diſturbance, flies away with him in the time of copulation..

On diſſecting the female, her uterus affords an aſtoniſhing ſight; the number of eggs in the tubes is amazing; but theſe have not all the ſame figure; and in ſome ſpecies, as the ſilk-worm, &c. the eggs are of a beautiful blue; if any yellowiſh ones are ſeen among them, they are judged to be defective.

The care of all the butterfly tribe, to lodge their eggs in ſafety, is ſurpriſing. Thoſe whoſe eggs are to be hatched in a few weeks, and are to live in the caterpillar ſtate during part of the remaining ſummer, always lay them on the leaves of ſuch plants as will afford them a proper nouriſhment; but, on the contrary, thoſe whoſe eggs are to remain unhatched till the following ſpring, always lay them on the branches of trees and ſhrubs, and uſually are careful to ſelect ſuch places as are leaſt expoſed to the rigours of the enſuing ſeaſon, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpoſe; others hide themſelves in hollow places in trees, and in other ſheltered cells, and there live in a ſort of torpid ſtate the whole winter, that they may depoſit their eggs in the ſucceeding ſpring, at a time when there will be no ſeverities of weather for them to combat. The day-butterflies only do this; but the night ones, or phalenæ, all without exception, lay their eggs as ſoon as they have been in copulation with the male, and die immediately afterwards.

It is well known that the common and natural food of theſe creatures is the leaves and verdure of vegetables; yet as weak and harmleſs as they ſeem, they will many of them deſtroy their fellows whenever they get an opportunity. Reaumur gives us an inſtance of this in twenty caterpillars of the oak, which he kept in a box, with a ſufficient quantity of their natural food, yet their numbers daily decreaſed, till at length there remained only one. This is, however, only the caſe in ſome few ſpecies, the generality of theſe animals being very peaceable, many ſpecies living together in the ſame place, without moleſting one another. Theſe ſpecies, however, though freed from theſe dangers, are expoſed to others of a much more terrible kind; the worms or maggots of ſeveral ſorts of flies are frequently found about them, ſome preying upon their outſide, others lodged within them, under the ſkin, but both kinds eating the poor defenceleſs creature up alive. Thoſe which feed on the outſides are eaſily diſcovered, the others are more hid, and frequently the caterpillar, which ſeems very hearty and vigorous, and very fleſhy, ſhall be found, upon opening, to be a mere ſkin, the internal parts being all eaten away, and all the food that he ſwallows ſerving only to feed a vaſt number of worms, or maggots, which crawl about at liberty within him. Theſe devouring worms are of many different ſpecies, ſome being of the gregarious, ſome of the ſolitary kinds, and ſome ſpinning webs of their own ſilk to transform themſelves in, others undergoing that change without any ſuch covering. The beautiful cabbage caterpillar is one of thoſe unhappy kinds which frequently are infeſted with the gregarious kinds, large numbers of which ſpin themſelves webs one after another, and afterwards come out in ſhape of the parent fly, to whoſe eggs they owed their origin.

Theſe inteſtine enemies are a ſure prevention of the butterfly's appearing at its proper time; and as many of the former naturaliſts, who knew what butterfly to expect from a peculiar ſpecies of caterpillar which they preſerved, often ſaw a parcel of flies come out in the place of it, they having no idea that the fly had laid its eggs in the fleſh of the poor creature, ſuppoſed that this was one of the natural transformations of the creature, and that certain ſpecies of the caterpillars ſometimos produced butterflies, ſometimes ſmall flies.

Theſe, and many other deſtroyers, among which the birds are to be reckoned in the principal place, ſerve a noble purpoſe in preventing the too great numbers of theſe miſchievous animals. Their uſual habitations being the leaves and flowers of plants, they are, in their feeding, much expoſed to all thoſe deſtroyers; yet nature has taken care to preſerve a great number, by making many of them ſo exactly of the colours of the leaves they feed on that they are not ſo eaſily diſtinguiſhed from them; and by giving others a caution of keeping on the under part of the leaves, and being, by that means, out of ſight. But ſome ſpecies are much leſs expoſed, and of much more miſchief to the plants they feed on, by devouring more eſſential parts of them. Of theſe ſome eat the roots, and others the interior part of the trunk, deſtroying the veſſel that imbibe, and thoſe that diſtribute the juices. Theſe are different from the common caterpillars, in that their ſkin is much leſs tough and hard, and theſe are ſecure from our obſervation, and, in general, from their great deſtroyers the birds. They are not, however, abſolutely ſafe from the common dangers of the other ſpecies; for there are a kind of worms that find their food and habitation even in the bodies of theſe.

The root caterpillars, and thoſe which live within the branches of plants, are much more eaſy found out. The roots of ſcrophularia, and the ſtalks of lettuces, and ſome other plants, afford caterpillars which ſeem all of the ſame ſpecies. Thoſe found in the lettuces are extremely plentiful ſome years, and deſtroy vaſt quantities of that plant. Theſe uſually have their firſt habitation in the ſtalk, near the root.

Nothing more ſurpriſes us, in regard to inſects, than their induſtry; and in this the caterpillars yield to no kind, not to mention their ſilk, the ſpinning of which is one great proof of it. The ſheaths and caſes which ſome of theſe inſects build for the paſſing their transformations under, are, by ſome, made of the ſilk, with their own hair, mixed with pieces of bark, leaves, and other parts of trees, with paper, and other materials; and the ſtructure of theſe is well worthy our attention.

There are others whoſe workmanſhip, in this article, far exceeds theſe. There is one which builds in wood, and is able to give its caſe a hardneſs nearly as great as the wood itſelf in its natural ſtate. This is the ſtrange horned caterpillar of the willow, which is one of thoſe that eat their exuviæ. This creature has extremely ſharp teeth, and with theſe it cuts the wood into a number of ſmall fragments; theſe fragments it afterwards unites together into a caſe, of what ſhape it pleaſes, by means of a peculiar ſilk, which is no other than a tough and viſceus juice, which hardens as it dries, and is a ſtrong and firm cement. The ſolidity of the caſe being thus provided for, we are to conſider, that the caterpillar incloſed in it is to become a butterfly, and the wonder is, in what manner a creature of this helpleſs kind, which has neither legs to dig, or teeth to knaw with, is to make its way out of ſo firm and ſtrong a lodgment as this in which it is hatched. It has been ſuppoſed by ſome, that the butterfly, as ſoon as hatched, diſcharged a liquor which ſoftened the viſcous matter that holds the caſe together, and ſo its ſeveral fragments falling to pieces, the way out lies open. This is evidently the truth of the caſe, though thoſe who ſuppoſed it, did it by mere conjecture; for, on a ſtrict examination, this liquor is always to be found in the animal, and is of the moſt proper kind for ſuch a ſervice. Reaumur judged, from the effects, that this liquor muſt be of a ſingular nature, and very different from the generality of animal fluids; and in diſſecting this creature in the caterpillar ſtate, there will always be found near the mouth, and under the œſophagus, a bladder, of the bigneſs of a ſmall pea, full of a limpid liquor, of a very quick and penetrating ſmell, and which, upon divers trials, proves to be a very powerful acid; and, among other properties, which it has in common with other acids, it ſenſenſibly ſoftens the glue of the caſe, on a common application.

It is evident that this liquor, beſides its uſe to the caterpillar, remains with it in the chryſalis ſtate, and is the very thing that gives it a power of diſſolving the ſtructure of the caſe, and making its way through in a proper manner, at the neceſſary time. Dr. Boerhaave has adopted the opinion, that there are no true acids in animals, except in the ſtomach, or inteſtines; but this familiar inſtance proves the error of that determination. Phil. Tranſ. abr. Vol. IX. p. 39, &c.

Another very curious and myſterious artifice, is that by which ſome ſpecies of caterpillars, when the time of their changing into the chryſalis ſtate is coming on, make themſelves lodgments in the leaves of the trees, by rolling them up in ſuch a manner as to make themſelves a ſort of hollow cylindric caſe, proportioned to the thickneſs of their body, well defended againſt the injuries of the air, and carefully ſecured for their ſtate of tranquility.

Beſides theſe caterpillars, which in this manner roll up the leaves of plants, there are other ſpecies which only bend them once, and others which, by means of thin threads, connect many leaves together to make them a caſe. All this is a very ſurpriſing work, but all much inferior to this method of rolling.

The different ſpecies of caterpillars have inclinations, not only in their ſpinning, and their different choice of food, but even in their manners and behaviour one to another. Some never part company from the time of their being hatched to their laſt change, but live and feed together, and undergo together their laſt change into chryſalis ſtate. Others ſeparate one from another as ſoon as able to crawl about, and each hunts its fortune ſingle: and there are others which regularly live to a certain time of their lives in community, and then ſeparate each to ſhift for itſelf, and never to meet again in that ſtate. Reaumur, Hiſt. Inſect. Vol. II. *paſſim.*

Caterpillars are very deſtructive and pernicious in gardens, particularly thoſe of two ſpecies. The one of theſe is that which afterwards becomes the common white butterfly. This is of a yellowiſh colour, ſpotted with black, and infeſts the leaves of cabbages, cauliflowers, and the Indian creſs, of which it eats off all the tender parts, leaving only the fibres entire, ſo that whole plantations are often ſeen deſtroyed by them in autumn, eſpecially ſuch as are near large buildings, or are crouded with trees. There is no remedy againſt this evil, but the pulling the creatures off before they are ſpread from their neſts, and watching the butterflies, which are daily, in the hot weather, depoſiting their eggs on theſe plants. Theſe, however, feed principally on the outſide of the leaves of the plants, and are therefore the eaſier taken off; but the other kind lives near the centre, and therefore is with much more difficulty diſcovered. This is much larger, and the ſkin is very tough, and of a brown colour. It is called, by the gardeners, a grub, and is extremely pernicious. The eggs which produce it are uſually depoſited in the very heart, or centre, of the plant, particularly in cabbages; and the creature, when formed and grown to ſome ſize, eats its way through all the leaves, and leaves its dung in great quantity behind it, which ſpoils the cabbage. This inſect alſo burrows under the ſurface of the ground, and makes ſad havock among young plants, by eating off their tender ſhanks, and drawing them into the holes. This miſchief is chiefly done in the night; but wherever a plant is ſeen thus deſtroyed, if the earth be ſtirred with a finger an inch deep, the creature will be certainly found; and this is the only way of deſtroying them.

When theſe inſects attack fruit trees, the beſt method of driving them off is to boil together a quantity of rue, wormwood, and the common tobacco, of each equal parts, in common water; to make the liquor very ſtrong, and ſprinkle it on the leaves and young branches every night and morning, during the time when the fruit is ripening.

In Dr. Hawkeſworth's Account of the Voyages to the South Seas, Vol. iii. p. 520, we have the following account of a kind of ſmall green caterpillar, which the voyagers found in great numbers, on the true Weſt Indian mangroves. Their bodies were thick ſet with hairs, and they were ranged on the leaves ſide by ſide like files of ſoldiers, to the number of twenty or thirty together. When they touched them, they found that the hair of their bodies had the quality of a nettle, and gave them a much more acute, though leſs durable pain. For the claſſification of this animal, ſee Syſtem of ENTOMOLOGY.

Water CATERPILLARS, *Erucæ Aquaticæ*. It might ſeem incredible that there is any ſuch creature as a caterpillar, whoſe natural habitation is under water; but experience and obſervation prove that there are ſuch, and that they feed on the water plants as regularly as the common kinds do on thoſe at land. Theſe are not named at random, like many of the aquatic animals of the larger kinds, the ſea-wolf, and the ſea-horſe, &c. which might as well be called any thing elſe as wolves and horſes, but they are properly what they are called, and do not reſpire in the manner of the fiſh-tribe, but by their ſtigmata, as other caterpillars. M. Reaumur, in his obſervations, met with two ſpecies of theſe, the one upon the potamogiton, or pond-weed, the other upon the lenticula, or duck-meat. Theſe are both very induſtrious animals; but the firſt being much the larger, its operations are more eaſily diſtinguiſhed.

This, though truly an aquatic animal, ſwims but badly, and does not at all love to wet itſelf. The parent-butterfly lays her egg on a leaf of the potamogiton, and, as ſoon as the young caterpillar is hatched, it gnaws out a piece of the leaf of a roundiſh ſhape. This it carries to another part of the ſame leaf, and lays it in ſuch a manner, that there may be a hollow between, in which it may lodge. It then faſtens down this piece to the larger leaf with ſilk of its own ſpinning, only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It eaſily gets out, though the aperture be naturally ſmall, ſince a little force from the body bends up the upper leaf, and bends down the lower, both being flexile; and when the creature is out, it has a ſort of down that defends itſelf from being wetted, and the natural elaſticity of the leaves, and of the ſilk, join the aperture up again, ſo that no water can get in. The leaves of this kind of plant are alſo naturally very ſlippery, and not eaſily wetted by water. It ſoon happens, that this habitation becomes too ſmall for the animal, in which caſe it makes juſt ſuch another, and after that, at times, ſeveral others, each being only made fit for it at the ſize it is then of. The changes of this creature into the chryſalis and butterfly ſtate, are in the common method. The butterfly gets out of a chryſalis which was placed on the ſurface of the water, the lightneſs of the animal eaſily ſuſtains it on the water till its wings are dried, and it then leaves that element never to return to it again.

Wood CATERPILLARS, *Erucæ Sylveſtres*, the name of a genus of caterpillars which do not live in the manner of others on leaves of trees or plants, or open to our obſervation, but under the bark, in the trunk and branches, and in the roots of trees, and ſometimes in the body of fruits.

Theſe are eaſily diſtinguiſhed from thoſe worms and maggots which are found in roots and fruits, and owe their origin to flies of another kind; but are ſubject to be confounded with a ſort of animals, called by M. Reaumur, falſe, or baſtard caterpillars, which carry a great reſemblance in their figure to the real caterpillars, but which have more legs than any of the true ones have, and are finally transformed into four winged flies, which are not true butterflies.

The butterflies which are the parents of thoſe caterpillars which live immured in trees or fruits, lay their eggs on the ſurface, and the young caterpillars, when hatched, eat their way in.

What appears ſomething ſurpriſing, however, in this, is, that there uſually is only one caterpillar in a fruit, which is large enough to afford food to a large number; and if there are ſometimes found two creatures within, one is uſually a caterpillar, the other a worm of ſome other kind. The whole occaſion of which is, that the operation of penetrating into the fruit, is ſo difficult to the young animal, that it ſeldom ſucceeds in it; and though the butterfly depoſits many eggs on each fruit, and theſe all hatch, yet it is only here and there one on a fruit that can find the way into it.

Theſe creatures, when once lodged in their priſon, have nothing to do but to eat up the ſubſtances which incloſe them, leaving the outer hard ſhell unhurt, which ſtill ſerves as a caſe for them; this is a very frequent caſe in the grains of corn, where the farinaceous ſubſtance ſerves as aliment, and the hard outer ſkin becomes a firm hollow caſe afterwards for the animal. The farinaceous ſubſtance in this caſe uſually proves enough for the animal in its caterpillar ſtate; but if it does not, the creature has recourſe to a very ſingular expedient; it eats again its own excrements, and finds its now ſtronger ſtomach able to ſeparate nouriſhment from that very matter, which had before paſſed off from its weaker ſtomach undigeſted.

Of theſe ſpecies of caterpillars, ſome go out of their priſon in order to change into their chryſalis, and thence into their butterfly ſtate; but the greater number remain there, and paſs through all their changes within.

Theſe caterpillars, like all the other kinds, have certain fleſh eating worms, whoſe parents are of the fly kind, for their terrible enemies and deſtroyers; and it is not unfrequent, on opening one of theſe ſpoiled fruits, inſtead of the expected caterpillar, to find a fly juſt ready to come out; this has been produced from the chryſalis of a worm, which had before found its way into the fruit, and eat up the caterpillar, which was the original poſſeſſor of the place.

Method of deſtroying CATERPILLARS *on Trees*. Take a chaſing diſh with lighted charcoal, and placing it under the branches that are loaded with caterpillars, throw ſome pinches of brimſtone upon the coals. The vapour of the ſulphur, which is mortal to theſe inſects, will not only deſtroy all that are on the tree, but prevent it from being infeſted with them afterwards. A pound of ſulphur will clear as many trees as grow on ſeveral acres. This method has been ſucceſsfully tried in France. In the Journal Oeconomique, the following is ſaid to be infallible againſt the caterpillars feeding on cabbage, and perhaps may be equally ſerviceable againſt thoſe that infeſt other vegetables. Sow with hemp all the borders of the ground where you mean to plant your cabbage; and, although the neighbourhood is infeſted with caterpillars, the ſpace incloſed by the hemp will be perfectly free, not one of the vermin will approach it.

CATERPILLAR *Eaters*, a name given by ſome authors to a ſpecies of worms which are bred in the body of a caterpillar, and eats its fleſh: theſe are owing to a certain kind of fly which lodges her eggs in this animal, and they, after their proper changes, become flies like their parents.

M. Reaumur has given us, in his Hiſtory of Inſects, ſome very curious particulars in regard to theſe little worms. This inſect is called the ichneumon of caterpillars.

CATERPILLARS, ſcorpiurus, in botany, a genus of the diadelphia decandria claſs. Its characters are theſe: the empalement of the flower is of one leaf, erect, blown up, lightly compreſſed, ending in five acute points.

CATHÆRETICS, or CATHÆRETIC *Medicines*, are ſuch as ſerve to conſume, an deat off, fungous or proud fleſh growing in wounds, ulcers, and the like.

The word is formed from Καθαιρω, ſometimes uſed for *depaſcor*, or *abſumo*, I eat, conſume, &c. of Κατα, and αιρεω, I take away.

Cathæretics are otherwiſe denominated ſarcophagous medicines, q. d. fleſh eaters.

Such are red precipitate, burnt alum, *æs uſtum*, blue vitriol, &c.

Cathæretic only differs in degree from cauſtic or ſeptic, which are more violent in their operation.

CATHARINE, *Order of St.* in modern hiſtory, belongs to ladies of the firſt quality in the Ruſſian court. It was inſtituted in 1714, by Catharine wife of Peter the Great, in memory of his ſignal eſcape from the Turks in 1711. The emblems of this order are a red croſs, ſupported by a figure of St. Catharine, and faſtened to a ſcarlet ſtring edged with ſilver, on which are inſcribed the name of St. Catharine, and the motto *Pro fide & patria.*

CATHARMA, Καθαρμα, from καθαιρω, to purge, in medicine, imports the excrements purged from any part of the body; as the ſtomach, inteſtines, or bladder.

CATHARTICS, or CATHARTIC *Medicines*, are remedies which promote evacuation by ſtool.

Cathartics are the ſame with what we otherwiſe denominate purgatives.

Cathartics are of three principal kinds, mild, moderate, and violent: the firſt purge gently, as caſſia, manna, tamarins, rhubarb, ſena, &c. the ſecond pretty briſkly, as jallop, ſcammony, &c. the third ſeverely, as colocynth, hellebore, laureola.

A ſafe, pleaſant, gentle, and effectual purgative, or cathartic, may be at any time prepared in the following manner. Take a quart of Dulwich water, or any other water of a like kind: diſſolve in this, over the fire, an ounce of manna, and half an ounce of black tamarinds; ſtrain off the liquor, and let it be taken at ſeveral draughts, at half an hour's diſtance or leſs, the whole being drank in an hour and a half, or two hours.

The purging mineral waters act with more eaſe, gentleneſs, and ſafety than any of the ſhop medicines; all that they require is to be either concentrated by boiling away a part, or elſe quickened as in this manner; and a general trial of a purge of this kind would perhaps encourage the practiſers of phyſic to reject almoſt all the common rough purges in uſe.

Cathartic *Salt, ſal catharticum amarum*, a denomination given to what we improperly call Epſom ſalt.

CATHEDRA, in a general ſenſe, a chair.

The word is more particularly uſed for a profeſſor's chair, and a preacher's pulpit.

Cathedra is alſo uſed for the biſhop's ſee, or throne, in a church.

Cathedra, *Ex*, a phraſe uſed in ſpeaking of the ſolemn dictates or deciſions of prelates, chiefly the popes, delivered in their pontifical capacity.

The advocates for the papacy maintain, that the pope is infallible, *ex cathedra*, a term of modern theology entirely unknown to the ancients. Even thoſe who uſed it do not agree in the explication of it.

CATHEDRAL, a church wherein is a biſhop's ſee, or ſeat. The word comes from the Greek *καθεδρα, chair*, of *καθεζομαι ſedeo, I ſit*.

The denomination cathedral ſeems to have taken its riſe from the manner of ſitting in the antient churches, or aſſemblies of primitive Chriſtians; in theſe, the council, i. e. the elders and prieſts, was called preſbyterium; at their head was the biſhop, who held the place of chairman; *cathedralis*, or *cathedraticus*: and the preſbyters, who ſat on either ſide, were alſo called by the antient fathers, *aſſeſſores epiſcoporum*. The epiſcopal authority did not reſide in the biſhop alone, but in all the preſbyters, of whom the biſhop was preſident.

A cathedral therefore, originally, was different from what it is now; the Chriſtian, till the time of Conſtantine, having no liberty to build any temple: by their churches, they only meant their aſſemblies; and by cathedrals, nothing more than conſiſtories:—whence appears the vanity of ſome authors, eſpecially the Spaniards, who pretend their cathedrals to have been built in the times of the apoſtles.

CATHETER, among ſurgeons, a hollow probe, or inſtrument, uſually of ſilver, ſomewhat crooked; to be introduced into the bladder, in order to ſearch for the ſtone, or to diſcharge the urine when ſuppreſſed.

The word is formed from *καθιημι, immitto*.

CATHETOLIPES, in natural hiſtory, the name of a genus of foſſils of the claſs of the *ſelenitæ*, but differing from the common kinds in the diſpoſition of the conſtituent plates.

The word is derived from λαθετος, *perpendicular*, and ληπις, a *ſcale*, or *plate*, and expreſſes a ſet of theſe bodies whoſe plates are ranged perpendicularly. All the known *ſelenitæ*, except thoſe of this genus, are compoſed of a number of parallel plates, or thin flakes, ranged evenly horizontally on one another.

CATHETO PLATEUS, in natural hiſtory, a term with its oppoſite, which is plagioplateus, very much uſed by Artedi, and others who adopt his ſyſtem, in the deſcription of fiſhes; they may be very well explained in Engliſh, by the two familiar words, *compreſſed* and *depreſſed*. The heads of fiſhes are the principal parts characteriſed by theſe terms.

CATHETUS, in geometry, a perpendicular, or a line, or radius, falling perpendicular on another line, or ſurface.

Thus, the catheti of a rectangle triangle, are the two ſides that include the right angle.

Cathetus *of Incidence*, in catoptrics, is a right line drawn from a radiant point, perpendicular to the reflecting line, or the plane of the ſpeculum or mirror.

Cathetus *of Reflection*, or *of the Eye*, a right line drawn from the eye, or from any point of a reflected ray, perpendicular to the plane of reflection, or of the ſpeculum.

Cathetus, in architecture, is a perpendicular line, ſuppoſed to paſs through the middle of a cylindrical body, as a column. See the Pales of Architecture.

Cathetus is ſometimes applied to a line in the Ionic capital, paſſing perpendicularly through the eye or centre of the volute. This is otherwiſe called the axis of the *volute*.

CATHOLIC, from *κατα* and *ὅλος, whole*, denotes a thing that is univerſal, or general.

Catholic *Church*. The riſe of hereſies induced the primitive Chriſtian church to aſſume to itſelf the appellation of catholic, being a characteriſtic to diſtinguiſh itſelf from all ſects, who, though they had party names, ſometimes ſheltered themſelves under the name of Chriſtians.

The Romiſh church diſtinguiſhes itſelf now by the name of catholic, in oppoſition to all thoſe who have ſeparated from her communion, and whom ſhe conſiders as heretics and ſchiſmatics, and herſelf only as the true Chriſtian church. In the ſtrict ſenſe of the word, there is no catholic church in being, that is, no univerſal Chriſtian communion.

Catholic *King*, is a title which has been long hereditary to the king of Spain. Mariana pretends, that Reccarede firſt received this title after he had deſtroyed Arianiſm in this kingdom, and that it is found in the council of Toledo for the year 589. Vaſcè aſcribes the origin of it to Alphonſus in 738. Some alledge that it has been uſed ſince the time of Ferdinand and Iſabella. Coſombiere ſays, it was given them on occaſion of the expulſion of the Moors. The Bollandiſts pretend, it had been borne by their predeceſſors, the Viſigoth kings of Spain; and that Alexander VI. only renewed it to Ferdinand and Iſabella. Others ſay, that Philip de Valois firſt bore the title; which was given him after his death, by the eccleſiaſtics, on account of his favouring their intereſts.

In ſome epiſtles of the antient popes, the title catholic is given to the kings of France, and of Jeruſalem, as well as to ſeveral patriarchs and primates.

CATHOLICUS, the title of a dignitary, or magiſtrate, under the Roman emperors, who had part of the adminiſtration, and particularly the care and receipt of the revenues and taxes in in Roman dioceſes.

CATKIN, among botaniſts, a cluſter of flowers affixed to an axis: in ſome caſes, there are ſquamæ on the axis which do the office of cups; in others the flowers are naked. This is otherwiſe called *julus* and *amentum*.

CATLING, among ſurgeons, is a diſmembering knife for cutting off any corrupted part of a body.

CATMINT, *Nepeta*, in botany, a genus of the didynamia gymnoſpermia claſs. There are twelve ſpecies.

The whole plant has a ſtrong ſcent between mint and penny royal. It is called catmint, becauſe cats are very fond of it, eſpecially when it is withered; for then they will roll themſelves on it, and tear it to pieces, chewing it with great pleaſure.

It conſiſts of warming and attenuating parts, ſomewhat like penny-royal; and like that is of great ſervice in opening obſtructions of the womb, and helping in the green ſickneſs: as alſo hyſteric fits and vapours. It promotes the birth and lochia, and is by ſome authors commended againſt barenneſs.

CATOCHE, or **Catochus**, from *κατεχω, I retain*; in medicine, a kind of waking ſleep; or a vehement diſpoſition of the body to ſleep, without being able to attain it; the eyes ſtill remaining open, and the breath entire, but the body motionleſs, and in the ſame poſture wherein the patient was firſt ſeized.

The catoche is the ſame with catalepſis. It differs from the coma and cataphora, in that the eyes are open in the former, and cloſed in the latter.

CATOCYSTUS, in natural hiſtory, a name given to one of the general diviſions of the echinodermata, or ſea hedge-hogs. Theſe have their aperture for the anus not at the top of the ſhell, as the anocyſti have it, but in ſome part of the baſe.

For the more accurately diſtinguiſhing theſe into genera, the baſes of the ſhell are to be divided into the regular and irregular. The regular are thoſe which are round or oval; the irregular, thoſe which are made with ſinuſes and angles.

CATODON, in the Artedian ſyſtem of ichthyology, the name given to a genus of the plagiura, or cetaceous fiſhes, the characters of which are theſe: the teeth are placed only in the lower jaw; there is no fin upon the back; and the fiſtule is placed either in the head or the ſnout. The ſpecies of this genus are only two.

This, in the Linnæan ſyſtem, is the name of a ſpecies belonging to the genus denominated phyſeter, in the order of cete, and claſs of mammalia.

The word catodon is derived from *κατα, below*, and *οδους, a tooth*; and expreſſes that the fiſh hath teeth only in the lower part of its mouth.

CATOPTRICS, the ſcience of reflex viſion; or that branch of optics, which delivers the laws of light, reflected from mirrors, or ſpecula.

The doctrine and laws of catoptrics are laid down under the head of Optics.

The word comes from *κατοπτρον, ſpeculum*; of *κατα*, and *οπτομαι, video, I ſee*.

Catoptrical *Dial*, a dial which exhibits objects by reflexed rays.

Catoptric *Teleſcope*, a teleſcope that exhibits objects by reflexion.

Catoptric *Ciſtula*, a machine or apparatus, whereby little bodies are repreſented extremely large; and near ones extremely wide, and diffuſed through a vaſt ſpace; with other agreeable phenomena; by means of mirrors, diſpoſed by the laws of catoptrics, in the concavity of a kind of cheſt.

Of theſe there are various kinds, accommodated to the various intentions of the artificer: ſome multiply the objects; ſome deform them; ſome magnify, &c. The ſtructure of one or two of them will ſuffice to ſhew how many more may be made.

C A T O P T R I C S.

CATOPTRICS.

CATOPTRICS is that part of optics which explains the properties of reflected light, and particularly that which is reflected from mirrors.

As this and the other branches of optics will be fully treated on in the Syſtems, we ſhall, in the preſent article, 1ſt, Juſt give a ſummary of the principles of the branch, in a few plain aphoriſms, with ſome preliminary definitions.

SECT. I.

DEFINITIONS.

See Plate I. OPTICS *including* CATOPTRICS.

1. Every poliſhed body that reflects the rays of light is called a mirror, whether its ſurface be plane, ſpherical, conical, cylindric, or of any other form whatever.

2. Of mirrors there are three principally uſed in optical experiments, which are, the plane mirror, (*Fig.* 3.) the ſpherical convex mirror, (*Fig.* 4.) and the ſpherical concave mirror, (*Fig.* 5.)

3. The point K, (*Fig.* 4, 5.) round which the reflecting ſurface of a ſpherical mirror is deſcribed, is called its centre. The line KH, drawn from its centre perpendicular to its two ſurfaces, is the axis of the mirror, and the point H, to which that line is drawn, is its vortex.

4. The diſtance between the lines AG and BG, (*Fig.* 3.) is called the angle of incidence, and the diſtance between BG and CG is the angle of reflection.

SECT. II.

APHORISMS.

I. *In a plain Mirror.*

1. The image DF, (*Fig.* 3.) will appear as far behind the mirror, as the object AC is before it.

2. The image will appear of the ſame ſize, and in the ſame poſition as the object.

3. Every ſuch mirror will reflect the image of an object of twice its own length and breadth.

4. If the object be an opaque body, and its rays fall on the mirror nearly in direct lines, there will be only one image viſible, which will be reflected by the inner ſurface of the glaſs. But

5. If the object be a luminous body, and its rays fall very obliquely on the mirror, there will appear, to an eye placed in a proper poſition, ſeveral images; the firſt of which, reflected from the outer ſurface of the glaſs, will not be ſo bright as the ſecond, reflected from the inner ſurface. The following images, that are produced by the repeated reflections of the rays between the two ſurfaces of the glaſs, will be in proportion leſs vivid, to the eighth or tenth, which will be ſcarce viſible.

II. *In a Spherical Convex Mirror.*

1. The image DF, (*Fig.* 4.) will always appear behind it.
2. The image will be in the ſame poſition as the object.
3. It will be leſs than the object.
4. It will be curved, but not, as the mirror, ſpherical.
5. Parallel rays falling on this mirror will have the focus or image at half the diſtance of the centre K, from the mirror.
6. In converging rays, the diſtance of the object muſt be equal to half the diſtance of the centre, to make the image appear behind the mirror.
7. Diverging rays will have their image at leſs than half the diſtance of the centre. If the object be placed in the centre of the mirror, its image will appear at one-eighth of that diſtance behind it.

III. *In a Spherical Concave Mirror.*

1. That point where the image appears of the ſame dimenſions as the object, is the centre of that mirror.

2. Parallel rays will have their focus at one half the diſtance of the centre.

3. Converging rays will form an image before the mirror.

4. In diverging rays, if the object be at leſs than one half the diſtance of the centre, the image will be behind the mirror, erect, curved, and magnified, as DEF, (*Fig.* 5.) but if the diſtance of the object be greater, the image will be before the mirror, inverted and diminiſhed, as DEF, (*Fig.* 6.)

5. The ſun's rays falling on a concave mirror, and being parallel, will be collected in a focus at half the diſtance of its centre, where their heat will be augmented in proportion of the ſurface of the mirror to that of the focal ſpot.

6. If a luminous body be placed in the focus of a concave mirror, its rays being reflected in parallel lines, will ſtrongly enlighten a ſpace of the ſame dimenſion with the mirror, at a great diſtance. If the luminous object be placed nearer than the focus, its rays will diverge, and conſequently enlighten a larger ſpace. It is on this principle, that reverberators are constructed.

IV. In all plane and ſpherical mirrors the angle of incidence is equal to the angle of reflection.

SECT. III.

ENTERTAINING EXPERIMENTS.

I. *Appearance of a boundleſs Viſta.* *Fig.* 7.

1. Conſtruct a box AB, of about a foot long, eight inches wide, and ſix high; or what other dimenſion you ſhall think fit, provided it does not greatly vary from theſe proportions.

On the inſide of this box, and againſt each of its oppoſite ends A and B, place a mirror of the ſame ſize. Take off the quickſilver from the mirror that you place at B, for about an inch and an half, at the part C, where you are to make a hole in the box of the ſame ſize, by which you may eaſily view its inſide. Cover the top of the box with a frame, in which muſt be placed a tranſparent glaſs, covered with gauze, on the ſide next the inner part of the box. Let there be two grooves at the parts E and F to receive the two painted ſcenes hereafter mentioned. On two pieces of cut paſteboard let there be ſkilfully painted on both ſides (ſee *Fig.* 8. and 9.) any ſubject you think proper; as woods, gardens, bowers, colonades, &c. and on two other paſteboards, the ſame ſubjects on one ſide only; obſerving that there ought to be on one of them ſome object relative to the ſubject placed at A, that the mirror placed at D may not reflect the hole at C on the oppoſite ſide.

Place the two boards painted on both ſides in the grooves E and F; and thoſe that are painted on one ſide only, againſt the oppoſite mirrors C and D; and then cover the box with its tranſparent top. This box ſhould be placed in a ſtrong light to have a good effect.

When the eye is placed at C, and views the objects on the inſide of the box, of which ſome, as we have ſaid, are painted on both ſides, they are ſucceſſively reflected from one to mirror to the other; and if, for example, the painting conſiſts of trees, they will appear like a very long viſta, of which the eye cannot diſcern the end: for each of the mirrors repeating the objects, continually more faintly, contribute greatly to augment the illuſion.

II. *Of a Fortification of immenſe Extent.* *Fig.* 10.

2. Take a ſquare box ABCD, of about ſix inches long, and twelve high; cover the inſide of it with four plane mirrors, which muſt be placed perpendicular to the bottom of the box CHFD.

Place certain objects in relief on the bottom of this box; ſuppoſe, for example, a piece of fortification, (as *Fig.* 11.) with tents, ſoldiers, &c. or any other ſubject that you judge will produce an agreeable effect by its diſpoſition when repeatedly reflected by the mirrors.

On the top of this box place a frame of glaſs, in form of the bottom part of a pyramid, whoſe baſe AGEB is equal to the ſize of the box: its top ILN, muſt form a ſquare of ſix inches, and ſhould not be more than four or five inches higher than the box. Cover the four ſides of this frame with a gauze, that the inſide may not be viſible but at the top ILN, which ſhould be covered with a tranſparent glaſs.

When you look into this box through the glaſs ILN, the mirrors that are diametrically oppoſite each other, mutually reflecting the figures incloſed, the eye beholds a boundleſs extent, completely covered with theſe objects; and if they are properly diſpoſed, the illuſion will occaſion no ſmall ſurprize, and afford great entertainment.

Note, The nearer the opening ILN is to the top of the box, the greater will be the apparent extent of the ſubject. The ſame will happen if the four mirrors placed on the ſides of the box be more elevated. The objects, by either of theſe diſpoſitions, will appear to be repeated nine, twenty-five, forty-nine times, &c. by taking always the ſquare of the odd numbers of the arithmetical progreſſion 3, 5, 7, 9, &c. as is very eaſy to conceive, if we remember that the ſubject encloſed in the box is always in the centre of a ſquare, compoſed of ſeveral others, equal to that which forms the bottom of the box.

Other pieces of the ſame kind (that is viewed from above) may be contrived, in which mirrors may be placed perpendicular on a triangular, pentagon, or hexagon, (that is, a three, five, or ſix-ſided) plane. All theſe different diſpoſitions, properly directed, as well with regard to the choice as poſition of the objects, will conſtantly produce very remarkable and pleaſing illuſions.

If inſtead of placing the mirrors perpendicular, they were to incline equally, ſo as to form part of a reverſed pyramid, the ſubject placed in the box would then have the appearance of a very extenſive globular or many-ſided figure.

III. *Surprizing Multiplication of Objects,* *Fig.* 12.

3. On the hexagonal or ſix-ſided plane ABCDEF, draw ſix ſemi-diameters GA, GB, GC, GD, GE, GF; and on each of theſe place perpendicularly, two plane mirrors, which muſt join exactly at the centre G. Decorate the exterior boundary of this piece (which is at the extremity of the angles of the hexagon) with ſix columns, that at the ſame time ſerve to ſupport the mirrors, by grooves formed on their inner ſides. (See the Profile H

Add to theſe columns their entablatures, and cover the edifice in ſuch manner as you ſhall think proper.

In each one of theſe ſix triangular ſpaces, contained between two mirrors, place little figures of paſte-board, in relief, repreſenting ſuch objects as when ſeen in an hexagonal form will produce an agreeable effect. To theſe add ſmall figures of enamel; and take particular care to conceal, by ſome object that has relation to the ſubject, the place where the mirrors join, which, as we have ſaid before, all meet in the common centre G.

When you look into any one of the ſix openings of this palace, the objects there contained being repeated ſix times, will ſeem entirely to fill up the whole of the building. This illuſion will appear very remarkable; eſpecially if the objects made choice of are properly adapted to the effect that is to be produced by the mirrors.

Note, if you place between two of theſe mirrors part of a fortification, as a curtain and two demibaſtions, you will ſee an entire citadel, with its ſix baſtions. Or if you place part of a ball-room, ornamented with chandeliers and figures in enamel, all thoſe objects being here multiplied, will afford a very pleaſing proſpect.

IV. *In the Opaque Bodies ſeemingly rendered tranſparent, Fig.* 13.

4. Within the caſe ABCD, place four mirrors, O, P, Q, R, ſo diſpoſed that they may each of them make an angle of forty-five degrees, that is, that they may be half way inclined from the perpendicular, as in the figure. In each of the two extremities AB, make a circular overture, in one of which fix the tube GL, in the other the tube MF, and obſerve that in each of theſe is to be inſerted another tube, as H and I.

Furniſh the firſt of theſe tubes with an object glaſs at G, and a concave eye glaſs at F. You are to obſerve, that in regulating the focus of theſe glaſſes, with regard to the length of the tube, you are to ſuppoſe it equal to the line G, or viſual pointed ray, which entering at the overture G, is reflected by the four mirrors, and goes out at the other overture F, where the ocular glaſs is placed. Put any glaſs you will into the two ends of the moveable tubes H and I; and laſtly place the machine on a ſtand E, moveable at the point S, that it may be elevated or depreſſed at pleaſure.

When the eye is placed at F, and you look through the tube, the rays of light that proceed from the object T, paſſing through the glaſs G, are ſucceſſively reflected by the mirrors, O, P, Q, and R, to the eye at F, and there paint the object T, in its proper ſituation, and theſe rays appear to proceed directly from that object.

The two moveable tubes H and I, at the extremities of each of which a glaſs is placed, ſerve only the more to diſguiſe the illuſion, for they have no communication with the interior part of the machine. This inſtrument being moveable on the ſtand E, may be directed to any object; and if furniſhed with proper glaſſes will anſwer the purpoſe of a common perſpective

The two moveable tubes H and I being brought together, the machine is directed toward any object, and deſiring a perſon to look in at the end F, you aſk him if he ſees diſtinctly that object. You then ſeparate the two moveable tubes, and leaving a ſpace between them ſufficient to place your hand, or any other ſolid body, you tell him that the machine has the power of making objects viſible through the moſt opaque body; and as a proof you deſire him then to look at the ſame object, when, to his great ſurprize, he will ſee it as diſtinct as when there was no ſolid body placed between the tubes.

Note. This experiment is the more extraordinary, as it is very difficult to conceive how the effect is produced. The two arms of the caſe appearing to be made to ſupport the perſpective glaſs; and to whatever object it is directed, the effect is ſtill the ſame.

V. VI. *The Magician's Mirrors, Fig.* 14.

5. In the partition AB, make two overtures, CD, and EF, of a foot high, and ten inches wide, and about a foot diſtant from each other. Let them be at the common height of a man's head; and in each of them place a tranſparent glaſs, ſurrounded with a frame, like a common mirror.

Behind this partition place two mirrors H and I inclined to it in an angle of forty-five degrees: let them be both 18 inches ſquare: let all the ſpace between them be incloſed by boards or paſteboard, painted black, and well cloſed, that no light may enter: let there alſo be two curtains to cover them, which may be drawn aſide at pleaſure.

When a perſon looks into one of theſe ſuppoſed mirrors, inſtead of ſeeing his own face, he will perceive the object that is in front of the other; ſo that if two perſons preſent themſelves at the ſame time before theſe mirrors, inſtead of each one ſeeing himſelf, they will reciprocally ſee each other.

Note, There ſhould be a ſconce with a candle placed on each ſide of the two glaſſes in the wainſcot, to enlighten the faces of the perſons who look in them, otherwiſe this experiment will have no remarkable effect.

This experiment may be conſiderably improved by placing the two glaſſes in the partition, in adjoining rooms, and a number of perſons being previouſly placed in one room, when a ſtranger enters the other, you may tell him his face is dirty, and deſire him to look in the glaſs, which he will naturally do; and on ſeeing a ſtrange face he will draw back: but returning to it, and ſeeing another, another, and another, like the phantom kings in Macbeth, what his ſurprize will be is more eaſy to conceive than expreſs. After this, a real mirror may be privately let down on the back of the glaſs; and if he can be prevailed to look in it once more, he will then, to his further aſtoniſhment, ſee his own face; and may be told, perhaps perſuaded, that all he thought he ſaw before was mere imagination.

How many tricks, leſs artful than this, have paſſed in former times for ſorcery; and paſs at this time, in ſome countries, for apparitions?

Note, When a man looks in a mirror that is placed perpendicular to another, his face will appear entirely deformed. If the mirror be a little inclined, ſo as to make an angle of eighty degrees (that is, one ninth part from the perpendicular) he will then ſee all the parts of his face, except the noſe and forehead. If it be inclined to ſixty degrees (that is, one third part) he will appear with three noſes and ſix eyes: in ſhort, the apparent deformity will vary at each degree of inclination; and when the glaſs comes to forty-five degrees (that is, half way down) the face will vaniſh. If, inſtead of placing the two mirrors in this ſituation, they are ſo diſpoſed that their junction may be vertical, their different inclinations will produce other effects; as the ſituation of the object relative to theſe mirrors, is quite different. The effects of theſe mirrors, though remarkable enough, occaſions but little ſurpriſe, as there is no method of concealing the cauſe by which they are produced.

The Magician's Mirrors. Fig. 15.

6. Make a box of wood, of a cubical figure, ACBD, of about fifteen inches every way. Let it be fixed on the pedeſtal P, at the uſual height of a man's head. In each ſide of this box let there be an opening of an oval form, of ten inches high, and ſeven wide.

In this box place two mirrors A, D, with their backs againſt each other; let them croſs the box in a diagonal line, and in a vertical poſition. Decorate the openings in the ſides of this box with four oval frames and tranſparent glaſſes, and cover each of them with a curtain, ſo contrived that they may all draw up together.

Place four perſons in front of the four ſides, and at equal diſtances from the box, and then draw up the curtains that they may ſee themſelves in the mirrors; when each of them, inſtead of his own figure, will ſee that of the perſon who is next him, and who, at the ſame time, will ſeem to him to be placed on the oppoſite ſide. Their confuſion will be the greater, as it will will be very difficult for them to diſcover the mirrors concealed in the box. The reaſon of this phænomenon is evident; for though the rays of light may be turned aſide by a mirror, yet, as we have before ſaid, they always appear to proceed in right lines.

VII. *Catoptrical Illuſions.*

7. Of all our ſenſes the ſight is certainly ſubject to the greateſt illuſion. The various writers on optics have deſcribed a great number of inſtances in which it deceives us, and have conſtantly endeavoured to inveſtigate the cauſes, to explain their effects, and to reconcile appearance with reality. We every day diſcover new phenomena, and doubtleſs many more are reſerved for poſterity. It frequently happens, that a diſcovery which at firſt ſeemed of little conſequence, has led to matters of the higheſt importance.

Take a glaſs bottle A, (*Fig.* 16.) and fill it with water to the point B; leave the upper part BC empty, and cork it in the common manner. Place this bottle oppoſite a concave mirror, and beyond its focus, that it may appear reverſed, and before the mirror (See Sect. II. Aphor. 4, of Aſpher. Concave Mirror,) place yourſelf ſtill further diſtant than the bottle, and it will appear to you in the ſituation *a*, *b*, *c*, (*Fig.* 17.)

Now it is remarkable in this apparent bottle, that the water, which, according to all the laws of catoptrics, and all the experiments made on other objects, ſhould appear at *a b*, appears on the contrary at *b c*, and conſequently the part *a b* appears empty.

If the bottle be inverted and placed before the mirror, (as in *Fig.* 18.) its image will appear in its natural, erect poſition; and the water, which is in reality at BC, will appear at *a b*.

If while the bottle is inverted it be uncorked, and the water run gently out, it will appear that while the part BC is emptying, that of *a b* in the image is filling; and what is likewiſe very remarkable, as ſoon as the bottle is empty the illuſion ceaſes, the image alſo appearing entirely empty. If the bottle likewiſe be quite full there is no illuſion.

If while the bottle is held inverted, and partly empty, ſome drops of water fall from the bottom A towards BC, it ſeems in the image as if there were formed at the bottom of the part *a b*, bubbles of air that roſe from *a* to *b*; which is the part that ſeems full of water. All theſe phenomena conſtantly appear.

The remarkable circumſtances in this experiment, are, firſt, not only to ſee an object where it is not, but alſo where its image is not; and ſecondly, that of two objects which are really in the ſame place, as the ſurface of the bottle and the water it contains, the one is ſeen at one place, and the other at another; and to ſee the bottle in the place of its image, and the water where neither it, nor its image, are.

VIII. *The perſpective Mirror, Fig.* 19.

8. Provide a box ABCD of about two feet long, fifteen inches wide, and twelve inches high. At the end AC place a concave mirror, the focus of whoſe parallel rays is at eighteen inches from the reflecting ſurface. At IL place a paſteboard blacked, in which a hole is cut ſufficiently large to ſee on the mirror H, the object placed at BEFD.

Cover the top of the box, from A to I, cloſe, that the mirror H may be entirely darkened. The other part IB, muſt be covered with a glaſs, under which is placed a gauze.

Make an aperture at G, near the top of the ſide EB; beneath which, on the inſide, place, in ſucceſſion, paintings of different ſubjects, as viſtas, landſcapes, &c. ſo that they may be in front of the mirror H. Let the box be ſo placed that the object may be ſtrongly illumined be the ſun, or by wax lights placed under the encloſed part of the box AI.

By this ſimple conſtruction the objects placed at GD will be thrown into their natural perſpective; and if the ſubjects be properly choſen, the appearance will be altogether as pleaſing as in optical machines of a much more complicated form.

Note, A glaſs mirror ſhould be always here uſed, as thoſe of metal do not repreſent the objects with equal vivacity, and are beſide ſubject to tarniſh. It is alſo neceſſary that the box be ſufficiently large, that you may not be obliged to uſe a mirror whoſe focus is too ſhort; for in that caſe, the right lines near the border of the picture will appear bent in the mirror, which will have a diſagreeable effect, and cannot be avoided.

IX. *To ſet Fire to a combuſtible Body by the Reflection of two Concave Mirrors.*

9. The rays of a luminous body placed in the focus of a concave mirror being reflected in parallel lines, if a ſecond mirror be placed diametrically oppoſite the firſt, it will, by collecting thoſe rays in its focus, ſet fire to a combuſtible body.

Place two concave mirrors, A and B (*Fig.* 20.) at about twelve or fifteen feet diſtance from each other, and let the axis of each of them be in the ſame line. In the focus C, of one of them, place a live coal, and in the focus of D, of the other, ſome gunpowder. With a pair of double bellows, which make a continual blaſt, keep conſtantly blowing the coal, and notwithſtanding the diſtance between them the powder will preſently take fire.

It is not neceſſary that theſe mirrors be of metal or braſs, thoſe made of wood or paſteboard, gilded, will produce the exploſion, which has ſometimes taken effect at the diſtance of fifty feet, when mirrors of eighteen inches, or two feet diameter, have been uſed.

This experiment ſucceeds with more difficulty at great diſtances; which may proceed from the moiſture in a large quantity of air. It would doubtleſs take effect more readily, if a tin tube of an equal diameter with the mirrors, were to be placed between them.

XIV. *The real Apparition,* (*Fig.* 21.)

10. Behind the partition AB, place in a poſition ſomething oblique, the concave mirror EF, which muſt be at leaſt ten inches in diameter, and its diſtance from the partition equal to three fourths of the diſtance of its center.

In the partition make an opening of ſeven or eight inches, either ſquare or circular: it muſt face the mirror, and be of the ſame height with it. Behind this partition place a ſtrong light, ſo diſpoſed that it may not be ſeen at the opening, and may illumine an object placed at C, without throwing any light on the mirror.

Beneath the aperture in the partition, place the object C, that you intend ſhall appear on the outſide of the partition, in an inverted poſition; and which we will ſuppoſe to be a flower. Before the partition, and beneath the aperture, place a little flower pot D, the top of which ſhould be even with the bottom of the aperture, that the eye, placed at G, may ſee the flower in the ſame poſition as if its ſtalk came out of the pot.

Take care to paint the ſpace between the back part of the partition and the mirror black, to prevent any reflections of light from being thrown on the mirror; in a word, ſo diſpoſe the whole that it may be as little enlightened as poſſible.

When a perſon is placed at the point G, he will perceive the flower that is behind the partition, at the top of the pot at D, but on putting out his hand to pluck it, he will find that he attempts to graſp a ſhadow.

Remarks. The phenomena that may be produced by means of concave mirrors are highly curious and aſtoniſhing. By their aid, ſpectres of various kinds may be exhibited. Suppoſe, for example, you were to tell any one, that at ſuch an hour, and in ſuch a place, he ſhould ſee the apparition of an abſent or deceaſed friend (of whoſe portrait you are in poſſeſſion). In order to produce this phantom, inſtead of the hole in the partition AB, in the laſt figure there muſt be a door, which opens into an apartment, to which there is a conſiderable deſcent. Under that door you are to place the portrait, which muſt be inverted and ſtrongly illuminated, that it may be lively reflected by the mirror, which muſt be large and well poliſhed. Then having introduced the incredulous ſpectator at another door, and placed him in the proper point of view, you ſuddenly throw open the door at AB, when, to his great aſtoniſhment, he will immediately ſee the apparition of his friend.

It will be objected, perhaps, that this is not a perfect apparition, becauſe it is only viſible at one point of view, and by one perſon. But it ſhould be remembered, that it was an eſtabliſhed maxim in the laſt centuries, that a ſpectre might be viſible to one perſon and not to others. So Shakeſpeare makes both Hamlet and Macbeth ſee apparitions that were not viſible to others, preſent at the ſame time. It is not unlikely, moreover, that this maxim took its riſe from certain apparitions of this kind that were raiſed by the monks, to ſerve ſome purpoſes they called religious; as they alone were in poſſeſſion of what little learning there then was in the world.

To make a Catoptric *Ciſtula to repreſent ſeveral different Scenes of Objects, when viewed at different Foramina, or Holes.*

Provide a polygonous ciſtula, or cheſt, of the figure of the multilateral priſm ABCDEF (*Fig.* 1.) and divide its cavity by diagonal planes EB, FC, DA, interſecting each other in the centre, into as many triangular locules, or ſhells, has the cheſt has ſides. Line the diagonal planes with plain mirror: in the lateral planes make round holes, through which the eye may peep within the locules of the cheſt. The holes are to be covered with plain glaſſes, ground within-ſide, but not poliſhed, to prevent the object, in the locules, from appearing too diſtinctly. In each locule are to be placed the different objects whoſe images are to be exhibited; then covering up the top of the cheſt with a thin tranſparent membrane, or parchment, to admit the light; the machine is complete.

For, from the laws of reflexion, it follows, that the images of objects placed within the angles of mirrors, are multiplied, and appear ſome more remote than others; whence the objects in one locule will appear to take up more room than is contained in the whole cheſt. By looking, therefore, through one hole only, the objects in one locule will be ſeen, but thoſe multiplied, and diffuſed through a ſpace much larger than the whole cheſt: thus every new hole will afford a new ſcene: according to the different angles the mirrors make with each other, the repreſentation will be different; if they be at an angle greater than a right one, the images will be monſtrous, &c.

The parchment that covers the machine, may be made pellucid, by waſhing it ſeveral times in a very clear ley, then in fair water, and bracing it tight, and expoſing it to the air to dry. If it be deſired to throw any colour on the objects, it may be done by colouring the parchment. Zahnius recommends verdigriſe ground in vinegar, for green; decoction of Braſil wood, for red, &c. He adds, that it ought to be varniſhed, to make it more pellucid.

To make a Catoptric *Ciſtula to repreſent the Objects within it prodigiouſly multiplied, and diffuſed through a vaſt Space.*

Make a polygonous ciſtula, or cheſt, as before, but without dividing the inner cavity into any apartments, or locules (*Fig.* 2.); line the lateral plane CBHI, BHLA, ALMF, &c. with plane mirrors, and at the foramina, or apertures, pare off the tin and quickſilver, that the eye may ſee through: place any objects in the bottom MI, v. g. a bird in a cage, &c.

Here the eye looking through the aperture *hi*, will ſee each object placed at bottom, vaſtly multiplied, and the images removed at equal diſtances from one another. Hence, were a large multangular room, in a prince's palace, lined with large mirrors, over which were plain pellucid glaſſes to admit the light; it is evident the effects would be very ſurpriſing and magnificent.

CATOPRITES, in natural hiſtory, a name given by ſome writers to a ſtone of the marble kind, which, when poliſhed, was capable of ſerving as a ſpeculum, either flat, and only uſed to repreſent the images of things; or concave, and uſed as our reflecting burning glaſſes. The hard black marbles were moſt frequently uſed for this purpoſe; but ſometimes the reddiſh ones, and ſometimes one or other of the jaſpers. All theſe were indiſcriminately called by the name catoptrics, when put to this uſe.

CATTLE, a collective name, importing all quadruped, uſed either in tilling the ground, or for the food of man. See Syſtem of *Tetrapodology*.

The ancient riches conſiſted wholly in the number of cattle; whence it is ſuppoſed to be, that the Romans called money by a name formed from that of cattle, *pecunia* from *pecus*.

CATURUS, in botany, a genus of the dioecia triandria claſs.

CATUS *Pardus*, in tetrapodology, the name of a beaſt of prey, called alſo by ſome catus montanus, and by us the cat of the mountain; and, in the Linnæan ſyſtem, a ſpecies of the cat called felis pardalis. It is of the ſize of a maſtiff dog; but it reſembles in all reſpects the common domeſtic cat in ſhape, except that the tail is, in proportion to the creature's ſize, conſiderably ſhorter.

Optics and Catoptrics.

CATOPTRICS.

Fig. 1.

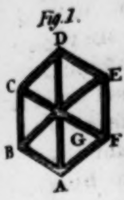


Fig. 2.

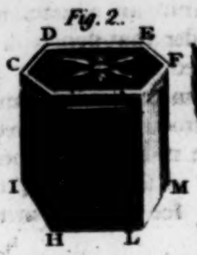


Fig. 3.

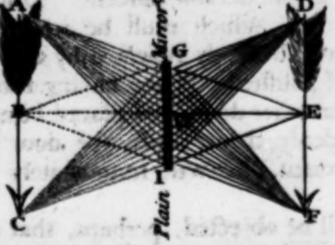

A
D
B
E
C
Mirror
Plain

Fig. 4.

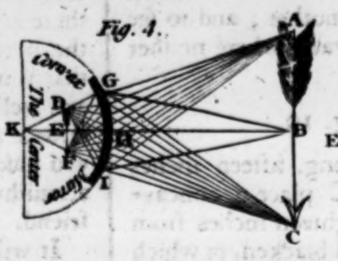

Concave
The Centre
Mirror
A
G
K
E
B
C

Fig. 5.

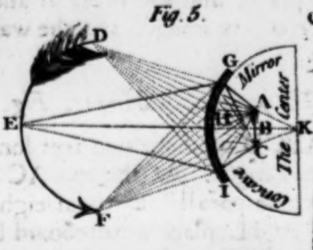

Mirror
The Centre
Concave
G
K
I

Fig. 6.

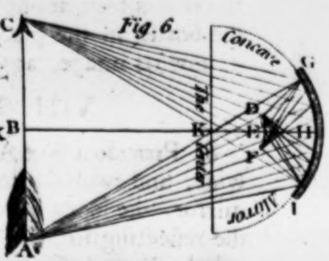

C
Concave
G
The Centre
Mirror
B
H
I

Fig. 7.

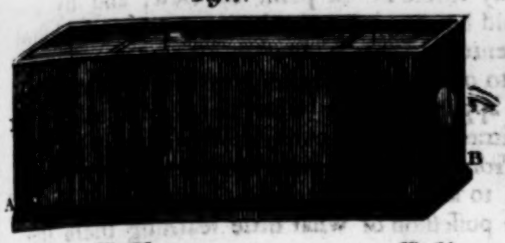


Fig. 8.

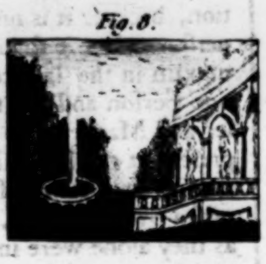


Fig. 9.

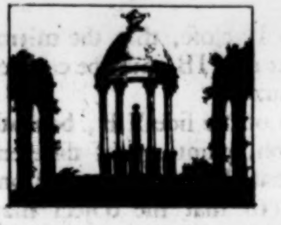


Fig. 11.

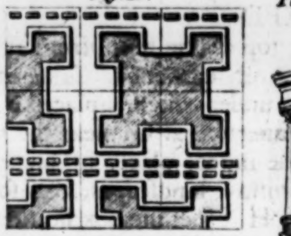


Fig. 12.

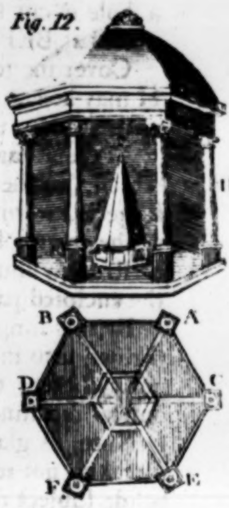


Fig. 15.

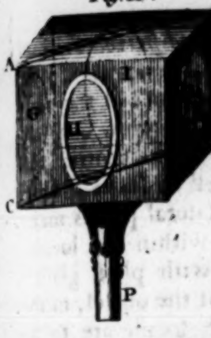


Fig. 14.

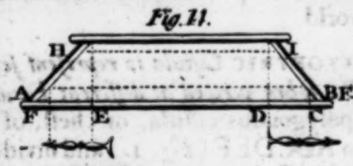


Fig. 13.

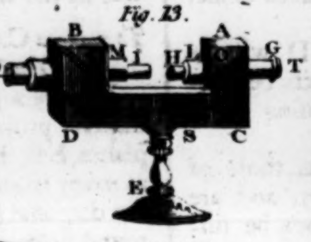


Fig. 19.

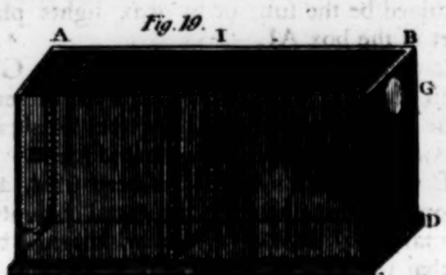


Fig. 10.

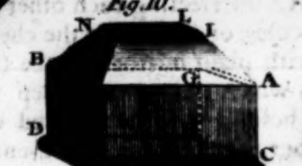


Fig. 17.

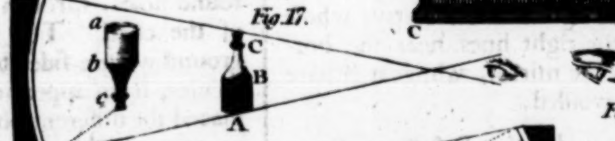


Fig. 21.

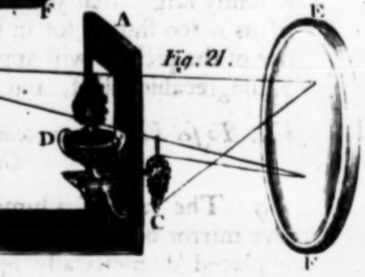


Fig. 20.

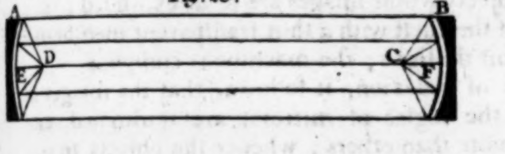


Fig. 16.

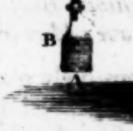
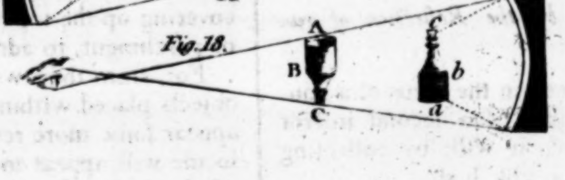


Fig. 18.



OPTICS.

Fig. 22.

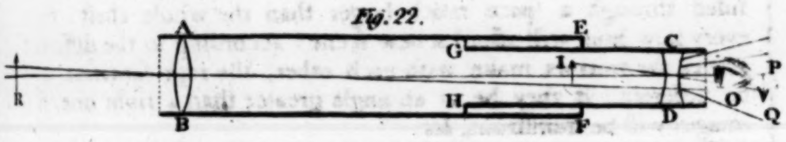

A
R
B
G
E
C
H
F
D
P
O
Q

Fig. 29.

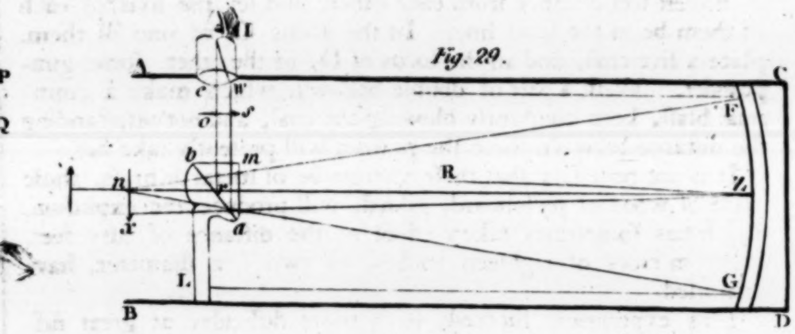

M
I
C
E
R
b
m
a
L
G
D

Fig. 24.

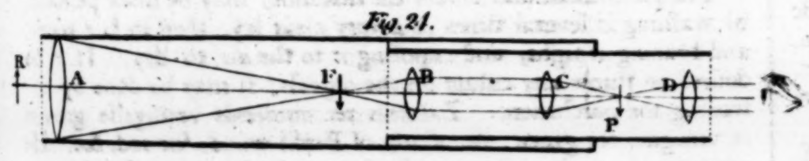


Fig. 31.

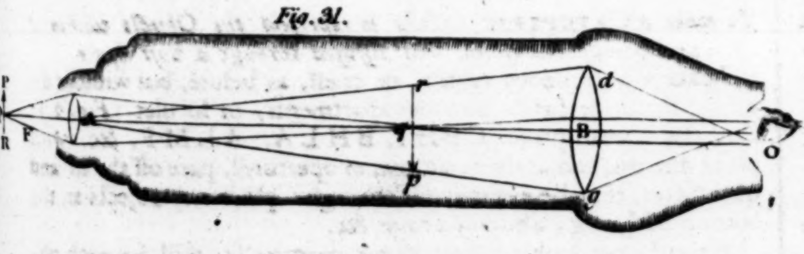


Fig. 26.

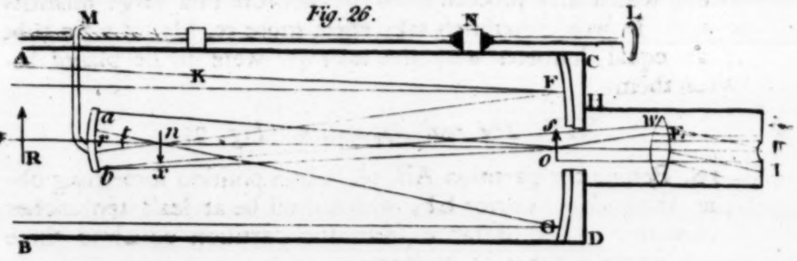

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Fig. 27.

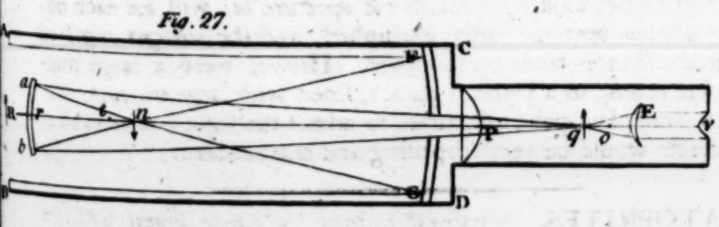

Fig. 28.

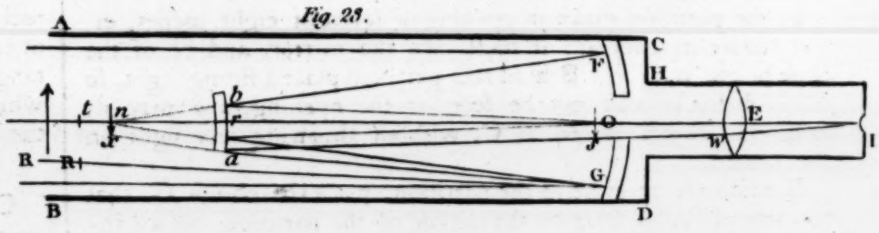
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Fig. 33.

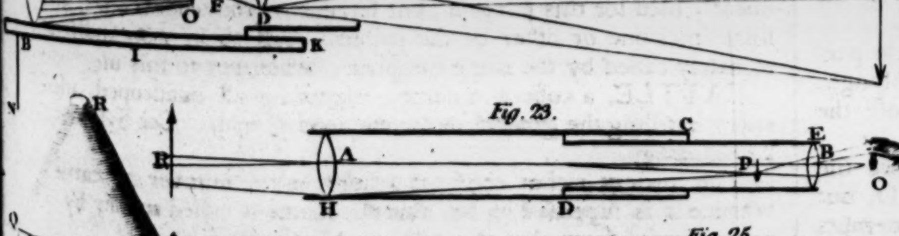
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Fig. 32.

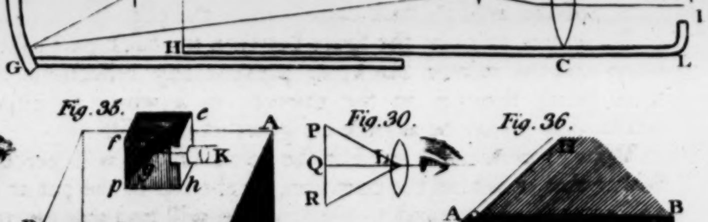
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Fig. 23.

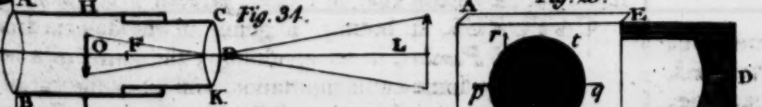

Fig. 34.

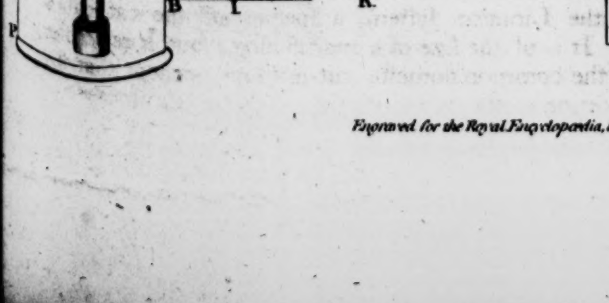
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Fig. 25.

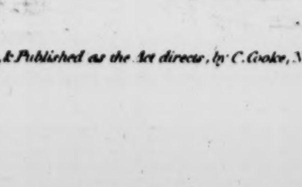


Fig. 35.

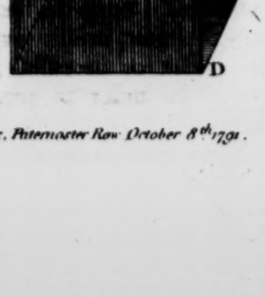


Fig. 30.

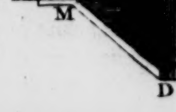
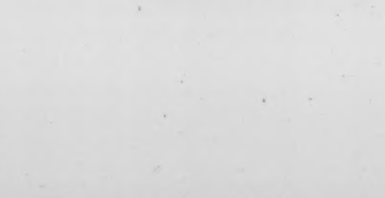


Fig. 36.



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BRITISH MUSEUM 18 MR 63

It has upright pointed ears, marked with two brown tranſverſe bars: the colour of the head, and whole upper part of the body, a reddiſh brown, marked with long narrow ſpots on the back, and with ſmall ſpots on the ſides: the belly, chin, and throat are white; the tail, arred with black. The length of this animal is two feet and a half; and that of the tail, eight inches.

It is leſs fierce againſt the human ſpecies than many of the other beaſts of prey, and may even be tamed. It naturally grows very fat, and inhabits America.

CATUS *Zibethicus*, in tetrapodology, a name improperly given to the creature which produces the perfume called civet; it not being of the cat, but of the wolf or dog kind.

CATY is a ſmall weight, whereby the lapidaries of the Eaſt weigh their emeralds, equivalent to three grains.

CAVA, in anatomy, the name of a vein, the largeſt in the body, terminating in the right ventricle of the heart; where it opens with a large mouth, to convey to it the blood brought from all the parts of the body, by the branches of the other veins, which all terminate in the cava.

At its entrance into the right ventricle, it has three membranous valves, called tricuſpides, or triglochines, from their triangular figure; ſo accommodated as to allow the blood's paſſage from the cava to the heart, and to prevent its return.

The cava is divided into the aſcending and deſcending parts; the aſcending cava, is that which ariſes from the lower parts; ſo called, becauſe the blood hereby conveyed to the heart, mounts or aſcends. The deſcending cava comes from the upper parts; and is ſo called, becauſe the blood hereby brought from the head, and other parts, deſcends.

CAVAGIRO, in ichthiology, the name of a fiſh common in the mediterranean, and brought to the markets in many places. It is ſomething of the eel ſhape, but thinner and flatter.

CAVALCADE, a formal, pompous march, or proceſſion of horſemen, equipages, &c. by way of parade, or ceremony, as to grace a triumph, public entry, or the like.

CAVALIER, or CAVALEER, a horſeman, or perſon mounted on horſeback: eſpecially if he be alſo armed and has alſo a military appearance.

Anciently the word was reſtrained to a knight, or *miles*. See KNIGHT.

The French ſtill uſe Chevalier in the ſame ſenſe.

CAVALIER, in fortification, a mount or elevation of earth, either round, or oblong; having a platform on the top, bordered with a parapet, to cover the cannon placed on it, and cut with embraſures to fire through; ſerving to overlook and command all around the place.

Cavaliers are generally placed within the baſtions, and made of the ſame form, leaving about five fathoms room between the parapets. They ſerve as a rampart to the baſtion, and their height exceeds that of the baſtion by about ſix or ſeven feet. Sometimes they are placed in the gorges, or behind the curtain, but not often.

Cavaliers are a double defence for the faces of the oppoſite baſtion: they defend the ditch, break the beſiegers galleries, command the traverſes in dry moats, ſcour the ſaliant angle of the counterſcarp, where the beſiegers have their counter-batteries, and enfilade the enemies trenches, or oblige them to multiply their parallels: they are likewiſe very ſerviceable in defending the breach and the retrenchments of the beſieged, and can very much incommode the entrenchments which the enemy make, being lodged in the baſtion.

CAVALRY, a body of ſoldiers who fight or march on horſeback

The word comes from the French *cavaliere*, and that from the corrupt Latin *cabellus* a horſe; whence *caballarius*, and *cavallarius*, in the later Latin, and *καϐαλλαριος*, in the Greek.

The cavalry is uſually divided into horſe and dragoons.

The horſe are either regimental, or independent troops; to which latter ſort belong the horſe-guards; and in France, the gens d'armes and muſketeers who ſerve on horſeback. The dragoons and regimental horſe form what they call the light cavalry; the troopers, the heavy cavalry. When an army is ranged in order of battle, the cavalry is poſted on the wings.

Bodies of cavalry, ranged in form of battle, are called ſquadrons.

The chief uſe of the cavalry is to make frequent excurſions to diſturb the enemy, intercept his convoys, and deſtroy the country; in battle to ſupport and cover the foot, and to break through, and put the enemy in diſorder; alſo to ſecure the retreat of the foot. Formerly the manner of fighting of the cavalry was, after firing their piſtols or carabines, to wheel off, to give opportunity for loading again. Guſtavus Adolphus is ſaid to have firſt taught the cavalry to charge through, to march ſtraight up to the enemy, with the ſword drawn in the bridle hand, and each man having fired his piece, at the proper diſtance, to betake himſelf to his ſword, and charge the enemy as was found moſt advantageous.

The Turkiſh cavalry conſiſts partly of ſpahis, and partly of horſemen, raiſed and maintained by the Zaims and Timariots.

CAUDA *Capricorni*, a fixed ſtar of the fourth magnitude, in the tail of capricorn.

CAUDA *Ceti*, a fixed ſtar of the third magnitude.

CAUDA *Cygni*, a fixed ſtar of the ſecond magnitude in the ſwan's tail.

CAUDA *Delphini*, a fixed ſtar of the third magnitude, in the tail of the dolphin.

CAUDA *Draconis*, the dragon's tail, in aſtronomy, the name of the moon's ſouthern or deſcending node.

CAUDA *Equina*, in anatomy, a denomination given to the loweſt part of the ſpinal marrow, from the laſt vertebra of the thorax to the end of the os ſacrum.

It is thus denominated from its form, which is ſuppoſed to reſemble a horſe's tail. Its ſubſtance is fibrous, and very tenaceous.

CAUDA *Equina* alſo denotes a medicinal herb, whoſe leaves are reputed to have a ſtrengthening virtue. This, in Engliſh, is called the horſe-tail. The officinal kind is more particularly called by botaniſts equiſetum majus, in Engliſh, the great marſh-horſe-tail.

CAUDA *Leonis*, a fixed ſtar of the firſt magnitude in the lion's tail.

CAUDA *Urſæ Majoris*, a fixed ſtar of the third magnitude, in the extreme part of the tail of the great bear.

CAUDA *Urſæ Minoris*, a fixed ſtar of the third magnitude, in the extreme part of the tail of the leſſer bear.

CAUDEBEC, in manufactures and commerce, a ſort of hats thus called from the town of Caudebec in Normandy, where they manufacture a great number of them. They are made of lamb's wool, of the hair or down of oſtriches, or of camel's hair.

CAUDISONA, vipera, in amphibiology, a name by which authors call the rattle ſnake.

CAVE, a ſubterraneous hollow place of a certain extent.

Some authors diſtinguiſh between a cave and a cavern, making the firſt the effect of art, and the latter of nature. Caves were doubtleſs the primative habitations; before men brought themſelves to erect edifices above ground, they took ſhelter under it. The primative manner of burial, was alſo to repoſite bodies in caves, which appears to have been the origin of the catacombs. Phil. Tranſ. No. 244. p. 344.

Badmington cave, in Wiltſhire, conſiſts of a ſeries or row of uniform holes, wherein pieces of armour are ſaid to have been found, whence they are by many ſuppoſed to have been tombs of ancient warriors.

CAVEAR, CAVIA, or KAVIA, a kind of food or pickle, in great uſe and repute throughout Muſcovy; and alſo introduced upon the Engliſh table.

It is formed from the Italian *caviale*, or barbarous Greek *καϐιαρι*, which ſignifies the ſame.

The *cavia*, or *cavear*, is the roe, or ſpawn of the ſturgeon, taken out, ſalted, and dried in the ſun, or by the fire. The Italian merchants ſettled at Moſcow, drive an incredible trade with cavear; the fiſh being caught in prodigious quantities at the mouth of the Volga, and other rivers which empty themſelves into the Caſpian ſea. They cure or prepare the roes on the ſpot, and thence ſend them in this form of cavear up the Volga to Moſcow, to be there diſtributed throughout that vaſt empire; where it is of wonderful ſervice to the people, on account of the three Lents there obſerved with great ſeverity.

The manner of making the cavear is by taking out of the ſpawn of the ſturgeon all the nerves or ſtrings, then waſhing it in vinegar, or white wine, and ſpreading it on a table, they dry and ſalt it with the hand, and preſs it in a fine bag, that the liquor may run out; this done, they caſe it up in a veſſel with a hole at bottom, that if there be any moiſture left it may run out. In this ſtate, being well preſſed and covered, it is fit for ſale.

CAVEAR is alſo prepared of the ſpawn of ſome other fiſhes: what we otherwiſe call botargo, is a cavear made from a ſort of mullet caught in the Mediterranean.

According to Savary, the beſt cavear brought from Muſcovy is that made from the belluga, a fiſh eight or ten feet long, caught in the Caſpian ſea, which is much preferable to that made of the ſpawn of ſturgeon.

The Engliſh import conſiderable quantities of this commodity from Archangel; though not ſo much for home conſumption as to ſupply the French and Italians. To be good, it ſhould be of a reddiſh brown colour, and very dry. It is eat with oil and lemon; ſometimes with vinegar; ſome eat it alone with bread; and others only as a ſauce, or pickle, like anchovies.

CAVEAT, in law, a bill entered in the eccleſiaſtical court, to ſtop the proceeding of one who would prove a will, or obtain letters of adminiſtration, to the prejudice of another.

It is alſo uſed to ſtop the inſtitution of a clerk to a benefice. An inſtitution after a caveat entered, is void by the eccleſiaſtical law; but this the temporal courts pay no regard to, and look upon a caveat as a mere nullity. Blackſt. Com. vol. iii. p. 246.

CAVEATING, in fencing, the act or art of diſengaging, or ſhifting the ſword from one ſide of the adverſary's ſword to the other.

CAVERN, a hollow place under ground.

Okey-hole, Elden-hole, Poole's-hole, and the Devil's A—ſe in the Peake, are famous among the natural caverns of our country.

The entrance to Okey-hole, on the ſouth ſide of Mendip-hills, is in the fall of thoſe hills, which is beſet all about with rocks, and has near it a precipitate deſcent of near twelve fathoms deep, at the bottom, of which there continually iſſues from the rocks a conſiderable current of water. The naked rocks above the entrance ſhew themſelves about thirty fathoms high, and the whole aſcent of the hill above is about a mile, and is very ſteep. As you paſs into this vault, you go at firſt upon a level, but advancing farther, the way is found to be rocky and uneven, ſometimes aſcending, and ſometimes deſcending. The roof of this cavern, in the higheſt part is about eight fathoms from the ground, but in many particular places, it is ſo low, that a man muſt ſtoop to get along. The breadth is not leſs various than the height, for in ſome places it is five or ſix fathoms wide, and in others not more than one or two. It extends itſelf in length about two hundred yards. People talk much of certain ſtones in it, reſembling men and women, and other things, but there is little matter of curioſity in theſe, being only ſhapeleſs lumps of a common ſpar. At the fartheſt part of the cavern there is a good ſtream of water, large enough to drive a mill, which paſſes all along one ſide of the carvern, and at length ſlides down, about ſix or eight fathoms, among the rocks, and then preſſing through the clefts of them, diſcharges itſelf into the valley.

The river within the cavern is well ſtored with eels, and has ſome trouts in it; and theſe cannot have come from without, there being ſo great a fall near the entrance. In dry ſummers, a great number of frogs are ſeen all along this cavern, even to the fartheſt part of it; and on the roof of it, at certain places, hang vaſt numbers of bats, as they do in almoſt all caverns, the entrance of which is either level, or but ſlightly aſcending or deſcending; and even in the more perpendicular ones they are ſometimes found, provided they are not too narrow, and are ſufficiently high. The cattle that feed in the paſtures, through which this river runs, have been known to die ſuddenly ſometimes after a flood; this is probably owing to the waters having been impregnated, either naturally or accidentally, with lead ore. Philoſoph. Obſerv. N° 2. p. 2.

In the Philoſophical Tranſactions, N° 480. p. 223. we have an account of a ſubterranean cavern, near Weredale, about twenty miles ſouth-weſt of Newcaſtle.

Elden-hole is a perpendicular chaſm, three miles from Buxton, ranked among the natural wonders of the Peak. Its depth is unknown, and is pretended to be unfathomable. Cotton tells us he ſounded 884 yards; yet the plumbet ſtill drew. But he might eaſily be deceived, unleſs his plumbet was very heavy; the weight of a rope of that length might well make the landing of the plumbet ſcarce perceivable. Phil. Tranſ. N° 407. p. 24.

Peak's-hole, and Pool's-hole, called alſo the Devil's A—ſe, are two remarkable horizontal ſprings under mountains; the one near Caſtleton, the other juſt by Buxton. They ſeem to have owed their origin to the ſprings which have their current through them: when the water had forced its way through the horizontal fiſſures of the ſtrata, and had carried the looſe earth away with it, the looſe ſtones muſt fall down of courſe: and where the ſtrata had few or no fiſſures, they remained entire; and ſo formed there very irregular arches, which are now ſo much wondered at. The water which paſſes through Pool's hole is impregnated with particles of lime-ſtone, and has incruſted the whole cavern in ſuch a manner that it appears as one ſolid rock. Martyn, in Phil. Tranſ. N° 407. p. 27, & ſeq.

In caverns are frequently found cryſtals of the rock, ſtalactites, and other natural conglaciations, and thoſe often of an amazing beauty.

CAVERNOSA *Corpora*, in anatomy, called alſo *corpora nervoſa*, and *ſpongioſa*, are two cavernous bodies, of an indeterminate length and thickneſs, whereof the penis is principally compoſed.

Their internal ſubſtance is rare, and ſpongy; and when filled with blood and ſpirits, it dilates and ſwells, in which the tenſion or erection of the penis conſiſts.

CAVERNOSUM *Corpus Urethræ*, a third ſpongeous body of the penis; ſo called, becauſe the urethra, or urinary paſſage of the penis is incloſed by it. See Syſtem of ANATOMY, Sect. III. Part IV.

CAVERNOSA *Corpora of the Clitoris*, are two nervous or ſpongy bodies, like thoſe of the penis; they have their origin from the lower part of the os pubis, on each ſide; and uniting together, conſtitute the body of the clitoris, as others do that of the penis.

Indeed, they have no perforation analagous to that of the penis; but they have a ſeptum, or membranous partition, running all along between them, and dividing them from the glans, to its divarication at the os pubis, where they are called crura clitoridis.

CAVETTO, in architecture, a hollow member or moulding, containing a quadrant of a circle, and having an effect juſt contrary to that of a quarter round: it is uſed as an ornament in cornices.

The word is Italian, and is no more than a diminutive of cavus, hollow.

M. Felibien obſerves, that the workmen confound the cavetto with a ſcotia, but improperly; the cavetto being in effect only half a ſcotia: yet he himſelf is chargeable with the ſame overſight.

When in its natural ſituation, the workmen frequently call it gula, or gueule; and when inverted gorge.

Cavetto is the ſame with what is otherwiſe denominated a caſement. Moxon ſhews how to deſcribe the cavetto, both from the oxygon and the ſemicircle.

CAVIL, *cavillatio*, is defined by ſome a fallacious kind of reaſon, carrying ſome reſemblance of truth, which a perſon knowing its falſehood, advances in diſpute for the ſake of victory.

The art of framing ſophiſms or fallaces is called by Boethius, *cavillatoria*.

CAVIN, in the military art, a natural hollow, fit to cover a body of troops, and thereby facilitate their approach to a place.

A cavin near a place beſieged is of great advantage to the beſiegers; as by help hereof they can open trenches, make places of arms, keep guards of horſe, and the like, without being expoſed to the enemy's ſhot.

CAVITY, among anatomiſts and phyſicians, make a ſpecies of organical conformation, either natural or morbid.

CAVITIES *of the Bones* are of two kinds; the firſt formed from articulation, called *cotyles* and *glenes*; the ſecond for other purpoſes, called *cells*, *caverns*, *foramina*, *foſſæ*, and *ſulci*.

CAUK, or CAWK, is uſed by miners in the Peak, to denote a coarſe ſort of ſpar; being a ponderous white ſtone, generally found near lead mines, which will draw a white line chalk, or the galactites. Phil. Tranſ. N° 110. p. 226. Ibid. N° 39, p. 770. It is unſoluble in acids, and fulcible by fire.

The word is formed probably of the German *kaalq*, *ſpar*.

It is properly no other than a ſparry matter, rendered very coarſe, by being mixed with a large portion of earth. In ſome places it is found more clear and tranſparent than in others; it approaches in this ſtate to the nature of cryſtal, and is called baſtard cauk, and bright cauk. Philoſ. Tranſ. N° 407.

There is a ſingular proceſs mentioned by Dr. Liſter, which is that of vitrifying antimony by its means. This is done with great readineſs and ſpeed by it, and the glaſs, thus made, will produce ſome effect on other metals, which no other glaſs will, nor indeed any other preparation of antimony. The method of preparing it is this: take a pound of antimony, flux it clear; have in readineſs an ounce or two of cauk in a lump red hot; put it in the crucible to the melted antimony, and continue it in fuſion; then caſt it into a clean mortar, not greaſed, decanting the clear liquor from the lump of cauk. This proceſs gives more than fifteen ounces of glaſs of antimony, like poliſhed ſteel, and bright as the moſt refined quickſilver. The cauk, in the mean time, is found to be diminiſhed, not increaſed in its weight, and will never flux with the antimony, though ever ſo ſtrong fire be given it. This is a very odd mineral, and this learned author ſuppoſes it to be allied to thoſe white, milky, and mineral juices which are found in the mines. The effect of both is evidently the ſame; for the milky juice of lead mines vitrifies the whole body of antimony, in the ſame manner that the cauk does in this experiment. Phil. Tranſ. N° 110.

That there is ſomewhat very peculiar in the cauk, is plain from this effect on antimony, which no other thing of this kind is poſſeſſed of; for lapis calaminaris, ſulphur, vivum, galactites, mundicta, alum ore, ſpar, and many other things have been tried with antimony in the ſame manner, but not one of them has this effect.

CAUKING, or CAULKING, *of a Ship*, is driving a quantity of oakum, or old ropes untwiſted and drawn aſunder, into the ſeams of the planks, or into the intervals where the planks are joined together in the ſhip's decks or ſides, in order to prevent the entrance of water. After the oakum is driven very hard into theſe ſeams, it is covered with hot melted pitch or roſin, to keep the water from rotting it.

Kennet derives the word from the barbarous Latin, *calciatura*, ſhoeing.

CAUL, in anatomy, a membrane in the abdomen, covering the greateſt part of the guts; called from its ſtructure *reticulum*, but moſt frequently *omentum*.

CAUL is likewiſe a little membrane, found in ſome children, encompaſſing the head, when born.

Drelincourt takes this caul to be only a fragment of the membranes of the fœtus, which ordinarily break at the birth of the child.

CAUL, or CAULE, among mineraliſts, a reddiſh pink coloured ſtone, found in the ſtrata of the tin mines.

CAULICOLES, CAULICULI, in architecture, denote thoſe eight leſſer branches, or ſtalks in the Corinthian capital, which ſpring out from the four greater principal caules, or ſtalks. See ARCHITECTURE, Plate IV.

The word comes from the Latin *caulis*, the ſtalk, or ſtem, of a plant.

The volutes of this order are ſuſtained by four caules, or primary branches of leaves; from which ariſe theſe caulicoles, or leſſer foliages.

Some authors confound the caulicoles with the volutes themſelves; ſome with the helices in the middle, and ſome with the principal ſtalks whence they ariſe.

CAULIFEROUS *Herbs*, are ſuch as have a true caulis, ſtalk, or trunk, which a greatmany have not; as the capillaries, &c.

They are ſometimes divided into cauliferous, and acaloſe.

The former are either perfectly cauliferous, as cabbage, or imperfectly, as moſſes.

CAULIFLOWERS, a ſpecies of braſſica, are the produce of a kind of cabbage, and have of late years been ſo far improved in England, as to exceed in ſize and goodneſs any that are raiſed in the reſt of Europe. They are in ſeaſon in the months of May, June and July, but the ſkill of the gardener can continue them much longer. The manner of propagating them is this:

Having procured ſome good ſeed, you muſt ſow it before the middle of Auguſt, upon an old cucumber or melon bed, ſifting earth over the ſeeds to a quarter of an inch thickneſs: if the weather prove very hot and dry, the beds muſt be ſhaded with mats, and be lightly watered at times. In about a week's time the plants will appear above ground, and they muſt be uncovered by degrees, but not expoſed to too much ſun at firſt. In about a month after ſowing, they ſhould be pricked out on another old bed, at two inches diſtance, and ſhaded and watered when firſt tranſplanted; but after this they muſt not be much watered, nor be ſuffered to have too much rain, which will make them black ſhanked, or rotten in the ſtalks. In this bed they are to remain till the end of October, when they are to be planted out for the winter ſeaſon: they are then to be planted out in rich beds, and thoſe which are to be early ripe are to be ſhaded with bell glaſſes, two under each glaſs, and toward the latter end of February to be planted out again: the reſt are to be at firſt ſet at a greater diſtance, and to ſtand.

When the cauliflowers begin to fruit, they muſt be carefully watched, and ſome of the inner leaves muſt be bent down over the flower, to ſhade it from the ſun, which would otherwiſe turn it yellow. The very fineſt of the cauliflowers, which are not looſe and frothy about the edges, and very firm, ſhould be ſaved for ſeed; and the flower ſtems, as they ſhoot out, be ſupported with ſticks till the ſeeds are ripened, which muſt then be carefully gathered and dried for uſe. Mill. Gard. Dict.

CAULIS, among botaniſts, the ſtalk or ſtem of an herbaceous plant; or that part which riſes ſingle above the earth, from which the branches and leaves ſhoot upward.

In trees and ſhrubs this is properly called caudex, or trunk; in herbs caulis; or ſtalk; in corn and graſſes, calmus, or ſtem.

CAUSA *Matrimonii Prælocuti*, in law, a writ that lies when a woman gives land to a man in fee, to the intent he ſhall marry her, and he refuſes to do it in a reaſonable time: and in ſuch caſe for not performing the condition, the entry of the woman into the lands again has been adjudged lawful. The huſband and wife may ſue this writ againſt another, who ought to have married her.

CAUSA *Nobis Significes*, in law, a writ directed to the mayor of a town, &c. who, being by the king's writ commanded to make ſeiſin of lands to the king's grantee, delays doing it. The writ requires him to ſhew cauſe of the delay.

CAUSALITY, in metaphyſics, the power or action of a cauſe in producing its effect.

It is a diſpute among philoſophers, whether, and how the cauſality is diſtinguiſhed from the cauſe and effect? Some held it a mode, or modal entity, ſuper-added to the cauſe, &c. others contend for its being the cauſe itſelf, only conſidered *principiativè* and *terminativè*, &c.

CAUSE, that from whence any thing proceeds, or by virtue of which any thing is done: it ſtands oppoſed to effect. We get the ideas of cauſe and effect from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produces, is the cauſe; and that which is produced, the effect: thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

Firſt CAUSE, is that which acts of itſelf, and from its own proper power or virtue. In this ſenſe, God is the only firſt cauſe.

Second CAUSES, are thoſe which derive the power and faculty of acting from a firſt cauſe.

It is certain the philoſophers are ſtrangely puzzled, and divided about the manner of their agency: ſome maintain them to act by their matter, figure, and motion; others by a ſubſtantial form; many by accidents, or qualities; ſome by matter and form; and others by certain faculties different from all theſe.

CAUSES, again, are diſtinguiſhed into phyſical, or natural and moral.

CAUSEWAY, a common hard raiſed way, maintained and repaired with ſtones and rubbiſh.

Devil's CAUSEWAY, a famous work of this kind which ranges through the county of Northumberland, commonly ſuppoſed to be Roman, though Mr. Horſley ſuſpects it to be of later times. Horſley, Brit. Rom. lib. v. ca. 2. p. 449.

Giants CAUSEWAY, is a denomination given to a large pile of ſtony columns, in the diſtrict of Coleraine in Ireland.

It is alſo a name given by the common people of the county of Antrim, in Ireland, to a vaſt quantity of that kind of black marble, called baſaltes, which ſtands in columns, and is natural to that marble, and runs out a great way into the ſea.

The ignorance of the vulgar as to the nature of this ſtone, has occaſioned this great pile of it to be ſuppoſed artificial, and the work of giants, once inhabitants there. But the truth is, that the baſaltes, in whatever part of the world it is found, is always naturally of this figure. Whoever conſiders this amazing ſeries of columns in Ireland, will be ſoon convinced no human hands could have formed them, and will find an accuracy in their figures greater than could have been expected from the moſt curious hand. The length of the ſeveral columns, and their joints ſo regularly placed in ſeries, and the niceneſs of their articulations, by which no ſpace or vacuity is left between, are wonderful.

Nature has been abundantly curious in the ſtructure and formation of animal and vegetable bodies, but the foſſils in general are leſs curiouſly put together; but this cauſeway of baſaltes ſeems one of the works in this part of the creation, in which her greateſt accuracy has been employed.

The ſingle columns, of which this maſs of piles conſiſts, are ſometimes octangular, ſometimes of ſeven, or fewer ſides, but, generally, from three to nine ſides; and, when examined, they are found juſt ſuch as muſt neceſſarily be required in the places where they ſtand to fill up between others, ſo as to leave no vacuity. Each of theſe columns is compoſed of a great many ſeries of joints, each of which is ſo well fitted to the place, that the joining appears only a crack or crevice in the ſtone: yet theſe are regularly articulated, there being always a ball on one part, and a ſocket in the other to receive it, ſo that the joints cannot ſlip off from one another. The triangular and ſquare columns are fewer in number than the others, but they ſtand principally in the inner part of the large ſeries, and are ſeldom ſeen, unleſs ſearched after by a curious eye.

The regular figure of the ſtone, compoſing this cauſeway, is not more wonderful than its quantity. Other figured ſtones, as cryſtals, ſpars, and the remains of animals, ſuch as entrochi and aſteriæ, are found only ſcattered thinly up and down; but nature has been profuſe in this part of her workmanſhip, the whole country for many miles being full of it, and a vaſt maſs running into the ſea: for, beſides what vulgarly goes by the name of the giant's cauſeway, which is itſelf of vaſt extent, there are great numbers of the ſame pillars at diſtances in other places.

There are two other ſmaller and imperfect cauſeways to the left hand of the great one, and farther in the ſea, a great number of rocks ſhew themſelves at low water, which appear plainly all to conſiſt of the ſame ſort of columns.

One parcel of them is much admired, and called by the country people the looms of the organs. It ſtands in an elegant form, and faces the bottom of the hill. The columns, of which this cluſter conſiſts, are fifty in number, and they are ſo nicely put together, that the talleſt ſtand in the middle, and the ſhorter gradually on each ſide of it to the end, ſo that they look like the pipes of a church organ viewed from the front. The talleſt one of all theſe, which ſtands exactly in the centre, is forty feet high, and conſiſts of forty four diſtinct joints.

Five miles weſtward of the giants cauſeway ſeveral ranges of tall pillars, of the ſame kind with thoſe of the cauſeway ſhew, themſelves in cluſters, and ſmaller piles ſtanding for a long way on the ſides of the rocks. A neighbouring church was built of the ſtone of ſome like pillars found thereabout; and this ſtone, on examination, proves to be the very ſame with that of the pillars of the giants cauſeway. Other pillars have been obſerved at a ſtill greater diſtance, ſo that their whole extent is not leſs than about eleven Iriſh miles, or fourteen Engliſh.

The inland pillars differ from thoſe which run into the ſea, and are called the cauſeway, only in the following particulars: ſome of the inland pillars are much larger than thoſe of the cauſeway, being two feet and a half in diameter, and among theſe there are only found ſuch as have three, four, five, and ſix ſides, none of them having yet been found to have ſeven or eight ſides, as many of thoſe of the cauſeway itſelf have. And, finally, theſe inland pillars, though compoſed of as many joints as thoſe of the cauſeway, yet have not that curious articulation of the ball and ſocket, but are only joined by the laying one ſmooth ſurface on another; ſo that a joint of a ſingle column may be ſlipped off from the reſt, by a conſiderable force preſſing againſt it.

Great numbers of the upper ends of the columns, which compoſe the cauſeway itſelf, are hallowed at the top, as if intended to receive another joint with a ball at its end, or as if ſuch a joint had fallen off from them. Theſe hollows are of great uſe to the neighbouring poor, for they make a kind of ſalt pans of them, and thus very eaſily procure themſelves a kind of bay ſalt in ſummer. They fill theſe little baſons with ſea water at high tides, and the heat of the ſun and of the ſtone contributing greatly to the evaporation, as well as the ſhallowneſs of the baſon, the whole humidity is found evaporated in the time of four tides, and they take out the ſalt ready for uſe. The joints, of which theſe pillars conſiſt, are generally convex at one end, and concave at the other; the firſt part ſerving as a ball for the ſocket of the joint next below, and the other as a ſocket for the ball of the joint next above. But this is not an unalterable law in their formation; for there are ſome joints found which are convex at both ends, and others which are concave at both ends, to receive balls, or enter ſockets both ways. The vaſt height of theſe ſtraight joint pillars, eſpecially of the more ſlender and perfect ones, is amazing. Forty feet is a very conſiderable height for a pillar, of perhaps leſs than a foot in diamer, yet this is far from being the whole real length of the pillar, for this appears above ground, but what is buried in the earth is not yet known. Some curious people have dug down eight feet at the baſe, and found the column run in the ſame ſhape and regularity to that depth, and there appeared no room to doubt of its having gone in reality much farther.

It is to be obſerved, that where the top of any pillar ſeems complete, and no part to have been broken off, the ſummit of the top joints is uſually flat and ſmooth, nature having provided no convexity or cavity in a part where it had no uſe.

There ſeems a very great difficulty to conceive by what means the ſtony joints, ſo bulky and ponderous, and ſo perfectly diſtinct, and diſcontinued bodies from one another, could arrive at the places where they now are placed, or be carried to the top of ſuch high columns; but when we conſider many other natural phenomena, we ſhall find ſo many things equally wonderful, that this will not appear the leſs a work of nature becauſe it is beyond our comprehenſion.

The internal ſubſtance of the ſtone compoſing theſe columns, is extremely hard and compact. Its greet, or grain, is ſo very fine, that the eye does not perceive it, unleſs examined very nicely, and that in the ſurface of a piece newly broken. It then ſhews itſelf like a very fine glittering ſand, thickly interſperſed among a more opake matter; the whole is heavier than almoſt any other ſimple ſtone; yet it contains not the leaſt particle of any metal ſo far as has been yet diſcovered. It is the pureſt and moſt hemogene of any ſtone of this country: having no extraneous matter, no foſſils of the animal kind in it, ſuch as ſhells, entrochi, and the like; which are well known to be very common in the various ſtrata of ſtone, in Ireland, and in many other parts of the world. However, Mr. Drury, well known for his models of ſeveral ſtones of this cauſeway, and his engravings of the proſpects of the cauſeway itſelf, found in one of the ſtones a rough pebble in the ſhape of an egg, about three quarters of an inch long, and above an inch thick; which, when it was poliſhed, proved to be a white cornelian.

Marbles, in general, are very ſubject alſo to cracks, which when filled up, as they uſually are with ſparry matter, make a ſort of white veins; but ſuch cracks and veins are not to be ſeen in the marble of theſe columns. It has been tried in a glaſs houſe, and found to melt with kelp, ſo as to make the black glaſs bottles.

From theſe obſervations ſome have concluded, that there is an analogy between this marble and cryſtal in their origin and formation, as the colums of every cryſtal are alike pure and homogeneous, alike of a regularly angular figure, and both are alike free from veins, cracks, and extraneous ſubſtances. See Philoſ. Tranſ. N° 199, 212, 241. Lowth Abridg. vol. ii. p. 511. ſeq. Phil. Tranſ. vol. xlvii. vol. xlviii. art. 34 and 35.

There are other priſmatic colums, ſimilar to thoſe above deſcribed, in our own iſland; particularly in the mountain of Caderidis, near Dolgelly, in Merionethſhire.

CAUSTICS, in phyſic, an appellation given to medicines of ſo hot and fiery a nature, that, being applied, conſume the texture of the parts, like hot iron.

Cauſtics are uſed to eat off proud fungous fleſh; they alſo penetrate within hard callous bodies, and liquify the humours: and are particularly applied in abſceſſes and impoſthumation, to eat through to the ſuppurated matter, and give it vent: ſometimes, alſo, to make iſſues in parts where cutting is difficult, or inconvenient.

Cauſtics are generally divided into four ſorts; the common ſtronger cauſtic, the common milder cauſtic, the antimonial cauſtic, and the lunar cauſtic. See Syſtem of PHARMACY.

CAUSTICITY, in chemiſtry, denotes a quality belonging to ſeveral ſubſtances, by the acrimony of which the parts of living animals may be corroded and deſtroyed. Bodies which have this quality, taken internally, are true poiſons; and the cauſticity of ſome of them is ſo deadly, as, for example, of arſenic, that even their external uſe is proſcribed by prudent phyſicians.

CAUSUS, in medicine, denotes a burning fever, or a kind of acute continual fever, attended with a vehement heat, and other indications of an uncommon inflammation.

CAUTERY, *Cauterium*, a medicine to burn, ſear, eat through, or corrode, ſome ſolid part of the body.

The word is originally Greek, καυτηρ, or καυτηριον; formed from καιω, *I burn*.

CAUTING *Iron*, among farriers, an iron inſtrument, wherewith they cauteriſe and ſear the parts of a horſe which require burning.

CAXOU, in metallurgy, a word uſed to expreſs a cheſt of ores of ſilver, or any other metal, that has been burnt, ground, and waſhed, and is ready to be refined.

CAY, in tetrapodology, the name of a ſmall monkey of the Braſils, an extremely ſmall kind, and of a coal black. It lives only in the thick woods, and is uſually found ſitting on the boughs of ſome of the trees which bear pods, the fruit of which it feeds upon.

CAYANG, in botany, a leguminous plant cultivated in the Mogul dominions for food. It is a kind of coarſe pulſe; of which the Europeans uſe great quantities on ſhip-board in the Eaſt Indies. It is a ſpecies of the cytiſus, called by the Indians there kiſſery.

CAYELAC, a ſweet-ſcented wood, which grows in Siam; the Siameſe and Chineſe burn it in their temples. It is one of the commodities exported from Siam for China.

CAYMAN, the name of a ſpecies of crocodile found in the ſouthern parts of America, and on the coaſt of Guinea, and more uſually called by authors by its Braſilian name jacare.

CAZEMATE, in fortification, a kind of vault, or arch, of ſtone work, in that part of the flank of a baſtion next the curtain; ſomewhat retired, or drawn back, towards the capital of the baſtion; ſerving as a battery, to defend the face of the oppoſite baſtion, and the moat, or ditch.

The name comes from a vault, formerly made to ſeparate the platforms of the upper and lower batteries; each of which was called in Italian, *caſa armata*; and, in the Spaniſh, *caſamata*: though others derive the word from *caſa à matti*, houſe of fools; Covarruvias, from *caſa* and *mata*, low houſe.

CAZIC, or CAZIQUE, a general title given by the Spaniards to the petty kings, princes, and chiefs of the ſeveral countries of America, excepting thoſe of Peru, who are ſtiled curatas.

CEANOTHUS, in botany, a genus of the pentandria monogynia claſs; Euvonymus, Com. Hort. New Jerſey tea.

CEDAR, in botany. The ſpecies of cedar famous for its duration, is that popularly called by us the cedar of Lebanon, by the ancients *cedrus magna*, or the great cedar; alſo *cedrelate*, Κεδρελατη; and ſometimes the Phœnician, or Syrian cedar, from the country where it grows in its greateſt perfection. It is a coniferous evergreen, of the bigger ſort, bearing large roundiſh cones of ſmooth ſcales, ſtanding erect, the leaves being ſmall, narrow, and thick ſet. They ſometimes counterfeit cedar, by dying wood of a reddiſh hue: but the ſmell diſcovers the cheat, that of true cedar being very aromatic. In ſome places, the wood of the cajou tree paſſes under the name of cedar, on account of its reddiſh colour, and its aromatic ſmell, which ſomewhat reſemble that of ſantal.

CEDRIA, a reſinous liquor iſſuing from the great cedar tree, or cedar of Lebanon. The word is alſo written *cedrium* and *cedrinum*. Cedria, when good, yields a ſtrong ſmell, is tranſparent, and of a thick fatty conſiſtence; ſo that in pouring it out it does not fall too faſt or freely, but equally, drop by drop. It is poſſeſſed of two oppoſite qualities, viz. to preſerve dead bodies by its drying and conſuming ſuperfluous moiſture without damaging the ſolid parts, and to putrefy the ſoft and tender parts of living bodies without exciting any pain. The cedria is properly the tear of the cedar. The ſame denomination is alſo given to the cedrelæon, or oil of the cedars, which differs little from the reſin, except that it is of a thinner conſiſtence.

CEDRUS, the cedar-tree of Barbadoes, and mahogany, &c. As the cedar of Libanus is very properly referred by Linnæus to the genus of larix, and all the berry bearing cedars to to that of Juniperus, Mr. Miller hath choſen to treat this as a diſtinct genus; which, to avoid embarraſſment from a long detail of different ſpecies, ſeems the moſt proper method.

Species. 1. The odorata, or Barbadoes cedar, is a native of the Britiſh iſlands in America, and is one of the largeſt trees to be found there. The wood has a fragrant odour, from whence the name of cedar has been given to it. It grows to the height of 70 or 80 feet: while young, the bark is ſmooth, and of an aſh colour; but, as they advance, the bark becomes rough, and of a darker colour. Towards the top it ſends out many ſide branches, which are garniſhed with winged leaves, compoſed of 16 or 18 pair of lobes, and are ſometimes near three feet long: the lobes are broad at their baſe, and near two inches long, blunt at their ends, and of a pale colour; theſe emit a very offenſive odour in the ſummer time. The fruit is oval, of the ſize of a partridge's egg, ſmooth, and of a dark colour, and opens in five parts, having a five cornered column ſtanding in the middle, between the angles of which the winged ſeeds are cloſely placed, lapping over each other like the ſcales of fiſhes.

Species. 2. The mahogoni, or mahogany tree, is a native of the warmeſt parts of America; growing plentifully iu the iſlands of Cuba, Jamaica, Hiſpaniola, and the Bahama iſlands. In Cuba and Jamaica there are mahogany trees of a very large ſize, ſo as to cut into planks of ſix feet breadth; but thoſe of the Bahama iſlands commonly do not exceed four. They riſe to a great height, though they are generally found growing upon ſolid rocks, where there is ſcarce any earth for their nouriſhment. The leaves of this tree are winged like the aſh, having commonly ſix or eight pair of lobes, which are ſhorter and broader at the baſe than thoſe of the aſh, where they adhere by the midrib by very ſhort foot-ſtalks: theſe lobes are very ſmooth, having but one vein running through each, which is always on one ſide, ſo as to divide them unequally. Mr. Cateſby has delineated both the flowers and fruit of this tree. The former cannot be depended on, as they were drawn from a withered imperfect fragment; but the fruit is very exact. The fruit before it opens is of a brown colour, growing erect upon long foot-ſtalks, which cloſely adhore to the five cornered column running through the middle, and to which the ſeeds are faſtened, lying *imbricatim*, like the ſtates of a houſe. When the fruit is ripe, it divides at the bottom into five equal parts; and when theſe fall off, and the ſeeds are diſperſed, the foot-ſtalk and the column remain ſome months after on the tree. 3. The alaternifolius grows to the height of 80 feet or more. Towards the top it divides into many large branches, garniſhed with leaves ſomewhat reſembling the witch-hazel; but broader at their baſe, and cut angular at their top: theſe are of an aſh colour underneath, and ſet on the branches without any order: the fruit is much larger than that of the Barbadoes cedar, broad at the baſe, and diminiſhing gradually to the top, where it terminates in a point. This has alſo a woody column or core running lengthwiſe through the fruit, to which the winged ſeeds adhere as in the former.

All theſe plants may be eaſily propagated by ſeeds; but, being natives of very warm climates, they muſt be planted in pots ſheltered in a ſtove. The trunks of the firſt ſpecies are ſo large, that the inhabitants of thoſe iſlands where they grow were wont to hollow them, and form them into the ſhape of boats and periaguas; for which purpoſe they are extremely well adapted: the wood being ſoft, may be cut with great facility; and being light, will carry a great load on the water. The wood is often uſed for wainſcotting rooms, and to make cheſts, becauſe vermin do not ſo frequently breed in it as in other ſorts of wood; this having a very bitter taſte, which is communicated to whatever is put into the cheſts, eſpecially while the wood is freſh; for which reaſon it is never made into caſks, as the liquors put into them would diſſolve part of the bitter reſin. The uſes of mahogany are ſo well known that it is needleſs to enumerate them. As for the wood of the third ſpecies, we have no accounts whether it is ever uſed in buildings or for other purpoſes.

If the plants are properly managed, they will make conſiderable progreſs in England; ſome are now in Chelſea garden eight or ten feet high, which are but of a few years growth from ſeeds.

CEDRELA, in botany, a genus of the pentandria monogynia claſs, including only one ſpecies.

CEDRINUM, *Vinum*, cedar wine; of which there are ſeveral ſorts, whoſe qualities are heating, diuretic, and gently aſtringent.

CEGINUS, in aſtronomy, a fixed ſtar of the third magnitude, in the left ſhoulder of Bootes.

CEILING, in architecture, the top, or roof, of a lower room; or a covering of plaſter, over laths nailed on the bottom of the joiſts that bear the floor of the upper room; or where there is no upper room, on joiſts for the purpoſe; hence called ceiling joiſts.

The word ceiling anſwers pretty accurately to the Latin *lacunar*, every thing over head.

Plaiſtered ceilings are much uſed in England, more than in any other country: nor are they without their advantages, as they make the room lightſome; they are good in caſe of fire; ſtop the paſſage of the duſt; leſſen the noiſe over head; and, in ſummer, make the air cooler.

CEIXUPEIRA, in ichthyology, the name of a fiſh caught in the American ſeas, and eſteemed a very fine and delicate one, though of an enormous ſize. It grows to nine or ten feet long, and to the thickneſs of a man's body: but is chiefly eaten while young. Its body is oblong, and its head flatted. Its mouth is but ſmall for the ſize of the fiſh, and it has no teeth in the jaws; but the whole mouth is thick ſet with ſmall tubercles. Its back and ſides are black, and its belly of a fine bright white. Its fins are all black, except the belly ones, which are white, with a rim of black at their edge.

CELANDINE, in botany, chelidonium, a genus of the polyandria monogynia claſs.

The firſt ſort is the common celandine, which is uſed in medicine, and is eſteemed aperitive and cleanſing, opening obſtructions of the ſpleen and liver; and is of great uſe in curing the jaundice and ſcurvy. This grows naturally on the ſides of banks, and in ſhady places, in many parts of England, ſo is ſeldom cultivated in gardens. Miller's Gard. Dict.

Boccone has very ſtrongly recommended this plant as a ſpecific in the cure of conſumptions: he propoſes the taking it in infuſion, or drinking its juice; and ſays enough in its praiſe to recommend it at leaſt to a fair trial, which would be eaſily made in a country where conſumptions are ſo common. Boccon. de Plant.

CELANTES, in logic, a denomination given by the Peripatetic to the Galenical ſyllogiſm; otherwiſe called calentes.

CELARENT, among logicians, a mode of ſyllogiſm, wherein the major and concluſions are univerſal negative propoſitions, and the minor an univerſal affirmative. E. gr.

CE *None whoſe underſtanding is limited can be omniſcient.*
LA *Every man's underſtanding is limited.*
RENT *Therefore no man is omniſcient.*

CELEBATE, or CELIBACY, the ſtate of a perſon who lives out of marriage.

Scaliger derives the word from the Greek κοιτη, *bed*, and λειπω, *linquo, I leave*: others ſay, it is formed from *cæli beatitudo*, q. d. *the bleſſedneſs of heaven.*

The ancient Romans uſed all means imaginable to diſcourage celibacy. Nothing was more uſual than for the cenſors to impoſe a fine on old bachelors. Dionyſius Halicarnaſſeus mentions an ancient conſtitution, whereby all perſons of full age were obliged to marry. But the firſt law of that kind, of which we have any certainty, is that enacted under Auguſtus, called *Lex Julia de maritandis ordinibus.* It was afterwards denominated Papia, Poppæa, and more uſually Julia Papia, becauſe of ſome new ſanction and amendments made to it under the conſuls Papius and Poppæus. By this law, divers prerogatives were given to perſons who had many children: penalties impoſed on thoſe who lived a ſingle life, as that they ſhould be incapable of receiving legacies, except from their neareſt relations, and not exceeding a certain proportion, &c.

The celebate of the clergy, which is ſtill rigorouſly kept up among the Romaniſts, is of an ancient ſtanding. Syricius iſſued a decree in 385, obliging all prieſts and deacons to obſerve celibacy: and it was ſoon after enjoined by the ſynods of each particular nation, and obſerved in moſt of the weſtern churches. In 441, the council of Orange ordered thoſe to be depoſited who did not abſtain from their wives; and Leo the Great, in a letter written about the year 442, extended the law of celebacy, which was confined by the decree of this council to deacons, and by the letter of Syricius to deacons and preſbyters, to ſub-deacons likewiſe: but it was Gregory the Great, in 591, who firſt brought eccleſiaſtics to admit the celebate, as a law. In the council of Trent, it was propoſed to ſet the clergy at liberty again from the yoke of celebate; and this was even made an article of the Interim of Charles V. but the pope could not be brought into it.

The obligation of celebacy was firſt impoſed on the clergy in England by Henry I. under the influence of pope Calixtus II. and the archbiſhop Anſelem.

CELERITY, in mechanics, is the velocity of a moving body; or that affection of a body in motion, whereby it is enabled to paſs over a certain ſpace, in a certain time.

CELERY, in botany. The ſeed of celery ſhould be ſown at two or three different times, the better to continue it for uſe through the whole ſeaſon without running up to ſeed. The firſt ſowing ſhould be in the beginning of March, upon a gentle hot-bed; the ſecond may be at the end of the ſame month, which ought to be in an open ſpot of light earth, where it may enjoy the benefit of the ſun; the third time of ſowing ſhould be in the latter end of April, or beginning of May, on a moiſt ſoil; and if expoſed to the morning ſun only, it will be ſo much the better, but it ſhould not be under the drip of trees. The middle of May, ſome of the plants of the firſt ſowing will be fit to tranſplant for blanching.

The manner of tranſplanting it is as follows: after having cleared the ground of weeds, you muſt dig a trench by a line about ten inches wide, and eight or nine inches deep, looſening the earth in the bottom, and laying it level; and the earth that comes out of the trench ſhould be equally laid on each ſide the trench, to be ready to draw it again to earth the celery as it advances in height. Theſe trenches ſhould be made at three feet diſtance from each other; then plant your plants in the middle of the trench, at about four or five inches diſtance, in one ſtraight row, having before trimmed the plants, and cut off the tops of the long leaves: and as they are planted, you muſt obſerve to cloſe the earth well to their roots with your feet, and to water them plentifully until they have taken new root. As theſe plants advance in height, you muſt obſerve to draw the earth on each ſide cloſe to them, being careful not to bury their hearts, nor ever to do it but in dry weather, otherwiſe the plants will rot. When your plants have advanced a conſiderable height above the trenches, and all the earth, which was laid on the ſides thereof, have been employed in earthing them up; you muſt then make uſe of a ſpade to dig up the earth between the trenches, which muſt alſo be made uſe of for the ſame purpoſe; continuing from time to time to earth it up, until it is fit for uſe. The laſt crop ſhould be planted in a dryer ſoil, to prevent its being rotted with too much wet in the winter. Cover your ridges of celery with ſome peaſe-haulm, or ſome ſuch light covering, when the froſt is very hard, which will admit the air to the plants; for if they are covered too cloſe, they will be very ſubject to rot; by this means you will preſerve your celery till ſpring; but you muſt remember to take off the covering whenever the weather will permit, otherwiſe it will be apt to cauſe the celery to pipe, and run to ſeed. The celery, when full blanched, will not continue good above three weeks or a month before it will rot or pipe; therefore, in order to continue it good, you ſhould have, at leaſt, ſix or ſeven different ſeaſons of planting, proportioned to the conſumption.

The other ſort of celery, which is commonly called celeriac, is to be managed in the ſame manner; excepting that this ſhould be planted on the level ground or in very ſhallow drills: for this plant ſeldom grows above eight or ten inches high, ſo requires but little earthing up; the great excellency of this being in the ſize of the root, which is often as large as ordinary turneps.

The beſt method to ſave the ſeed of celery, is to make ſome choice of long good roots of the upright celery, which have not been too much blanched, and plant them out, at about a foot aſunder, in a moiſt ſoil, early in the ſpring; and when they run up to ſeed, keep them ſupported with ſtakes, to prevent their being broken down with the wind: and in July when the ſeed begins to be formed, if the ſeaſon ſhould prove very dry, it will be proper to give ſome water to the plants, which will greatly help its producing good ſeeds. In Auguſt theſe ſeeds will be ripe, at which time it ſhould be cut up, in a dry time, and ſpread upon cloths in the ſun to dry; then beat out the ſeeds, and preſerve it in bags for uſe.

Wild Celery, *apium antarcticum*, was found in conſiderable quantities by Mr. Banks and Dr. Solander, on the coaſt of Terra del Fuego. It is like the garden celery in the colour and diſpoſition of the flowers, but the leaves are of a deeper green. The taſte is between that of celery and parſley. It is a very uſeful ingredient in the ſoup for ſeamen, becauſe of its antiſcorbutic quality. Hawkeſworth's Voyage, vol. ii. p. 60, &c.

CELIDOGRAPHIA, the deſcription of the ſpots which appear on the faces of the ſun and planets.

The word is formed from κηλις, *macula, ſpot*, and γραφω, *I deſcribe.*

Signior Bianchini has publiſhed a *Celidographia*, or deſcription of the ſpots of the ſun.

CELL, *Cella*, in ancient writers, denotes a place or apartment uſually under ground, and vaulted; in which were ſtored up ſome ſort of neceſſaries, as wine, honey, wheat, and the like; according to which it was peculiarly denominated *cella vinaria, oleria, mellaria, penaria*, &c. The word is formed from *celare*, to conceal.

Cell was alſo uſed for the lodge, or habitation of a common woman or proſtitute, as being under ground: hence alſo denominated *fornix.*

> *Intravit calidum veteri centone lupanar,*
> *Et cellam vacuam.* Juv. Sat. vi. ver. 121.

On which place an ancient ſcholiaſt remarks, that the names of the whores were written on the doors of their ſeveral cells; by which we learn the meaning of *inſcripta cella*, in Martial, lib. xi. ep. 46.

Cell was alſo applied to the bedchambers of domeſtics and ſervants; probably as being low and narrow.

Cicero inveighing againſt the luxury of Anthony ſays, the beds in the very *cellæ* of his ſervants were ſpread with pompous purple coverlets.

Cell is alſo uſed for a leſſer or ſubordinate ſort of monaſtery, dependent on a great one, by which it was erected, and continues ſtill to be governed. The great abbies in England had moſt of them cells in places diſtant from the mother abbey, to which they were accountable, and from which they received their ſuperiors.

The alien priories in England were cells to abbies in Normandy, France, Italy, &c.

The name cell was ſometimes alſo given to rich and conſiderable monaſteries not dependent on any other. Such was that called *cella vetus*, erected by Otho, ſurnamed the Rich, marquis of Miſnia in the middle of the twelfth century, the moſt ſplendid abbey in that country.

CELLAR, *Celarium*, in ancient writers, denotes the ſame with cella, viz. a conſervatory of eatables, or drinkables.

Cellar differs from vault, as the latter is ſuppoſed to be deeper, the former being frequently little below the ſurface of the ground.

Cellars, in modern building, are the loweſt rooms in a houſe, the ceilings of which uſually lie level with the ſurface of the ground on which the houſe is built.

As to the ſituation of cellars, Sir Henry Wotton ſays, they ought, unleſs the whole houſe be cellared, to be ſituated on the north ſide of the houſe, as requiring a cool freſh air.

CELLEPORÆ, in botany, the name of a genus of marine plants, or rather animals, and claſs of worms in the Linnæan ſyſtem. They are of the genus of the lithophyta, and have oblong creeping hollows in ſeveral parts.

CELLS, *Cellæ, Cellulæ*, are little houſes, apartments, or chambers, particularly thoſe wherein the ancient monks, ſolitaries, and hermits, lived in retirement.

Some derive the word from the Hebrew כלא, i. e. *a priſon*, or *place where any thing is ſhut up.*

Cells, in anatomy, are little bags, or bladders, where fluids, or other matters are lodged, called alſo *loculi, cellulæ*, &c.

The diviſions in Newgate that are for the reception of criminals previous to their execution are called cells.

Cells *of Plants*, in botany, are thoſe partitions or hollow parts, in the huſks or pods of plants, wherein the ſeed is lodged.

CELLULÆ *Adipoſæ*, in anatomy, the loculi, or little cells, wherein the fat of bodies of good habit is contained.

Theſe are co-extended with the ſkin itſelf, except on the forehead, the eye-lids, penis, and ſcrotum. In emaciated bodies, theſe cells, being unfurniſhed of their fat, appear like a kind of flaccid, tranſparent membrane.

The cellular membrane is reticular and adipoiſe. The ſubſtance of the reticular part is merely a net work of ſlender fibres and ſmall membranes, whence it derives its ductility and looſeneſs; ſuch as it is found under the ſkin of the penis and ſcrotum: in other parts, as under the ſkin of the nates, and under the ſoles of the feet, it is loaded with oil, and leſs porous in its ſubſtance. The former part is diſperſed through the whole body, except in the ſubſtance of the bones, brain, and humours of the eye, covering the ſolids of the body, the muſcles, tendons, ligaments, and nerves, and uniting them to one another; and it is even intermixed with the ſubſtance of the ſkin. About the joints, the cellular membrane is chiefly reticular, for the ſake of eaſy motion; under the ſkin in general it is adipoſe, between which ſtratum and the ſurface of the muſcular maſs it is looſe, and chiefly reticular. In the fœtus, that part only of this membrane is adipoſe, which is upon the outſide of the body: as we grow up, the fat is more equally diſperſed through the body, and its greater quantity in proportion about the viſcera. Dr. Hunter is of opinion, that the fat in the body is lodged in a glandular apparatus ſuperadded to the reticular membrane, conſiſting of veſicles or bags for this purpoſe, and of veſſels fitted for ſecretion. See Med. Obſ. vol. i. p. 26, &c.

CELOSIA, amaranth, in botany, a genus of the pentandria monogynia claſs. Its characters are theſe: the flower hath five erect ſharp pointed petals, which are permanent, ſtiff, and ſhaped like a flower cup. It hath a ſmall nectarium joined to the border of the germen, to which adhere the five ſtamina, which are terminated by turning ſummits; the empalement afterwards becomes a globular capſule with one cell opening horizontally. Of this there are three ſpecies.

Linnæus has ſeparated the plants of this genus from the amaranths, which have been generally joined with them becauſe thoſe have male and female flowers on the ſame plants, whereas theſe have only hermaphrodite flowers.

CELSIA, in botany, a genus of the didynamia angioſpermia claſs. Linnæus gave it this name in honour of Dr. Celſus, profeſſor at Upſal. We have no Engliſh name for this plant.

CELTIS, the lote, or nettle-tree; a genus of the monœcia order, belonging to the polygamia claſs of plants. There are three ſpecies, all of them hardy deciduous trees, with leaves ſomewhat reſembling the common nettle, proper for ornamental plantations, and two of them alſo proper for foreſt trees. There are ſeveral varieties of each ſort, with bloatched leaves. They may be propagated by ſeeds, but the bloatched-leaved kinds only by layers, cuttings, grafting, &c. The ſeeds ought to be ſown in autumn, and covered with earth half an inch deep. When the plants appear, they will require to be ſheltered by mats from the cold.

CEMENT, in a general ſenſe, any glutinous ſubſtance capable of uniting and keeping things together in cloſe coheſion. In this ſenſe the word cement comprehends mortar, ſolder, glue, &c. but has been generally reſtrained to the compoſitions uſed for holding together broken glaſſes, china, and earthen ware. For this purpoſe the juice of garlic is recommended as exceedingly proper, being both very ſtrong, and, if the operation is performed with care, leaving little or no mark. Quicklime and the white of an egg mixed together, and expeditiouſly uſed, are alſo very proper for this purpoſe. Dr. Lewis recommends a mixture of quicklime and cheeſe, in the following manner: "Sweet cheeſe ſhaved thin and ſtirred with boiling hot water, changes into a tenacious ſlime which does not mingle with the water. Worked with freſh parcels of hot water, and then mixed upon a hot ſtone, with a proper quantity of unſlaked lime, into the conſiſtence of a paſte, it proves a ſtrong and durable cement for wood, ſtone, earthen-ware, and glaſs. When thoroughly dry, which will be in two or three days, it is not in the leaſt acted upon by water. Cheeſe barely beat with quicklime, as directed by ſome of the chemiſts for luting cracked glaſſes, is not near ſo efficacious." A compoſition of the drying oil of lintſeed and white lead is alſo uſed for the ſame purpoſes, but is greatly inferior.

Cement, in building, is uſed to denote any kind of mortar of a ſtronger kind than ordinary. The cement commonly uſed is of two kinds; hot, and cold. The hot cement is made of roſin, bees wax, brick-duſt, and chalk, boiled together. The bricks to be cemented are heated, and rubbed one upon another, with cement between them. The cold cement is that above deſcribed for cementing china, &c. which is ſometimes, though rarely, employed in building.

The ruins of the ancient Roman buildings are found to cohere ſo ſtrongly, that moſt people have imagined the ancients were acquainted with ſome kind of mortar, which, in compariſon of ours, might juſtly be called cement; and that to our want of knowledge of the materials they uſed, is owing to the great inferiority of modern buildings in their durability. In 1770, one M. Loriot, a Frenchman, pretended to have diſcovered the ſecret of the ancient cement, which, according to him, was no more than a mixture of powdered quick-lime with lime which had been long ſlacked and kept under water. The ſlacked lime was firſt to be made up with ſand, earth, brick duſt, &c. into mortar after the common method, and then about a third part of quick-lime in powder was added to the mixture. This produced an almoſt inſtantaneous petrification, ſomething like what is called the ſetting of alabaſter, but in a much ſtronger degree; and was poſſeſſed of many wonderful qualities needleſs here to relate, ſeeing it has never been known to ſucceed with any other perſon who tried it. Mr. Anderſon, in his eſſays on agriculture, has diſcuſſed this ſubject at conſiderable length, and ſeemingly with great judgment. He is the only perſon we know, who has given any rational theory of the uſes of lime in building, and why it comes to be the proper baſis of all cements. His account is in ſubſtance as follows:

Lime which has been ſlaked and mixed with ſand, becomes hard and conſiſtent when dry, by a proceſs ſimilar to that which produces the natural ſtalactites in caverns. Theſe are always formed by water dropping from the roof. By ſome unknown and inexplicable proceſs of nature, this water has diſſolved in it a ſmall portion of calcareous matter in a cauſtic ſtate. As long as the water continues covered from the air, it keeps the earth diſſolved in it; it being the natural property of calcareous earths, when deprived of their fixed air, to diſſolve in water. But when the ſmall drop of water comes to be expoſed to the air; the calcareous matter contained in it begins to extract the fixable part of the atmoſphere. In proportion as it does ſo, it alſo begins to ſeparate from the water, and to reaſſume its native form of limeſtone or marble. This proceſs, Mr. Anderſon calls a cryſtallization; and when the calcareous matter is perfectly cryſtallized in this manner, he affirms that it is to all intents and purpoſes limeſtone or marble of the ſame conſiſtence as before: and "in this manner, ſays he, within the memory of man, have huge rocks of marble been formed near Matlock in Derbyſhire." If lime in a cauſtic ſtate is mixed with water, part of the lime will be diſſolved, and will alſo begin to chryſtallize. The water which parted with the chryſtallized lime, will then begin to act upon the remainder, which it could not diſſolve before; and thus the proceſs will continue, either till the lime be all reduced to an *effete*, or, (as he calls it) cryſtalline ſtate, or ſomething hinders the action of the water upon it. It is this chryſtallization which is obſerved by the workmen when a heap of lime is mixed with water, and left for ſome time to macerat. A hard cruſt is formed upon the ſurface, which is ignorantly called froſting, though it takes place in ſummer as well as in winter. If therefore the hardneſs of the lime, or its becoming a cement, depends entirely on the formation of its cryſtals, it is evident, that the perfection of the cement muſt depend on the perfection of the cryſtals, and the hardneſs of the matters which are entangled among them. The additional ſubſtances uſed in making of mortar, ſuch as ſand, brick-duſt, or the like, according to Mr. Anderſon, ſerve only for a purpoſe ſimilar to what is anſwered by ſticks put into a veſſel full of any ſaline ſolution, namely, to afford the cryſtals an opportunity of faſtening themſelves upon it. If therefore the matter interpoſed between the cryſtals of the lime is of a friable, brittle nature, ſuch as brick-duſt or chalk, the mortar will be of a weak and imperfect kind; but when the particles are hard, angular, and very difficult to be broken, ſuch as thoſe of river or pit-ſand, the mortar turns out exceedingly good and ſtrong. Sea-ſand is found to be an improper material for mortar, which Mr. Anderſon aſcribes to its being leſs angular than the other kinds. That the cryſtallization may be the more perfect, he alſo recommends a large quantity of water, that the ingredients be perfectly mixed together, and that the drying be as ſlow as poſſible. An attention to theſe circumſtances, he thinks, would make the buildings of the moderns equally durable with thoſe of the ancients; and from what remains of the ancient Roman works, he thinks a very ſtrong proof of his hypotheſis might be adduced. The great thickneſs of their walls neceſſarily required a vaſt length of time to dry. The middle of them was compoſed of pebbles thrown in at random, and which have evidently had mortar ſo thin as to be poured in among them. By this means, a great quantity of the lime would be diſſolved, and the cryſtallization performed in the moſt perfect manner; and the indefatigable pains and perſeverance for which the Romans were ſo remarkable in all their undertakings, leave no room to doubt that they would take care to have the ingredients mixed together as well as poſſible. The conſequence of all this is, that the buildings formed in this manner are all as firm as if cut out of a ſolid rock; the mortal being equally hard, if not more ſo, than the ſtones themſelves.

CENCHRIS, in ornithology, the name given by many authors to the keſtrel, or windhover, a ſpecies of hawk, of the long winged kind, called the tinnunculus, and by ſome in Engliſh, the ſtannel.

CENCHRIS, in amphibiology, the name of a ſpecies of ſerpent; ſo called becauſe of its ſmall ſpots, which reſembled the ſeeds of millet. It grows to five feet or more, in length, and is conſiderably thick and large, and grows very taper at the tail. It is of a greeniſh yellow colour, and is yellowiſh toward the belly. It is found in the iſlands of the Archipelago, particularly in Lemnos and Samos.

CENCHRUS, in botany, the name given by Linnæus to a genus of plants, of the polygamia monœcia claſs.

CENEONTLATOTI, in ornithology, the name of an American bird deſcribed by Nieremberg, and called by that author, *avis polyglotta*. It is famous for the different modulations of its voice, and excels even the nightingale in melody.

CENOTAPH, an empty tomb, or a monument without a body under it; erected by way of honour to the deceaſed.

The word is compounded of *κενος*, *empty*, and *ταφος*, *tomb*.

It ſtands diſtinguiſhed from ſepulchre, in which a corpſe is actually depoſited.

Cenotaphs are honorary tombs, erected either to perſons buried in another place, or to thoſe who have received no burial, and whoſe relics cannot be found, as being killed in battle, loſt at ſea, or the like. Among the ancients, the ſame privileges and religious regard were allowed to theſe *tumuli inanes & honorarii*, as to real tombs. Card. Norris has a treatiſe expreſs on the cenotaphs of the Cæſars, Caius and Lucius, which were ſtill ſeen at Piſa. Lamprid. in Alex. cap. 63.

CENOTZQUI, in ornithology, the name of an American bird deſcribed by Nieremberg, and called *avis evocatrix nivis*, becauſe it always is very clamorous before ſnow falls, and afterwards becomes ſilent. It is a very beautiful variegated bird, and lives as well in the colder as hotter climates, but is principally ſeen among the mountains. It has a very remarkable way of twiſting its head about; ſo that, without moving its body, it eaſily ſees every way round it. There is another ſpecies of it a little differing in the diſpoſition of the colours, which ſome call liceto.

CENSER, in antiquity, a kind of veſſel where incenſe was burnt to the gods.

Cenſer is chiefly uſed in ſpeaking of the Jewiſh worſhip. Among the Greeks and Romans, it is more frequently called *thuribulum*, λιβανοτις, and *acerra*.

The Jewiſh cenſer was a ſmall ſort of chafing diſh, covered with a dome, and ſuſpended by a chain. Joſephus tells us, that Solomon made twenty thouſand gold cenſers for the temple of Jeruſalem, to offer perſumes in, and fifty thouſand others to carry fire in.

CENSOR, in antiquity, one of the prime magiſtrates in ancient Rome; whoſe buſineſs was to ſurvey and rate the people, and to inſpect and correct their manners.

The word is derived from *cenſere*; becauſe he aſſeſſed and valued every man's eſtate; regiſtering their names, and placing them in a proper century, that the Romans might know their own ſtrength; though others ſay the cenſors were ſo called on account of their other office, viz. as being comptrollers, or correctors of manners and policy. There were two cenſors firſt created in the year of Rome 311, upon the ſenator's obſerving, that the conſuls were too much taken up with matters of war, to be left at leiſure for looking near enough into private affairs. The two firſt were Papirus and Sempronius: their authority extended over every perſon; and they had a right to reprehend the higheſt. At firſt they were taken out of the ſenate; but after the plebeians had got the conſulate open to them, they ſoon arrived at the cenſorſhip. M. Rutilius was the firſt; who, having been twice conſul and dictator, in the year 402, demanded the office of cenſor. The cuſtom was to elect two; the one of a patrician family, the other a plebeian; and upon the death of either, the other was diſcharged from his office, and two new ones elected; but not till the next luſtrum.

This office was ſo conſiderable, that few aſpired to it till they had paſſed all the reſt: ſo that it was looked on as ſurpriſing, that Craſſus ſhould be admitted cenſor, without having been either conſul, or prætor.

The buſineſs of the cenſors was, to regiſter and value the effects, &c. of the Roman citizens; and to impoſe taxes, in proportion to what each perſon poſſeſſed. Cicero reduces their functions to the numbering of the people; the correction and reformation of manners; the eſtimating the effects of each citizen; the proportioning of taxes; the ſuperintendance of tribute; the excluſion from the temples, and the care of the public places. They had alſo a right, *ſenatu ejicere*, to expel from the ſenate ſuch of the members as they judged unworthy of the dignity: as well as to break and caſhier the knights who failed in their duty, by taking from them the public horſe, *equum adimere*.

There are many examples of ſenators expelled by the cenſors, generally for good reaſons, yet ſometimes through mere peeviſhneſs, envy, or revenge: but in ſuch caſes, there was always the liberty of an appeal to the final judgment of the people. So that the cenſorian power, properly ſpeaking, was not that of making or unmaking ſenators, but of enrolling only thoſe whom the people had made; and inſpecting their manners, and animadverting upon their vices; over which they had a ſpecial juriſdiction delegated by the people. Their rule of cenſuring ſeems to have been grounded on an old maxim of the Roman policy, enjoining, *that the ſenate ſhould be pure from all blemiſh, and an example of manners to all the other orders of the city*: as we find it laid down by Cicero in his Book of Laws, which were drawn, as he tells us, from the plan of the Roman conſtitution.

Beſides the taſk of enrolling the ſenators, and inſpecting their manners, it was a part likewiſe of the cenſorian juriſdiction to let out to farm all the lands, revenues, and cuſtoms of the republic; and to contract with artificers for the charge of building and repairing all the public works and edifices, both in Rome, and the colonies of Italy. Now in this branch of their office it is certain that they acted merely under the authority of the people, and were prohibited by law to let out any of the revenues, except in the roſtra, under the immediate inſpection, and in the very preſence of the people.

In the general cenſus and review of the city, held by them every five years, though every ſingle citizen was particularly ſummoned and enrolled by name in his proper tribe, as a freeman of Rome, yet that ſolemn enrollment, as Cicero tells us, did not confirm any man's right to a citizenſhip, but ſignified only that he had paſſed for a citizen at that time; becauſe the proper power of determining that right reſided always in the people.

The office continued to the time of the emperors, who aſſumed the authority of it to themſelves, but without the name, calling themſelves inſtead of cenſors, *morum præfecti*; though Veſpaſian and his ſons took a pride to be called cenſors, and put this among their other titles on their coins. Decius attempted to reſtore the dignity to a particular magiſtrate. After this we hear no more of it till Conſtantine's time, who made his brother cenſor; the laſt who ſeems to have enjoyed the office.

The republic of Venice has at this day a cenſor of the manners of their people, whoſe office laſts ſix months.

CENSORIOUS *Perſon*, is one who is continually cenſuring others undeſervedly.

CENSORIAL *Note*, *virgula cenſoria*, among grammarians and critics, denotes a mark of reprobation, affixed to thoſe paſſages of a book or writing, which the critics diſapproves or condemns.

CENSURE, *Cenſura*, is popularly uſed for a judgment whereby ſome book, perſon, or action, is blamed, or condemned; more particularly for a reprimand made by a ſuperior, or perſon in authority.

CENSURES, eccleſiaſtical, are the public menaces which the church makes, or pains and penalties incurred by diſobeying what ſhe enjoins; or rather the pains and puniſhments themſelves: as interdiction, excommunication, &c.

Till the time of the reformation, the kings of England were ſubject to the cenſures of the church of Rome; but the kings of France have always maintained themſelves exempt from them.

The canoniſts diſtinguiſh two kinds of cenſures; the one *de jure*, and the other *de facto*, or by ſentence.

CENT, in commerce, an abbreviation of the Latin *centum*, which properly ſignifies a hundred. It is applied when expreſſing the profit or loſs upon any commodity.

CENT is alſo uſed in the trade of money, and ſignifies the benefit, profit, or intereſt of any ſum of money which is laid out for improvement. Thus we ſay money is worth 4 or 5 per cent. upon exchange; that is, it brings four or five pounds profit for every 100l. laid or lent out.

CENT is alſo uſed with regard to the draughts, or remittances of money, made from one place to another. Thus we ſay it will coſt 2½ per cent. to remit money to ſuch a city.

CENTAUROIDES, in medicine and pharmacy, the ſame with Gratiola.

Others give the denomination to the greater centaury.

CENTAURUS, centaur, in aſtronomy, a part or moiety of a ſouthern conſtellation, in form, half man, half horſe; uſually joined with the wolf.

The word comes from κενταυρος, formed of κεντεο, *pungo*, and ταυρυς, *bull*, q d. *bull pricker*.

The ſtars of this conſtellation, in Ptolomy's Catalogue, are 37; in Tycho's, 4; and in the Britannic Catalogue, with Sharp's Appendix, 35: the order, names, longitudes, latitudes, magnitudes, &c.

CENTAURY, *the Greater*, knapweed, blue bottle, &c. in botany, a genus of the ſyngeneſia polygamia fruſtanea claſs.

The root and leaves of the plant are eſteemed vulnerary and aſtringent; they are given in infuſion, in dyſenteries, profluvia of the menſes, and hæmorrhages of all kinds. The common people alſo are very fond of the root in France, as a remedy for bruiſes, and for diſſolving coagulated blood. Schroder alſo gives it great praiſes as a deobſtruent: he tells us it is of excellent uſe in diſtemperatures of the liver, and in obſtructions of the meſeraic glands. He preſcribes the root in powder.

CENTALLA, in botany, a genus of the monœcia tetandria claſs, having male and female flowers.

CENTER, or CENTRE, in a general ſenſe, ſignifies a point equally diſtant from the extremities of a line, figure, or body.

CENTER *of Gravity*, in mechanics, that point about which all the parts of a body do in any ſituation exactly balance each other.

CENTER *of Motion*, that point which remains at reſt, while all the other parts of a body move about it.

CENTER *of a Sphere*, a point in the middle, from which all lines drawn to the ſurface are equal.

As this is a ſubject which relates to mechanics, we ſhall treat on it in that Syſtem.

CENTIPED *Worm*, a term uſed for ſuch worms as have a great many feet, though the number does not amount to 100, as the term ſeems to import. M. Maloet relates the hiſtory of man, who, for three years, had a violent pain in the lower part of the forehead near the root of the noſe: at length he felt an itching, and afterwards ſomething moving within his noſtril, which he brought away with his finger; it was a worm of the centiped kind, an inch and an half long, which run ſwiftly. It lived five or ſix days among tobacco. The patient was free of his pain ever after. Mr. Littre mentioned a like caſe in 1708, of a larger centiped voided at the noſe, after it had thrown the woman, in whoſe frontal ſinus it was, into convulſions, and had almoſt deprived her of her reaſon.

CENTRAL, ſomething relating to centre, or center. Thus we ſay, *central eclipſe*, *central fire*, *central forces*, *central rule*, &c.

CENTRAL *Rule*, is a rule or method diſcovered by our countryman Thomas Baker, rector of Nympton in Devon, whereby to find the centre of a circle deſigned to cut the parabola in as many points as an equation to be conſtructed hath real roots.

Its principal uſe is in the conſtruction of equations; and he has applied it with good ſucceſs as far as biquadratics. The central rule is chiefly founded on this property of the parabola: that if a line be inſcribed in that curve perpendicular to any diameter, a rectangle formed of the ſegments of this inſcript is equal to a rectangle made of the intercepted diameter and parameter of the axis.

The central rule has the advantage over Cartes's and De Lattere's methods of conſtructing equations, in that both theſe are ſubject to the trouble of bearing the equation by taking away the ſecond term. This we are freed from in Baker's method, which ſhews us how to conſtruct all equations not exceeding the fourth power, by the interſection of a circle and parabola, without the omiſſion or change of any terms. See Phil. Tranſ. N° 157.

CENTRIFUGAL *Force* is that whereby a body revolving round a centre, endeavours to recede from it. See Syſtem of MECHANICS.

CENTRISCUS, in ichthyology, a genus of fiſhes belonging to the order of amphibia nantes. The head gradually ends in a narrow ſnout, the aperture is broad and flat; the belly is carinated; and the belly fins united. There are two ſpecies, viz. 1. The ſcutatus has its back covered with a ſmooth bony ſhell, which ends in a ſharp ſpine under which is the tail; but the back fins are between the tail and the ſpine. It is a native of the Eaſt Indies. 2. The ſcolopax has a rough ſcabrous body, and a ſtrait extended tail. It has two belly fins, with four rays in each, and has no teeth. It is found in the Mediterranean.

CENTRO-BARYC *Method*, from κεντρον and Βαρυς, *heavy*, in mechanics, is a method of meaſuring or determining the quantity of a ſurface, or a ſolid, by conſidering it as formed by motion, and multiplying it into the way of its centre of gravity.

CENTRONIA, in ichthyology, the name by which the echini marini have been lately diſtinguiſhed. Dr. Hill makes them a diſtinct ſeries of animals, living under the defence of ſhelly coverings, formed of one piece, and furniſhed with a vaſt number of ſpines, moveable at the creature's pleaſure.

The ſpecies of centronia are very numerous, but may be all comprehended under the following diviſions:

1. The roundiſh or ſubgloboſe kind; called by Klein, *cilaris*.
2. The cordated kinds; called by Klein, *ſpatangi* and *ſpatagoides*.
3. The flat kinds; called by Klein *placentæ*.

Klein, who has been at much pains to arrange theſe bodies, have divided them into a number of other genera; but they may be all ranked under one or other of theſe diviſions. But beſide the known recent ſpecies, we meet with ſeveral others, foſſile, of a very ſingular figure.

CENTRUM *Phonicum*, in acouſtics, is the place where the ſpeaker ſtands in polyſyllabical and articulate echoes.

CENTRUM *Phonocampticum*, is the place or object that returns the voice in an echo.

CENTRUM *Tindinoſum*, in anatomy, a point or centre, wherein the tails of the muſcles of the diaphragm meet. This centre is perforated towards the right ſide, for the *vena cava*; towards the left, backward: its fleſhy part gives way to the gula. The deſcending trunk of the great artery, thoracic duct, and *vena azygos*, paſs between its two inferior proceſſes.

CENTRY-BOX, a wooden cell, or lodge, made to ſhelter the centinel, or centry, from the injuries of the weather. In a fortification, ſuch lodges are uſually placed on the flanked angles of the baſtions, on thoſe of the ſhoulder, and ſometimes in the middle of the curtin.

CENTUNCULUS, in the Linnæan ſyſtem of botany. It makes a diſtinct genus of plants, of the tetandria monogynia claſs.

CENTURION, *Centurio*, among the Romans, an officer in the infantry, who commanded a century, or a hundred men.

CENTURY, in a general ſenſe, any thing divided into, or conſiſting of, an hundred parts.

The marquis of Worceſter publiſhed a century of inventions, (for a ſpecimen of which, ſee ACOUSTICS); and Dr. Hooke has given a decimate of inventions, as part of a century, of which he affirmed himſelf maſter. It is remarkable, that both in the century of the former, and the decimate of the latter, we find the principle on which Savary's fire or ſteam engine is founded.

CENTURY, in chronology, the ſpace of one hundred years. This method of computing by centuries is generally obſerved in church hiſtory, commencing from the time of our Saviour's incarnation: in which ſenſe we ſay the firſt century, the ſecond century, &c.

CEOAN, in ornithology, the name of a bird common in the Spaniſh Weſt Indies, and deſcribed by Nieremberg, who alſo calls it *avis nivea*. It is a little larger than our largeſt thruſh, and very remarkable for the facility with which it learns to imitate the human ſpeech.

CEPA, the onion, in botany, &c. See Onion.

CEPHALOPHARYNGÆI, in anatomy, two muſcles of the orifice of the æſophagus, called the pharynx.

They have their origin in the articulation of the head with the firſt vertebra, and are inſerted into the upper part of the pharynx: they ſerve to draw it upwards and backwards.

CEPHEUS, in aſtronomy, a conſtellation of the northern hemiſphere.

CEPOLA, in ichthyology, a genus of the thoracici in the claſs of fiſhes; the characters of which are, that the head is roundiſh and compreſſed, the mouth flat, the teeth crooked, the branchioſtege membrane conſiſts of ſix ſmall bones, the body uniform and naked, and the abdomen ſcarce as long as the head.

CEPPHUS, in ornithology, the name of a bird of the larus or gull kind; but, except in its feet and beak, very much reſembling the common duck. It is a moderately large bird, but is ſo thick feathered, that it appears much more ſo than it really is. It is of a variegated colour, of a mixture of white, brown, and yellow; but the long wing and tail-feathers are black: its legs are greeniſh; but the membrane which connects the toes is brown. See Phil. Tranſ. Vol. LII. Part I. N° 24.

CERAMBYX, in entomology, a genus of inſects of the beetle kind, belonging to the order of inſecta coleopatera. The antennæ are long and ſmall; the breaſt is ſpinous or gibbous; and the elytra are linear. There are no leſs than 83 ſpecies enumerated by Linnæus, principally diſtinguiſhed by the figure of the breaſt.

CERATOCARPUS, in botany, a name given by Buxbaum to a new genus of plants, belonging to the claſs of monœcia monandria in the Linnæan ſyſtem. It grows in marſhy places near the Caſpian ſea, and in the neighbourhood of Aſtracan; and toward autumn the ſtalks are uſually torn up by the winds, and blown about the marſhes in great abundance. Act. Petrop. Vol. I. p. 244.

CERATOGLOSSUM, in anatomy, a pair of muſcles of the tongue.

CERATONIA, the carob, or St. John's bread; a genus of the polyæcia order, belonging to the polygamia claſs of plants. There is but one ſpecies, a native of Spain, of ſome parts of Italy, and the Levant. It is an ever green; and, in the countries where it is native, grows in the hedges. It produces a quantity of long, flat, brown coloured pods, which are thick, meally, and of a ſweetiſh taſte. Theſe pods are many times eaten by the poorer ſort of inhabitants when there is a ſcarcity of other food; but they are apt to looſen the belly, and cauſe gripings of the bowels. The tree may be propagated in this country from ſeeds, which are to be ſown on a moderate hot bed, and the plants inured to the open air by degrees.

CERATOPHYLLUM, in botany, the name by which Linnæus calls a genus of plants, of the monœcia polyandria claſs.

CERATUM Epuloticum, a name given in the late London Diſpenſatory to the compoſition commonly called Turner's cerate. For the method of making it, ſee Syſtem of Pharmacy.

CERBERA, in botany, a genus of the monogynia claſs, belonging to the pentandria claſs of plants. The moſt remarkable ſpecies is the atroucir, a native of the warm parts of America. The wood of this tree ſtinks moſt abominably, and the kernels of the nuts are a deadly poiſon to which there is no antidote; ſo that the Indians will not even uſe the wood for fuel.

CERBERUS, among chemiſts, denotes mercury.

Cerberus *Chemicus*, in chemiſtry, a phraſe uſed by Hoffman and others to expreſs the common nitre or ſalt-petre, which they have called alſo ſal infernalis.

CERBERUS, in fabulous hiſtory, a dreadful three-headed maſtiff, born of Typhon and Echidna, and placed to guard the gates of hell. He fawned upon thoſe whoſe entered, but devoured all who attempted to get back. He was, however, maſtered by Hercules, who dragged him up to the earth, when, in ſtruggling, a foam dropped from his mouth, which produced the poiſonous herb called aconite or wolf's bane.

CERCELE, in heraldry. A croſs cercele, is a croſs which, opening at the ends, turns round both ways, like a ram's horn.

The croſs cercele differs from the croſs anchored, as the latter turns but a little rounding, whereas the former turns quite round.

CERCIS, the Judas tree: a genus of the monogynia order, belonging to the decandria claſs of plants.

Species 1. The ſiliquaſtrum, or common Judas tree, is a native of the ſouth of France, Spain, and Italy. 2. The canadenſis, or red bud tree, is a native of moſt parts of North America, and hath flowers reſembling the former, but inferior in beauty. Theſe plants are hardy enough to bear the open air, and are eaſily propagated from ſeeds. The wood of the firſt ſort is beautifully veined with black and green, and takes a fine poliſh. By the Portugueſe it is called the Tree of Love.

CERCOPITHECUS, in tetrapodology, the name given by Ray to a ſpecies of long tailed monkeys.

The word is derived from κερκος, *a tail*, and πιθηκος, a monkey. Aldrovandus, Marcgraave, and others, have given the figures and hiſtories of many of the cercopitheci. The former of theſe authors ſpeaks of ſome as large as maſtiff dogs, having tails extremely long. In Braſil there is a yellowiſh kind, which ſmells of muſk. As theſe monkeys climb trees, if in danger of falling, they ſave themſelves not only by their feet, but by their tails, wrapping them round the boughs of trees. The Zygantes in Africa eſteem their fleſh good meat.

CERCOSIS, in medicine, a preternatural extenſion and tumidity of the female clitoris, ſo as to project beyond the labia pudendi.

CERDONIANS, ancient heretics, who maintained moſt of the errors of Simon Magus, Saturninus, and the Manichees. They took their name from their leader Cerdon, a Syrian, who came to Rome in the time of Pope Hyginus, and there abjured his errors: but in appearance only; for he was afterwards convicted of perſiſting in them, and accordingly caſt out of the church again. Cerdon aſſerted two principles: the one good, and the other evil: this laſt, according to him, was the creator of the world, and the God that appeared under the old law. The firſt, whom he called unknown, was the father of Jeſus Chriſt; who, he taught, was incarnate only in appearance, and was not born of a virgin; nor did he ſuffer death but in appearance. He denied the reſurrection; and rejected all the books of the Old Teſtament, as coming from an evil principle. Marcion, his diſciple, ſucceeded him in his errors.

CEREALIA, in antiquity, feaſts of Ceres inſtituted by Triptolemus, ſon of Celeus, king of Eleuſine, in Attica, in gratitude for his having been inſtructed by Ceres, who was ſuppoſed to have been his nurſe, in the art of cultivating corn, and making bread.

Cerealia, in botany, from *Ceres*, the goddeſs of corn; Linnæus's name for the larger eſculent ſeeds of the graſſes: theſe are rice, wheat, rye, barley, oats, millet, panic graſs, Indian millet, holcus, zizania, and maize. To this head may be likewiſe referred darnel, (lolium): which by preparation, is rendered eſculent.

CEREBRUM, the brain. Its ſtructure and uſe are not ſo fully known as ſome other parts of the body, and different authors conſider it in various manners. However, according to the obſervations of thoſe moſt famed for their accuracy and dexterity in anatomical inquiries, its general ſtructure is as given in Anatomy, N° 397.

Dr. Hunter obſerves, that the principal parts of the medullary ſubſtance of the brain in ideots and madmen, ſuch as the *thalami nervorum opticorum*, and *medulla oblongata*, are found entirely changed from a medullary to a hard, tough, dark-coloured ſubſtance, ſometimes reſembling white leather.

CEREMONIAL is uſed for the ſet or ſyſtem of rules and ceremonies, which cuſtom has introduced, for regulating our behaviour; and which perſons practiſe towards each other, either out of duty, decency, or civility.

Ceremonial, in a more particular ſenſe, denotes the manner wherein princes and their ambaſſadors uſe to receive and treat one another. The ceremonial is a kind of law introduced by compact, cuſtom, preſcription, and which ſovereigns and their ambaſſadors are to obſerve at their interviews, that none of them may either receive more or leſs marks of reſpect than they are entitled to. Some diſtinguiſh three occaſions on which the ceremonial is to take place: viz. when princes meet in perſon; when they write to each other; and when they ſend ambaſſadors.

There are endleſs diſputes among ſovereigns about the ceremonial: ſome endeavouring to be on a level, and ſome to be ſuperior, to others. Numerous ſchemes have been propoſed for fixing the place and rank of each prince; but they have not been accepted of by any, except ſome alternate princes, as they are called in Germany.

Ceremonial is more particularly uſed in ſpeaking of the laws and regulations given by Moſes, relating to the worſhip of God among the ancient Jews.

In which ſenſe, it amounts to much the ſame with what we otherwiſe call levitical law; and ſtands contradiſtinguiſhed from the moral as well as the judicial law.

It is diſputed whether the obſervation of the Sabbath be a ceremonial or a moral law.

The ceremonial law preſcribes the forms, uſages, rites, &c. relating to ſacred places, utenſils, prieſts, levites, prophets, congregations, garments, feaſts, ſacrifices, ſabbaths, &c.

Moſt of the ceremonial laws of the Jews had ſome relation to thoſe idolatrous cuſtoms which had been eſtabliſhed among them before the publication of the levitical law.

CEREMONY, an aſſemblage of ſeveral actions, forms, and circumſtances, ſerving to render a thing more magnificent and ſolemn.

The word comes from the Latin *ceremonia, quaſi Cereris munia*, on account of the great number of ceremonies uſed in making the offerings to Ceres; or becauſe the firſt religious ceremonies were thoſe of Ceres. Hence Cicero calls *Cererem antiquiſſimam, religioſiſſimam principem omnium ſacrorum, quæ apud omnesgentes fiunt.*

We have an ample and magnificent account of the religious ceremonies and cuſtoms of all the nations in the world, repreſented in figures deſigned by Picart, with hiſtorical explanations, and divers curious diſſertations, &c. Ceremonies & Cautomes Religeuſes de tous les Peuples du Monde, 6 tom. fol. Amſt. 1723.

M. Porree, in 1646, publiſhed a hiſtory of ancient ceremonies; tracing the riſe, growth, and introduction of each rite into the church, and its gradual advancement to ſuperſtition therein.

Many of them were borrowed from Judaiſm; but more, as it ſhould ſeem, from Paganiſm.

Dr. Middleton has given a fine diſcourſe on the conformity between the popiſh and pagan ceremonies; which he exemplifies in the uſe of incenſe, holy water, lamps, and candles before the ſhrines of the ſaints, votive gifts or offerings round the ſhrines of the deceaſed, &c. In effect, the altars, images, croſſes, proceſſions, miracles, and legends; nay, even the very hierarchy, pontificate, religious orders, &c. of the preſent Romans, he ſhews are all copied from their heathen anceſtors. Who then can doubt of the idolatry of popery, when we ſee the preſent people of Rome worſhipping at this day in the ſame temples, at the ſame altars, ſometimes the ſame images, and always with the ſame ceremonies, as the old Romans?

Ceremony is alſo applied to thoſe reſpects and honours which people pay to each other, out of mere civility and good breeding. China is the land of ceremonies. The Chineſe have annexed ſuch an idea of reſpect and gravity to certain garments, that the miſſionaries dare not ſay maſs without their boots on.

Habit of Ceremony denotes the ornaments and external badges of profeſſion, dignity, or office.

Officers of Ceremony, thoſe whoſe buſineſs is to ſee the cuſtomary ceremonies duly obſerved in actions of pomp and ſolemnity. Such are marſhals, ſerjeant at armss, &c.

In our court, is a maſter and aſſiſtant of the ceremonies: the French have a grand-maſter of the ceremonies, as well as a maſter and aſſiſtant. In churches of the Romiſh communion there are alſo maſters of the ceremonies, to ſee that every thing be performed as preſcribed in the ritual.

CERIGO, in tetrapodology, a name by which many authors have called that remarkable American animal called the Opoſſum.

CERINTHIANS, a ſect that took their name from Cerinthus, cotemporary with St. John; who formed a ſingular ſyſtem of doctrine and diſcipline, by combining the doctrines of Chriſt with the opinions and errors of the Jewiſh and Gnoſtics.

CERNUA, in ichthyography, the name of a ſmall freſh-water fiſh; called by others the *aurata, aſpredo*, and *perca minor*, or *ſmall pearch*; and in Engliſh the *ruffe*. It is very much of the ſhape and figure of the common pearch. It is caught in many of our rivers; as the Yare at Norwich, &c.

CEROPEGIA, in botany, a genus of the pentandria monogynia claſs. The flower conſiſts of a ſingle petal; it has two ſmall erect leaves, plumoſe ſeeds, and the limb of the corolla is connivent.

CERTIFICATE, a teſtimony given in writing, to aſſure and notify the truth of any thing.

Certificate *of Bankrupt*, is a declaration in his favour, written and ſigned by four parts in five of his creditors (thoſe under 20l. excepted), and authenticated under the hands and ſeals of the commiſſioners, and by them tranſmitted to the lord chancellor. The certificate is allowed of courſe, if no cauſe be ſhewn to the contrary; in conſequence of which, the bankrupt is entitled to a decent allowance out of his effects for his future maintenance. If they do not amount to 10s. in the pound, he is left to the diſcretion of the commiſſioners, who are to allow him any ſum not exceeding three per cent. if they pay 10s. in the pound, he is to be allowed five per cent. if 12s. 6d. ſeven and a half per cent. if 15s. ten per cent. provided the allowance does not in the firſt caſe exceed 200l. in the ſecond 250l. and in the third 300l.

He is likewiſe diſcharged hereby from all debts owing at the time of his bankruptcy. However, he has no title to theſe advantages, if he conceals a fictitious debt produced by any creditor; if he has given above 100l. for a marriage portion to any of his children, unleſs at that time he had ſufficient to pay his debts; if he has loſt at any one time 5l. or in the whole 100l. within a twelvemonth before by gaming, or loſt to the value of 100l. by ſtock jobbing. Perſons who are thus cleared, and become bankrupts again, unleſs they pay 15s. in the pound, and are indemnified hereby only from bodily confinement, any future eſtate remaining liable to their creditors.

Certificate *of Coſts*, in law, relates to the caſe of a plaintiff, who, in action of treſpaſs, is allowed no more coſts than damages, when the jury give leſs damages than 40s. unleſs the judge certify under his hand that the freehold or title of the land came chiefly in queſtion. To this rule there are two exceptions: the one is grounded on ſtat. 8 and 9 W. III. c. 11. whereby the plaintiff obtains full coſts, if the judge certify that the treſpaſs was wilful and malicious. The other exception is by ſtat. 4 and 5 W. and M. c. 23. which gives full coſts againſt any inferior tradeſman, apprentice, or other diſſolute perſon, who is convicted of a treſpaſs in hawking, hunting, fiſhing, or fowling upon another's land.

CERTIORARI, or Certiorary Facias, in law, a writ iſſuing out of chancery, and directed to an inferior court, to call up the records of a cauſe there depending, in order that juſtice may be done. And this writ is obtained upon complaint, that the party who ſeeks it has received hard uſage, or is not like to have an impartial trial in the inferior court. A certiorari is made returnable either in the king's bench, common pleas, or in chancery.

It is not only iſſued out of the court of chancery, but likewiſe out of the king's bench, in which laſt mentioned court it lies where the king would be certified of a record. Indictments from inferior courts, and proceedings of the quarter ſeſſions of the peace, may alſo be removed into the king's bench by a certiorari: and here the very record muſt be returned, and not the tranſcript of it.

CERTITUDE, is properly a quality of the judgment, importing an adheſion of the mind to the propoſition we affirm, or the ſtrength wherewith we adhere to it; or it is, in other words, a neceſſary agreement or diſagreement of one part of our knowledge with another: as applied to the mind, it is the perception of ſuch agreement or diſagreement; or ſuch a firm well grounded aſſent, as excludes not only all manner of doubt, but all conceivable poſſibility of a miſtake.

There are three ſorts of certitude, or aſſurance, according to the different natures and circumſtances of them.

1. A phyſical or natural certitude, which depends upon the evidence of ſenſe; as that I ſee ſuch or ſuch a colour, or hear ſuch or ſuch a ſound; nobody queſtions the truth of this, where the organs, the medium, and the object, are rightly diſpoſed. 2. Mathematical certitude is that ariſing from mathematical evidence; ſuch is, that the three angles of a triangle are equal to two right ones. 3. Moral certitude is that founded on moral evidence, and is frequently equivalent to a mathematical one; as that there was formerly ſuch an emperor as Julius Cæſar, and that he wrote the commentaries which paſs under his name, becauſe the hiſtorians of theſe times have recorded it, and no man has ever diſproved it ſince; this affords a moral certitude, in common ſenſe ſo great, that one would be thought a fool or madman for denying it.

CERUSSE, Ceruse, a white calx of lead, uſed in painting, and coſmetics; made by calcining that metal in the vapour of vinegar.

Ceruſſe is made of third laminæ, or plates of lead made up into rolls, and ſo placed as to receive and imbibe the fumes of vinegar, contained in a veſſel ſet over a moderate fire.

The laminæ are thus converted into a white ruſt; which is gathered together, and ground up with water, and formed into little cakes. Cardan ſhews how to make a ſort of ceruſſe of tin and urine.

Ceruſſe makes a beautiful white colour, and is much uſed by the painters both in oil and water colours. It makes the principal ingredient in the fucus uſed by the ladies for the complexion. Taken inwardly, it is a dangerous poiſon; it ſoon ſhews its malignity, ſpoiling the breath and teeth, and haſtening wrinkles, and all the ſymptoms of old age. Even the external uſe of it as a paint or enamel, for it is ſaid that it has been ſo uſed, is attended with very diſagreeable, and, in the end, with fatal conſequences. Its effects in nervous diſorders are terrible; witneſs the caſe of Mr. Butler at Moſcow. See a curious account of it in the Phil. Tranſ. vol. l. part i. N° 2. and vol. liv. N° 2. an. 1764.

Ceruſſe is the only white hitherto found fit for painting in oil; the diſcovery of ſome other white for this purpoſe is deſireable, not only from the faults of ceruſſe as a paint, but alſo from its injuring the health of its manufacturers, and producing a dreadful diſeaſe, which lead and all its preparations frequently occaſion, called the colic of minerals, or the colic of painters.

Ceruſſe, like the other preparations of lead, is drying, ſedative, and lenient; as ſuch it is employed, but only externally; it is an ingredient in many ointments, plaſters, and other pharmaceutical preparations deſigned for external maladies.

The beſt ceruſſes is that of Venice; but this is rare: that chiefly uſed, is either Engliſh or Dutch, both of which have more chalk in them than white lead; the latter however, is the better of the two.

The manner of preparing ceruſſe in quantities at Venice, is deſcribed by Sir Phil. Vernatti. The plates for this purpoſe are large, and about the thickneſs of a knife's back, and rolled up; but ſo as that the ſurfaces no where touch. Each roll is put in a ſeparate pot, wherein it is upheld by a little bar from the bottom, that it may not touch the vinegar, which is alſo put into the pot, to effect the converſion. The pots are then covered with a plate of lead as cloſe as may be, and over this with a board; after which they are let down into a bed of horſe-dung, big enough to contain four hundred pots. After three weeks continuance the pots are taken up, the plates unrolled, laid on a board, and beaten with battledores till all the flakes come off; which, when they prove good, are hard, thick, and weighty; when otherwiſe, porous and light, and ſometimes black or burned, if the dung proves not well ordered: ſometimes alſo there will be no flakes, or ceruſſe at all. From the beating table it is carried to the mill, ground with water between two ſtones to an almoſt impalpable fineneſs: laſtly, it is moulded into ſmall parcels, and expoſed to the ſun to dry and harden for uſe. Vernatti, in Phil. Tranſ. N° 138, p. 935. ſeq.

CERVUS *Volans*, in natural hiſtory, a name given by authors to the ſtag-fly, or ſtag-horned beetle, a very large ſpecies of beetle with horns ſloped, and ſomewhat like thoſe of a ſtag. See Syſtem of Entomology.

CESARE, in logic, one of the modes of the ſecond figure of ſyllogiſms; the minor propoſition of which is an univerſal affirmative, and the other two univerſal negatives: thus,

CE No immoral books ought to be read.
SA But every obſcene book is immoral;
RE Therefore no obſcene books ought to be read.

CESSATION, the act of intermitting, diſcontinuing, or interrupting the courſe of any thing, work, action, or the like.

CESSATION *of Arms*, an armiſtice, or occaſional truce. When the commander of a place finds things reduced to an extremity, ſo that he muſt either ſurrender, or ſacrifice the garriſon and inhabitants to the mercy of the enemy, he plants a white flag on the breach, or beats the chamade: on which a ceſſation of arms and hoſtilities take place, to give opportunity for capitulation.

CESSION, in a legal ſenſe, an act whereby a perſon ſurrenders up and tranſmits to another perſon, a right which belonged to himſelf.

CESSION is a general term; the ſpecies whereof are, a ſurrender, relinquiſhment, transfer, and ſubrogation.

CESSION is particularly uſed in the civil law, for a voluntary and legal ſurrender of a perſon's effects to his creditors, to avoid impriſonment.

This practice ſtill obtains in France and other countries; and is done by virtue of letters patent granted in favour of the poor and honeſt. The ceſſion originally carried with it a mark of infamy, and obliged the perſon to wear a green cap, or bonnet; at Lucca, an orange one: to neglect this, was to forfeit the privileges of the ceſſion. This was originally intended to ſignify, that the ceſſionary was become poor through his own folly.

CESSION, in the eccleſiaſtical law, is when an eccleſiaſtical perſon is created a biſhop, or when a parſon of a pariſh takes another benefice, without diſpenſation, or being otherwiſe qualified. In both theſe caſes their firſt benefices became void by ceſſion, without any reſignation; and to thoſe livings that the perſon had, who was created biſhop, the king may preſent for that time, whoſoever is patron of them; and in the other caſe the patron may preſent.

What is called ceſſion in other benefices, is called conſecration in relation to a biſhopric; for if an incumbent be made a biſhop, his benefice is ſaid to be void by conſecration.

CETACEOUS, in natural hiſtory, a term applied to all large ſea-fiſhes, and beaſts, which bear a reſemblance to the whale.

The word is formed of *cetus*, a whale.

CETACEOUS, in a proper ſenſe, denotes only thoſe large fiſh which are viviparous, or breed their young within their own bodies; and have no gills, but lungs, with which they breathe like quadrupeds; having but one pair of fins, and giving ſuck to their young.

Theſe ſcarce differ in any thing from quadrupeds, except the want of feet. They have no air bladder; but are enabled by the air they receive into the lungs in reſpiration, to render their bodies equiponderant to water.

CETACEOUS, in the ordinary uſe, is extended to all large fiſh, called by the Latins *belluæ marinæ*, or ſea beaſts.

In which view, cetaceous fiſhes are divided into greater, including the whale kind, properly ſo called; and leſſer; to which belong the porpoiſe, ſhark, dog-fiſh, &c. Theſe latter are more properly called cartilaginous fiſhes. The ſea fox is ranked by authors in the claſs of cetaceous cartilaginous fiſhes, not flat, called alſo galeolæ; whoſe ſpecific difference conſiſts in this, that they have two livers, five gills, or branchiæ, on each ſide, and tufts hanging from the fins, which in the males are under the belly on each ſide the navel.

Of the cetaceous kind, properly ſo called, there are divers ſpecies: ſome without teeth, or tube to caſt up water; others with teeth and a water tube; and others with a large long horn.

The horn uſually called the unicorn's horn, is found to be the tooth of a cetace fiſh in the icy ſea, called narval.

CETERACH, in botany, an officinal, agglutinant plant; which ſtands recommended as an excellent diuretic. The whole plant is to be uſed, and ſhould be gathered in September. It is given by ſome in jaundices, in quartan agues, and in obſtructions of the ſpleen. In ſome parts of Eſſex, where it is common on the walls of their churches, and on the tombs in the church yards, the common people tell us wonders of its effects in the ſtone, as well as in a certain complaint incident to females.

CETUS, in aſtronomy, the whale; a large conſtellation of the ſouthern hemiſphere, under Piſces, and next the water of Aquarius. See the Syſtem.

CHA, in commerce, a ſilk ſtuff very thin and light, made in China, which moſt commonly ſerves the inhabitants for a ſummer dreſs; it is ſomewhat like our taffeties or luſtrings.

CHABNAM, or **ROSEE**, in commerce, a kind of muſlin or cotton linen, very clear and fine: it comes from the Eaſt Indies, particularly from Bengal.

CHADCHOD, in Jewiſh antiquity. Ezekiel mentions chadchod among the ſeveral merchandizes which were brought to Tyre. The old interpreters not very well knowing the meaning of this term, continued it in their tranſlation. Sr. Jerom acknowledges that he could not diſcover the ſignification of it. The Chaldee interprets it pearls; others think that the onyx, ruby, carbuncle cryſtal, or diamond is meant by it. Ezek. chap. xxvii. ver. 16. Calmet Dict. Bibl. in voc.

CHÆTIA, in zoology, the name of a ſpecies of inſects of the apteria kind, without any viſible limbs.

The chætia reſembles a hair, or a piece of fine thread; its ſurface is ſmooth, its body rounded, and very ſlender. It is called in Engliſh the hair worm. Hill's Hiſt. Anim. p. 14.

CHÆTODON, in ichthyology, the name of a genus of the acanthopterygious or thoracic fiſhes; the characters of which are theſe: the branchioſtege membrane, on which ſide contains five or ſix ſmall bones; the body is compreſſed, broad, thin, and ſhort; the back has but one fin, which reaches all along it: the tail is large, and there are in all ſix fins beſide it; the mouth is ſmall, the lips may be opened and extended, but naturally they cover a part of the teeth: the teeth in the jaws are oblong, contiguous to each other, and flexile: the ſcales are rough; and the eyes are not covered with the ſkin of the head. There are ſeveral ſpecies.

The name is derived from *χαιτη, a thin filament*, and *οδους, a tooth*; and expreſſes that the teeth may be divided into thin and fine filaments, reſembling briſtles.

CHAFE, or **CHAFING** *of a Rope*, in ſea language, is ſaid of a rope that is galled or fretted, or when the rope runs againſt any thing.

The Cable is chafed in the Hawſe, ſignifies that it is fretted or begun to be worn out there.

CHAFF, in huſbandry, the huſks of the corn, ſeparated by ſcreening or winnowing it. It ſignifies alſo the rind of corn; and ſtraw cut ſmall for the uſe of cattle.

CHAFFERY, or **CHAFERY**, in the iron works, the name of one of the two principal forges. The other is called the finery. When the iron has been wrought at the finery into what is called an ancony or ſquare maſs, hammered into a bar in its middle, but with its two ends rough, the buſineſs to be done at the chaffery is the reducing the whole to the ſame ſhape, by hammering down theſe rough ends to the ſhape of the middle part.

CHAFFINCH, in ornithology, a ſpecies of the fringilla, with a ferrugious breaſt; the wings black, ſpotted with white.

CHAIN, *Catena*, a ſeries of ſeveral rings, or links, fitted into one another.

There are chains of divers matters, ſizes, and forms, and for divers uſes. Ports, rivers, ſtreets, &c. are cloſed with iron chains: rebellious cities are puniſhed by taken away their chains, and barriers.

The arms of the kingdom of Navarre are, *chains or, in a field gules*. The occaſion hereof is referred to the kings of Spain leagued againſt the Moors; who having gained a celebrated victory againſt them in 1212, in the diſtribution of the ſpoils, the magnificent tent of Miralmumin fell to the king of Navarre; as being the firſt that broke and forced the chains thereof.

A Gold **CHAIN**, is one of the ornaments, or badges of the dignity, of a lord mayor of London; and remains to the perſon, after his being diveſted of that magiſtrature, as a mark that he has paſſed the chair.

CHAIN *Shot*, in war, two bullets, or rather half bullets, linked together by a chain. Their uſe at ſea is to ſhoot down yards, or maſts; or to cut the rigging of a ſhip.

CHAIN, in ſurveying, is a meaſure, conſiſting of a certain number of links of iron wire, uſually a hundred; ſerving to take the dimenſions of fields, &c.

It is of various dimenſions, as the length or number of links varies: that commonly uſed in meaſuring land, called Gunter's chain, is in length four poles or perches; or ſixty-ſix feet, or a hundred links; each link being ſeven inches $\frac{92}{100}$. Whence it is eaſy to reduce any number of thoſe links to feet, or any number of feet to links.

This chain is entirely adapted to Engliſh meaſures; and its chief convenience is in finding readily the numbers contained in a given field. When the proportions of ſquare feet and acres differ, the chain to have the ſame advantages as Gunter's chain, muſt alſo be varied. Thus in Scotland, the chain ought to be of 74 feet, or 24 Scotch ells, if no regard be had to the difference between the Scotch and Engliſh foot: but if regard be had to this difference, the Scotch chain ought to conſiſt of $74\frac{2}{5}$ Engliſh feet, or 74 feet 4 inches, and $\frac{4}{5}$ of an inch. This chain being divided into a hundred links, each of theſe will be 8 $\frac{928}{000}$ inches.

That ordinarily uſed for large diſtances, is in length a hundred feet: each link one foot.

For ſmall parcels, as gardens, &c. is ſometimes uſed a ſmall chain of one pole, or ſixteen feet and a half length: each link one inch $\frac{98}{100}$.

Some in lieu of chains uſe parchment; but theſe are liable to ſeveral irregularities; both from the different degrees of moiſture, and of the force which ſtretches them.

Hanging in **CHAINS**, a kind of puniſhment inflicted on murderers. By ſtat. 25 Geo. II. c. 37. the judge ſhall direct ſuch to be executed on the next day but one, unleſs Sunday intervene; and their bodies to be delivered to the ſurgeons to be diſſected and anatomized: and he may direct them afterwards to be hung in chains. During the interval between ſentence and execution, the priſoner ſhall be kept alone, and ſuſtained only with bread and water. The judge, however, hath power to reſpite the execution, and relax the other reſtraints of the Act. Blackſt. Com. vol. iv. p. 20.

CHAIR, *Cathedra*, was anciently uſed for the pulpit, or ſuggeſtum, whence the prieſt ſpoke to the people.

It is ſtill applied to the place whence profeſſors and regents in univerſities deliver their lectures, and teach the ſcience to their pupils: thus, we ſay, the profeſſors's chair, the doctor's chair, &c.

Marine **CHAIR**, an inſtrument for determining the longitude at ſea.

The perforated chair, wherein the new elected pope is placed, F. Mabillon obſerves is to be ſeen at Rome: but the origin thereof he does not attribute, as is commonly done, to the adventure of pope Joan; but ſays there is a myſtery in it; and it is intended to explain to the pope thoſe words of Scripture, *that God draws the poor out of the duſt and mire.*

CHAIRMAN, the preſident, or ſpeaker of an aſſembly, company, &c.

We ſay the chairman of a committe, &c.

CHAISE, a light carriage of which there are ſeveral ſorts, ſuch as poſt chaiſe, one horſe chaiſe, four wheel chaiſe, &c.

Aurelius Victor relates, that Trajan firſt introduced the uſe of poſt chaiſes: but the invention is generally aſcribed to Auguſtus; and was probably only improved by Trajan, and ſucceeding emperors.

CHALASTIC *Medicines*, are ſuch as have the faculty of relaxing the parts; on account of their extraordinary tenſion, or ſwelling, they occaſion pain.

The word comes from χαλαω, *I relax*.

CHALCAS, in botany, a genus of the decandria monogyria claſs: the calyx of which is ſeparated into five ſegments, and the corolla bell ſhaped, with unguiculated petals.

CHALCEDONIUS, the name of a medicine deſcribed by Galen; and directed by him to be infuſed into the ears, in inveterate diſorders of that part.

CHALCEDICA *Lacerta*, in amphibiology, a ſort of ſerpent, ſo called from its reſemblance in colour to the calcedony. Its bite is ſucceeded by a pellucid tumour, which has a kind of ſhining blackneſs at the margin.

CHALCITIS, a kind of vitriolic mineral, reddiſh like copper, friable, and having yellow ſhining veins within. It has the taſte of the blue vitriol of copper, and diſſolves very eaſily in aqueous liquors. There are two other minerals, called *miſy* and *ſory*, very much like the *chalcitis*. In effect, the ancients confounded them together; and not only the miſy and ſory, but alſo the melanteria.

The moderns make theſe four diſtinct matters; though the the chief difference between them is ſuppoſed to lie in the different tenuity or groſſneſs of their ſubſtance.

Some ſay, the miſy is formed on the chalcitis, as verdigriſe on copper, being properly its ruſt; and that chalcitis is formed in the ſame manner on the ſory.

They are all found in copper mines: but the modern druggiſts know little of any of them.

The calcitis is brought from Germany: it is very cauſtic and eſchoretic. Its chief uſe is in the compoſition of Venice treacle.

CHALCOGRAPHY, the art of engraving on copper and braſs.

CHALCOMUIA, the braſs fly, in natural hiſtory, the name of a fly, whoſe wings are of the colour of poliſhed braſs. It is of the carnivorous kind, feeding on other flies, and beetles, and on the bodies of ſerpents, when dead; whence it has been alſo called by ſome ophioborous; others have called it heſychicus.

CHALDEE, or **CHALDAIC** *Language*, that ſpoken by the Chaldeans, or people of Chaldea.

The Chaldee is a dialect of the Hebrew.

CHALDEE *Paraphraſe*, in the Rabbinical ſtyle, is called Targum.

There are three Chaldee paraphraſes in Walton's Polyglot: viz. that of Onkelos, that of Jonathan ſon of Uzziel, and that of Jeruſalem.

CHALDRON, **CHALDER**, or **CHAUDRON** *of Coals*, a dry Engliſh meaſure, conſiſting of thirty-ſix buſhels heaped up, according to the ſealed buſhel kept at Guildhall, London.

The chaldron ſhould weigh two thouſand pounds. On ſhip board, twenty one chaldrons of coals are allowed to the ſcore.

CHALK, *Creta*, is a white earth found plentifully in Britain, France, Norway, and other parts of Europe. They have a very eaſy way of digging chalk in the county of Kent. It is found on the ſides of hills; and the workmen undermine it; then digging a trench at the top as far diſtant from the edge as the undermining goes at bottom, they fill this with water, which ſoaks through in the ſpace of a night, upon which the whole flake falls down at once. In other parts of the kingdom, chalk generally lies deeper, and they are forced to dig for it at conſiderable depths, and raw it up in buckets. The Kentiſh farmers, hold the uſe of it in great eſtimation. See Syſtem of AGRICULTURE.

Cats thrive well on good chalky ſoil, as indeed do both wheat and barley.

There are various kinds of chalk, uſually diſtinguiſhed by their different colours.

French **CHALK**, an indurated clay which takes ſpots out of cloaths. It is harder than any other earth, of a greyiſh colour, with a mixture of green. It grows at Briançon in France, as well as in Germany and Sardinia.

CHALLENGE, a cartel, or invitation to a duel, or other combat.

The word challenge was anciently tranſlated calumnia.

Challenges to fight, either by word or letter, or bearing ſuch challenges, are puniſhable, by fine and impriſonment; and if they ariſe from gaming, the offender ſhall forfeit all his goods to the crown, and be impriſoned two years. 9 Ann. cap. 14.

CHALLENGE, in law, is an exception made to jurors, and is either in civil or criminal caſes.

In criminal caſes, challenges may be made either on the part of the king, or on that of the priſoner; and either to the whole array, or to the ſeparate polls, for the very ſame reaſons that they may be in civil cauſes.

CHALLENGE, in hunting. When hounds, at firſt finding the ſcent of their game, preſently open, and cry, the huntſman ſay *they challenge*.

CHALYBEAT, in medicine, ſomething that partakes of the nature of ſteel, or iron; or that is impregnated with particles of thoſe metals.

Chalybeats act chiefly as abſorbents, and deobſtruents. Iron, M. Lemery obſerves, is a mixture of an oily ſubſtance with a metallic matter; but the oil is predominant in the mixture; and between the parts mixed are large pores. Hence, iron becomes eaſily diſſolvable; and its oil eaſily diſengages itſelf: but when once decompounded, i. e. when once the oil is ſeparated from the pure, ferruginous, or metallic part, no diſſolvent has any effect on the caput mortuum.

Hence appears the abſurdity of that common practice, of calcining iron to ſuch a degree, as to convert it into what the chemiſts call a crocus, or ſaffron. This operation muſt of neceſſity take away all, or moſt of the oily ſubſtance; and leave nothing but the indiſſoluble caput mortuum. The oil here ſeparated ſhould properly have been ſeparated by the heat of the ſtomach.

The action of the particles of a chalybeat, by their elaſticity, together with the momentum they give the blood by their ponderoſity, make it not only preferable to moſt other deobſtruents, but alſo proper in other caſes: eſpecially where there is a viſcidity of the juices: the blood depauperated, and where the circulation is languid; as in moſt hectic and hypochondriac caſes.

CHAM, or **KHAN**, the title given to the ſovereign princes of Tartary.

The word in the Perſian, ſignifies *mighty lord*; in the Sclavonic *emperor*. Sperlingius, in his diſſertation on the Daniſh term of majeſty, *koning*, *king*, thinks the Tartarian *cham* may be well derived from it; adding, that in the North they ſay *kan*, *konnen*, *konge*, *konning*, *&c.* The term *cham* is alſo applied, among the Perſians, to the great lords of the court, and the governors of provinces.

CHAMA, in natural hiſtory, the name of a large genus of bivalve ſhells, the characters of which are theſe: they are uſually ſmooth, though in ſome places a little rugoſe, and have in ſome few a number of ſpines. The valves of the ſhell are equal, elate, and convex, and the mouth gaping, not cloſing faſt, and even in all parts, as in the oyſter.

The fiſh contained in this genus of ſhells, have all a hot taſte like that of pepper, and inflame the mouth in a troubleſome manner. The French have hence called them flames and flammets, and in ſome parts of the ſame nation they are called lavignons and pelourdes.

CHAMADE, in war, a certain beat of a drum, or ſound of a trumpet, which is given the enemy as a ſignal, to inform them of ſome propoſition to be made to the commander, either to capitulate, or have leave to bury their dead, make a truce, or the like.

Menage derives the word from the Italian *chiamata*, of *clamare*, *to cry*.

CHAMÆMORUS, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of five leaves; and the fruit is compoſed of many acini, in form of the mulberry.

There is only one ſpecies of this plant known, which grows on the tops of the higheſt hills in the north part of England.

CHAMÆPITYS, in botany, ground pine, a ſpecies of germander.

CHAMÆRODODENDROS, dwarf roſe-bay, a ſpecies of the kalmia, according to Miller, and of the rhododendron in the Linnæan ſyſtem.

CHAMBER, in building, a member of a lodging, or piece of an apartment, ordinarily intended for ſleeping in; and called by the Latins cubiculum.

The word comes from the Latin *camera*; and that, according to Nichod, from the Greek καμαρα, *vault*, or *curve*; the term chamber being originally confined to places arched over.

A complete apartment is to conſiſt of a hall, antechamber, chamber, and cabinet.

Privy CHAMBER, gentlemen of the privy chamber, are ſervants of the king, who are to wait and attend on him and the queen at court, and in their diverſions, progreſſes, &c.

Six of theſe are appointed by the lord chamberlain, together with a peer, and a maſter of the ceremonies, to attend all ambaſſadors from crowned heads in their public entries. Their number is fifty.

Their inſtitution is owing to king Henry VII. As a ſingular mark of favour, they are impowered to execute the king's verbal command, and without producing any written order; their perſon and character being deemed ſufficient authority.

CHAMBER *in Policy*, is uſed for the place where certain aſſemblies are held; alſo for aſſemblies themſelves.

Of theſe there are various kinds; ſome eſtabliſhed for the adminiſtration of juſtice; others for matters of commerce, &c. Of the firſt kind among us was the *Star* CHAMBER.

CHAMBER *of Bookſellers*, in Paris, denotes a ſociety conſiſting of a Syndic and aſſiſtants, elected by four delegates from the printers, and twelve from the bookſellers, whoſe buſineſs is to ſuperintend and regulate the trade of printing, and ſelling books, prints, &c. In the viſitation of books, performed by at leaſt three perſons of the ſociety, all libels againſt the honour of God, and the welfare of the ſtate, and all books printed in violation of their regulations and privileges, are ſuppreſſed, or rather meant to be ſuppreſſed; for, in defiance of the moſt active vigilance of this ſociety, libels occaſionally appear.

CHAMBER *of a Mortar*, or *Cannon*, is a cell, or cavity, at the bottom of the barrel, or chace, where the charge of powder is lodged.

The different form of the chamber is found by experiment to have an influence on the range of the piece. A cubical chamber carries the ball to a leſs diſtance than a circular one; and that leſs than a cylindrical one.

Though chambers are now diſuſed, Mr. Miller obſerves, that in large cannons they are an improvement not to be neglected; becauſe pieces, having chambers, require a leſs charge than they would otherwiſe do: and he recommends a chamber in all pieces of twenty-four pound ball and upwards, whoſe diameter ſhould be two thirds the diameter of the bore, and length equal to that diameter. And he adds, that though this chamber contains but one ninth part of the ſhot's weight of powder, yet the effect it produces is nearly equal to that of a fourth part, which is ſufficient in large pieces. Muller's Treat. of Artillery, p. 96.

CHAMBERLAIN, an officer who has the management or direction of a chamber.

The word chamberlain, according to Ragueau, originally ſignified a gentleman who was to ſleep in the king's bedchamber, at his bed's feet, in the abſence of the queen. There are almoſt as many kinds of chamberlains as chambers: the principal are as follow.

Lord CHAMBERLAIN *of Great Britain*, the ſixth great officer of the crown; to whom belongs livery and lodging in the king's court; and there are certain fees due to him from each archbiſhop or biſhop when they perform their homage to the king, and from all peers at their creation or doing their homage. At the coronation of every king, he is to have forty ells of crimſon velvet for his own robes. This officer, on the coronation day, is to bring the king his ſhirt, coif, and wearing clothes; and after the king is dreſſed, he claims his bed, and all the furniture of his chamber, for his fees: he alſo carries at the coronation, the coif, gloves, and linen, to be uſed by the king on that occaſion; alſo the ſword and ſcabbard, the gold to be offered by the king, and the robes royal and crown: he dreſſes and undreſſes the king on that day, waits on him before and after dinner, &c.

To him likewiſe belongs the proviſion of every thing in the houſe of lords, in the time of parliament? to which end he has an apartment uear the lord's houſe. He has the government of the palace of Weſtminſter, and iſſues out warrants for preparing, fitting out, and furniſhing Weſtminſter-hall, againſt coronations, trials of peers, &c.

He diſpoſes of the ſword of ſtate, to be carried by whom he pleaſes; and when he goes to parliament, is on the right hand of the ſword, the lord marſhal being on the left. On all ſolemn occaſions, the keys of Weſtminſter hall, of the Court of Wards, and Court of Requeſts, are delivered to him.

To him belong livery and lodging in the king's court; and he has certain fees from every peer at his creation. Under his command are, the gentleman-uſher of the black rod, the yeoman-uſher, and door-keepers.

Lord CHAMBERLAIN *of the Houſhold*, an officer who has the overſight and direction of all officers belonging to the king's chamber, except the precinct of the bed chamber; which is abſolutely under the groom of the ſtole.

He has the overſight and direction of the officers of the wardrobe, of the removing wardrobes, beds, tents, revels, muſic, comedians, hunting, meſſengers, trumpeters, drummers, handicrafts, and other tradeſmen retained in the king's ſervice: as alſo of all ſerjeants at arms, phyſicians, apothecaries, ſurgeons, barbers, the king's chaplains, &c. and adminiſters the oath to all officers above ſtairs. There is alſo a Lord Chamberlain of her majeſty's houſhold.

There are alſo Chamberlains of the king's courts, of the Exchequer, of North Wales, of the city of London, &c. In theſe caſes, this officer is commonly the receiver of all rents and revenues belonging to the place whereof he is chamberlain.

When there is no prince of Wales, and earl of Cheſter, the chamberlain of Cheſter hath the receipt and return of all writs coming thither out of any of the king's courts. In the Exchequer, there are two chamberlains, who keep a controulment of the pells of receipts, and exitus, and have certain keys of the treaſury and records: they alſo keep the keys of that treaſury where the leagues of the king's predeceſſors, and divers ancient books, as Doomſday book, and the Black book of the Exchequer, remain.

Vice CHAMBERLAIN, called alſo, in ancient ſtatutes, under-chamberlain, is an officer in the court, next under the Lord Chamberlain: and who, in his abſence, has command and controul of all officers belonging to that part of the houſhold called the chamber above ſtairs.

The CHAMBERLAIN *of London* keeps the city money, which is laid up in the chamber of London, an apartment in Guildhall: he alſo preſides over the affairs of maſters and apprentices; and makes free of the city, &c.

His office laſts but for a year, being choſen annually on Midſummer-day; but the cuſtom uſually obtains to rechuſe the ſame perſon; unleſs he has been chargeable with any miſdemeanor in his office.

CHAMBRANLE, in architecture and joinery, the border, frame, or ornament of ſtone, or wood, ſurrounding the three ſides of doors, windows, and chimneys.

The chambranle is different in the different orders; when it is plain, and without mouldings, it is called ſimply and properly, band, caſe, or frame.

The chambranle conſiſts of three parts; the two ſides, called aſcendants; and the top, called the traverſe, or ſupercilium.

The chambranle of an ordinary door is frequently called door caſe; of a window, a window-frame.

CHAMOIS, in tetrapodology, is uſed by the French, for the creature from whoſe ſkin the chamois leather is made.

It is known among naturaliſts by the name of rupicapra. It is very common in the mountains of Helvetia, and in many other places.

Both male and female have horns, and have two remarkable holes always open behind the ears; theſe, ſome imagine, ſerve for reſpiration.

CHAMOMILE, *Anthemis*, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. See ANTHEMIS.

CHAMOS, or CHEMOSH, the idol or god of the Moabites.

The name of Chamos comes from a root, which, in Arabic, ſignifies to make haſte; for which reaſon many believe Chamos to be the ſun, whoſe precipitate courſe might well procure it the name of ſwift or ſpeedy.

Farther particulars may be ſeen in Calmet's Diſſertation on Baal Peor and Chamos, prefixed to his Comment on the book of Numbers.

CHAMPAGNE, in heraldry, a name given by Ferne, and ſome other writers, to the line differing from the common lines, and called alſo urdee, and by Upton vere, from its reſemblance to the ends of the figures of that ſort of fur which is called vair by Heralds.

CHAMPAIN, or POINT CHAMPAIN, in heraldry, is a mark of diſhonour, in the coat of arms of him who kills a priſoner of war after he has cried quarter.

CHAMPARTORS, or CHAMPERTORS, are thoſe who move pleas, or ſuits, or cauſe them to be moved, either by their own procurement or others; and ſue them at their proper coſts, to have part of the land or other matter in variance: againſt whom lies a writ of champarty.

CHAMPARTY, or CHAMPERTY, in law, a maintenance of any man in his ſuit, upon condition of having part of the thing in queſtion, be it lands or goods, in caſe it be recovered.

The word come from the French, *champ, field*, and *parti, divided*; the field, or thing conteſted for, being ſuppoſed to be divided between the champertor, or maintainer, and the perſon in whoſe right he ſues.

This ſeems to have been an ancient grievance; for notwithſtanding ſeveral ſtatutes againſt it, and a form of writ accommodated to them, in the time of Edward I. yet in that of Edward III. it was enacted, that whereas redreſs on the former ſtatute was only to be had in the king's bench, which then followed the court: for the future it ſhould likewiſe be cognizable by the juſtices of the common pleas and judges of aſſize.

CHAMPION, properly ſignifies a perſon who undertakes a combat, in the place or quarrel of another: though the word is alſo ſometimes uſed for him who fights in his own cauſe.

CHAMPION *of the King*, is an officer, whoſe buſineſs is, at the coronation of the king of England, to ride into Weſtminſter-hall, armed cap-a-pe, when the king is at dinner, and throw down his gauntlet by way of challenge; pronouncing by a herald, "That if any man ſhall deny, or gainſay the king's title to the "crown, he is there ready to defend it in ſingle combat, &c." Which done, the king drinks to him, ſending him a guilt cup with a cover, full of wine; which the champion drinks, and has the cup for his fee.

This office, ever ſince the coronation of Richard II. has been continued in the family of Dymocke, who held the manor of Scrivelſby in Lincolnſhire, hereditary from the family of the Marmions, who had it before, by grand ſerjeantry; on condition that the lord thereof ſhould be the king's champion.

CHANCE, a term we apply to events, to denote that they happen without any neceſſary, or foreknown cauſe: or it is uſed to denote the bare poſſibility of an event, when nothing is known either to produce or hinder it.

We aſcribe thoſe things to chance, which are not neceſſarily produced as the natural effects of any proper cauſe, which we can diſcover; but the ignorance and precipitancy of many lead them to attribute effects to chance, which have neceſſary and determinate cauſes.

When we ſay a thing happens by chance, we really mean no more than that its cauſe is unknown to us: not, as ſome vainly imagine, that chance itſelf can be the cauſe of any thing. From this conſideration, Dr. Bently takes occaſion to expoſe the folly of that old tenet, *the world was made by chance.*

The caſe of the painter, who, unable to expreſs the foam at the mouth of a horſe he had painted, threw his ſponge in deſpair at the piece, and, by chance, did that which he could not before do by deſign, is an eminent inſtance of the force of chance: yet, it is obvious, all we here mean by chance, is, that the painter was not aware of the effect; or that he did not throw the ſponge with ſuch a view; not but that he actually did every thing neceſſary to produce the effect; inſomuch that, conſidering the direction wherein he threw the ſponge, together with its form, ſpecific gravity, the colours wherewith it was ſmeared, and the diſtance of the hand from the piece, it was impoſſible, on the preſent ſyſtem of things, that the effect ſhould not follow.

CHANCE is confounded with fate and deſtiny; and the word is alſo uſed for the manner of deciding things, the conduct or direction of which is left at large, and not reducible to any determinate rules or meaſures; or where there is no ground for preference: as at cards, dice, lotteries, &c.

For the Laws of CHANCE, in lotteries, whiſt, hazard, &c. ſee the reſpective Articles.

CHANCELLOR, was at firſt only a chief notary or ſcribe under the emperors; and was called *cancellarius*, becauſe he ſat behind a lattice (in Latin *cancellus*) to avoid being crowded by the people: though ſome derive the word from *cancellare*, to cancel; (ſee CHANCERY.) This officer was afterwards inveſted with ſeveral judicial powers, and a general ſuperintendency over the reſt of the officers of the prince. From the Roman empire it paſſed to the Roman church, ever emulous of imperial ſtate; and hence every biſhop has to this day his chancellor, the principal judge of his conſiſtory. And when the modern kingdoms of Europe were eſtabliſhed upon the ruins of the empire, almoſt every ſtate preferred its chancellor with different juriſdictions and dignities, according to their different conſtitutions. But in all of them he ſeems to have had the ſupervision of all charters, letters, and ſuch other public inſtruments of the crown as were authenticated in the moſt ſolemn manner: and therefore, when ſeals came in uſe, he had always the cuſtody of the king's great ſeal.

Lord High CHANCELLOR *of Great Britain*, or *Lord Keeper of the Great Seal*, is the higheſt honour of the long robe, being created by the mere delivery of the king's great ſeal into his cuſtody: whereby he becomes, without writ or patent, an officer of the greateſt weight and power of any now ſubſiſting in the kingdom; and ſuperior, in point of precedency, to every temporal lord. He is a privy counſellor by his office; and, according to Lord Chancellor Elleſmere, prolocutor of the houſe of lords by preſcription. To him belongs the appointment of all the juſtices of the peace throughout the kingdom. Being in former times uſually an eccleſiaſtic, (for none elſe were then capable of an office ſo converſant in writing,) and preſiding over the royal chapel, he became keeper of the king's conſcience; viſitor, in right of the king, of all hoſpitals and colleges of the king's foundation; and patron of all the king's livings under the value of 20l. per annum, in the king's books. He is the general guardian of all infants, idiots, and lunatics; and has the general ſuperintendance of all charitable uſes in the kingdom. And all this over and above the vaſt extenſive juriſdiction which he exerciſes in his judicial capacity in the court of chancery.

All other juſtices are confined to ſtrict law; but the chancellor has the king's abſolute power to moderate the rigour of the written law, to govern his judgment by the law of nature and conſcience, and to order all things *ſecundum equum & bonum.* Accordingly, Stamford ſays, the chancellor has two powers, the one abſolute, the other ordinary; meaning, that though by his ordinary power he muſt obſerve the ſame form of procedure as other judges, yet in his abſolute power he is not limited by any written law, but by conſcience and equity.

CHANCELLOR *of a Cathedral.* His office is thus deſcribed in the Monaſticon; viz. to hear the leſſons and lectures read in the church, either by himſelf, or his vicar; to correct and ſet right the reader when he reads amiſs; to inſpect ſchools, to hear cauſes, apply the ſeal, write and diſpatch the letters of the chapter, keep the books, take care there be frequent preachings, both in the church, and out of it, and aſſign the office of preaching to whom he liſts.

CHANCELLOR *of a Dioceſe*; is a judge of the biſhop's court held in the cathedral of each dioceſe.

He was anciently called *eccleſiaſticus*, and *eccleſiæ cauſſidicus*, the church lawyer. See *Biſhop's* COURT.

CHANCELLOR *of the Duchy of Lancaſter*, is an officer, the head of that court, whoſe buſineſs is to judge and determine all controverſies between the king and his tenants of the duchy land; and otherwiſe to direct all the king's affairs relating to that court. See *Duchy* COURT.

CHANCELLOR *of the Exchequer*, is an officer, ſuppoſed by ſome to have been created for moderating extremities in the exchequer.

He ſometimes ſits in that court and the exchequer chamber, and, with the reſt of the court, orders things to the king's beſt benefit. He is always in commiſſion with the lord treaſurer for letting lands accruing to the crown by diſſolution of abbeys, and otherwiſe he has power, with others, to compound for forfeitures on penal ſtatutes, bonds, and recognizances entered into by the king. He has great authority in managing the royal revenue, and in matters of firſt fruits.

The court of equity, in the exchequer chamber, is held before the lord treaſurer, chancellor, and barons, as that of common law before the barons only.

CHANCELLOR *of the Order of the Garter*, and other military orders, is an officer who ſeals the commiſſions and mandates of the chapter, and aſſembly of the knights, keeps the regiſter of their deliberations, and delivers acts thereof under the ſeal of the order.

CHANCELLOR *of an Univerſity*, is he who ſeals the diplomas or letters of degrees, proviſion, &c. given in the univerſity.

The chancellor of Oxford, is their chief magiſtrate, elected by the ſtudents themſelves: his office is *durante vita*, to govern the univerſity, preſerve and defend its rights and privileges, convoke aſſemblies, and do juſtice among the members under his juriſdiction.

Under the chancellor is the vice-chancellor, who is choſen annually, being nominated by the chancellor, and elected by the univerſity in convocation. His buſineſs is to ſupply the chancellor's abſence.

At his entrance upon his office, he chooſes four pro-vice-chancellors, out of the heads of colleges, to one of whom he deputes his power in his abſence.

The chancellor of Cambridge is in moſt reſpects the ſame with that of Oxford; only he does not hold his office *durante vita*, but may be elected every three years.

He has under him a commiſſary, who holds a court of record of civil cauſes, for all perſons of the univerſity under the degree of maſter of arts.

The vice-chancellor of Cambridge is choſen annually by the ſenate, out of two perſons nominated by the heads of the ſeveral colleges and halls.

CHANCERY, the higheſt court of juſtice in Britain next to the parliament, and of very ancient inſtitution. It has its name chancery (*cancellaria*) from the judge who preſides here, the lord chancellor, or *cancellarius*; who, according to Sir Edward Coke, is ſo termed *a cancellando*, from cancelling the king's letters patent when granted contrary to law, which is the higheſt point of his juriſdiction. In chancery there are two diſtinct tribunals: the one ordinary, being a court of common law; the other extraordinary, being a court of equity.

1. The ordinary legal court holds pleas of recognizances acknowledged in the chancery, writs of *ſcire facias*, for repeal of letters patent, writs of partition, &c. and alſo all perſonal actions by or againſt any officer of the court. Sometimes a *ſuperſedeas*, or writ of privilege, hath been here granted to diſcharge a perſon out of priſon: one from hence may have a *habeas corpus* prohibition, &c. in the vacation; and here a *ſubpœna* may be had to force witneſſes to appear in other courts, when they have no power to call them. But, in proſecuting cauſes, if the parties deſcend to iſſue, this court cannot try it by jury; but the lord chancellor delivers the record into the king's bench to be tried there; and after trial had, it is to be remanded into the chancery, and there judgment given: though if there be a demurrer in law, it ſhall be argued in this court.

In this court is alſo kept the *officina juſtitiæ*; out of which all original writs that paſs under the great ſeal, all commiſſions of charitable uſes, ſewers, bankruptcy, idiocy, lunacy, and the like, do iſſue; and for which it is always open to the ſubject, who may there and at any time demand and have, *ex debito juſtitiæ*, any writ that his occaſions may call for. Theſe writs, relating to the buſineſs of the ſubject, and the returns to them, were, according to the ſimplicity of ancient times, originally kept in a hamper, *in hanaperio*; and the others (relating to ſuch matters wherein the crown is mediately or immediately concerned), were preſerved in a little ſack or bag, *in parva baga:* and hence hath ariſen the diſtinction of the hanaper office, and the petty bag office, which both belong to the common law court in chancery.

2. The extraordinary court, or court of equity, proceeds by the rules of equity and conſcience; and moderates the rigour of the common law, conſidering the intention rather than the words of the law. It gives relief for and againſt infants notwithſtanding their minority, and for and againſt married women notwithſtanding their coverture. All frauds and deceits, for which there is no redreſs at common law; all breaches of truſt and confidence; and accidents, as to relieve obligors, mortgagers, &c. againſt penalties and forfeitures, where the intent was to pay the debt, are here remedied: for in chancery, a forfeiture, &c. ſhall not bind, where a thing may be done after, or compenſation made for it. Alſo this court will give relief againſt the extremity of unreaſonable engagements entered into without conſideration; oblige creditors, that are unreaſonable, to compound with an unfortunate debtor; and make executors, &c. give ſecurity and pay intereſt for money that is to lie long in their hands. This court may confirm title to lands, though one hath loſt his writings; and render conveyances, defective through miſtake, &c. good and perfect. In chancery, copyholders may be relieved againſt the ill uſage of their lords; incloſures of lands that are common, be decreed; and this court may decree money or lands given to charitable uſes, obliges men to account with each other, &c. But, in all caſes where the plaintiff can have his remedy at law, he ought not to be relieved in chancery; and a thing which may be tried by a jury is not triable in this court.

The proceedings in chancery are, firſt to file the bill of complaint, ſigned by ſome counſel, ſetting forth the fraud or injury done, or wrong ſuſtained, and praying relief: after the bill is filed, proceſs of *ſubpœna* iſſues to compel the defendant to appear; and when the defendant appears, he puts in his anſwer to the bill of complaint, if there be no cauſe for the plea to the juriſdiction of the court, in diſability of the perſon, or in bar, &c. Then the plaintiff brings his replication, unleſs he files exceptions againſt the anſwer as inſufficient, referring it to a maſter to report whether it be ſufficient or not; to which report exceptions may alſo be made. The anſwer, replication, rejoinder, &c. being ſettled, and the parties come to iſſue, witneſſes are to be examined upon interrogatories, either in court, or by commiſſion in the country, wherein the parties uſually join; and when the plaintiff and defendant have examined their witneſſes, publication is to be made of the depoſitions, and the cauſe is to be ſet down for hearing, after which follows the decree. But it is now uſual to appeal to the houſe of lords; which appeals are to be ſigned by two noted counſel, and exhibited by way of petition: the petition or appeal is lodged with the clerk of the houſe of lords, and read in the houſe, whereon the appellee is ordered to put in his anſwer, and a day fixed for hearing the cauſe; and after counſel heard, and evidence given on both ſides, the lords will affirm or reverſe the decree of the chancery, and finally determine the cauſe by a majority of votes, &c.

CHANCRE, in medicine, a malignant ulcer, which gnaws and eats the fleſh, occaſioned by venereal diſorders.

CHANDELIER, or CHANDELEER, in fortification, a wooden frame, made of two pieces, fixed croſs ways on two other pieces, at about four feet aſunder, and on their interſections are erected two vertical pieces of five feet high, each ſupported by three buttreſſes; the interval of theſe two pieces is filled up with faſcines, or faggots, to cover the workmen inſtead of a parapet.

Chandeliers are ſometimes alſo made to prevent the enemy from ſeeing what paſſes within.

The difference between chandeliers and blinds, conſiſts in this, that the former ſerve to cover the pioneers before, and the latter alſo cover them over head.

CHANDELIER ſignifies alſo a kind of candleſtick, uſed as ornamental furniture.

CHANGE, in commerce. See EXCHANGE.

CHANGER, or CHAUNGER, an officer belonging to the king's mint, who changes money for gold, or ſilver bullion.

CHANGES, in arithmetic, &c. the permutations or variations of any number of quantities; with regard to their poſition, order, &c.

CHANNA, in ichthyology, the name of a fiſh caught in great plenty in the Mediterranean, and brought to market in Italy and elſewhere, among the ſea-perch, which it ſo nearly reſembles, that it would not be diſtinguiſhable from it, but that the ſea-perch is bigger.

CHANNEL is alſo applied to arms of the ſea, wheret he waters run within the land; or to certain narrow ſeas, confined between two adjacent continents, or between an iſland and continent.

In this ſenſe we ſay, St. George's channel, the Britiſh channel, the channel of the Black Sea, of Conſtantinople, &c.

CHANT, *Cantus*, is uſed for the vocal muſic of churches.

CHANTOR, or CHAUNTOR, a perſon who ſings in the choir of a cathedral.

CHAOS, among the ancient philoſophers, was deſcribed a dark, turbulent kind of atmoſphere; or a diſorderly ſyſtem or mixture, of all ſorts of particles together, without any form or regularity; out of which the world was formed.

Dr. Burnet obſerves, that the opinion of the wiſe men of all ages, that what we now call the terreſtial globe, was originally an unformed, indigeſted maſs of heterogeneous matter, called chaos; and no more than the rudiments and materials of the preſent world.

Mr. Whiſton ſuppoſes the ancient chaos, the origin of our earth, to have been the atmoſphere of a comet; which, though new, yet, all things conſidered, is not the moſt improbable aſſertion. He endeavours to make it out by many arguments, drawn from the agreement which appears to be between them.

So that, according to him, every planet is a comet, formed into a regular and laſting conſtitution, and placed at a proper diſtance from the ſun, revolving in a nearly circular orbit; and a comet is a planet either beginning to be deſtroyed, or re-made; that is, a chaos, or planet unformed, or in its primæval ſtate, and placed, as yet, in an orbit very eccentrical.

CHAPELING *a Ship*, is the art of turning her round in a light breeze of wind, when ſhe is cloſe hauled, ſo that ſhe will lie the ſame way as ſhe did before. This is commonly occaſioned by the negligence of the ſteerſman, or by a ſudden change of the wind.

CHAPLAIN properly ſignifies a perſon provided with a chapel; or who diſcharges the duty thereof.

CHAPLAIN is alſo uſed for an eccleſiaſtical perſon, in the houſe of a prince or perſon of quality, who officiates in their chapels, &c.

With us there are forty eight chaplains to the king, who wait four each month, preach in the chapel, read the ſervice to the family, and to the king in his private oratory, and ſay grace in the abſence of the clerk of the cloſet. While in waiting they have a table, and attendance, but no ſalary.

An archbiſhop may retain eight chaplains; a duke or a biſhop ſix; a marquis or earl, five; a viſcount, four; a baron, knight of the garter, or lord chancellor, three; a dutcheſs, marchioneſs, counteſs, baroneſs, the treaſurer and comptroller of the king's houſe, the king's houſe, the king's ſecretary, dean of the chapel, almoner and maſter of the rolls, two each; the chief juſtice of the king's bench, one: all of whom may purchaſe a licence or diſpenſation, and take two benefices with cure of ſouls. Stat. 22 Hen. VIII. c. 13.

Every judge of the king's bench and common pleas, the chancellor and chief baron of the exchequer, the king's attorney and ſolicitor general, may each of them have one, entitled to one benefice with cure, and non-reſident. Stat. 25. Hen. VIII. c. 16.

And alſo the groom of the ſtole, treaſurer of the king's chamber, and chancellor of the duchy of Lancaſter, may retain each one chaplain. Stat. 33 Hen. VIII. c. 28. A chaplain muſt be retained by letters teſtimonial under hand and ſeal, or he is not a chaplain within the ſtatute: and a chaplain thus qualified may hold his livings, though diſmiſſed from attendance, during life; nor can a nobleman, though he may retain other chaplains in his family, qualify any of them to hold pluralities whilſt the firſt are living.

CHAPLET, an ancient ornament for the head, like a garland or wreath; but this word is frequently uſed to ſignify the circle of a crown. There are inſtances of its being borne in a coat of arms, as well as for creſts; the paternal arms for Laſcelles are argent, three chaplets, gules.

CHAPLET alſo denotes a ſtring of beads uſed by the Roman Catholics, to count the number of their prayers. The invention of it is aſcribed to Peter the hermit, who probably learned it of the Turks, as they owe it to the Eaſt Indians.

Chaplets are ſometimes called *pater-noſters*; and are made of coral, of diamonds, of wood, &c. The common chaplet contains fifty ave-marias, and five pater-noſters. There is alſo a chaplet of our Saviour, conſiſting of 33 beads, in honour of his 33 years living on earth, inſtituted by father Michael the Cameldulian.

The Orientals have a kind of chaplets which they call chains, and which they uſe in their prayers, rehearſing one of the perfections of God on each link or head. The Great Mogul is ſaid to have 18 of theſe chains, all precious ſtones; ſome diamonds, other rubies, pearls, &c. The Turks have likewiſe chaplets, which they bear in the hand, or hang at the girdle: but father Dandini obſerves, they differ from thoſe uſed by the Romaniſts, in that they are all of the ſame bigneſs, and have not that diſtinction into decads; though they conſiſt of ſix decads, or 60 beads. He adds, that the muſſulmans run over the chaplet almoſt in an inſtant, the prayers being extremely ſhort, as containing only theſe words, "praiſe to God," or, "glory to God," for each bead. Beſides the common chaplet they have likewiſe a larger one conſiſting of 100 beads, where there is ſome diſtinction, as being divided by little threads into three parts; on one of which they repeat 30 times *ſoubhan Allah*, i. e. "God is worthy to be praiſed;" on another, *ellamb Allah*, "glory be to God;" and on the third, *Allah echer*, "God is great.". Theſe thrice thirty times making only 90; to complete the number 100, they add other prayers for the beginning of the chaplet. He adds, that the Mahometan chaplet, appears to have its riſe from the *mea beracoth*, or "hundred benedictions;" which the Jews are obliged to repeat daily, and which we find in their prayer-books; the Jews and Mahometans having this in common, that they ſcarce do any without pronouncing ſome laud or benediction.

Menage derives the word chaplet, from *chapeau*, "hat." The modern Latins call it *chapellina*, the Italians more frequently *corona*.

CHAPTER, in eccleſiaſtical polity, a ſociety or community of clergymen belonging to the cathedrals and collegiate churches.

It was in the eighth century that the body of canons began to be called a chapter. The chapter of the canons of a cathedral were a ſtanding council to the biſhop, and, during the vacancy of the ſee, had the juriſdiction of the dioceſe. In the earlier ages, the biſhop was head of the chapter; afterwards abbots and other dignitaries, as deans, provoſts, treaſurers, &c. were prefered to this diſtinction. The deans and chapters had the privilege of chuſing the biſhops in England; but Henry VIII. got this power veſted in the crown; and as the ſame prince expelled the monks from the cathedrals, and placed ſecular canons in their room, thoſe he thus regulated were called deans and chapters of the new foundation; ſuch are Canterbury, Wincheſter, Ely, Carliſle, &c.

Chapter, in matters in literature, a diviſion in a book for keeping the ſubject treated of more clear and diſtinct.

CHAR, in ichthyology, a ſpecies of ſalmon.

CHARACTER, in a general ſenſe, ſignifies a mark, or figure, drawn on paper, metal, ſtone, or other matter, with a pen, graver, chiſſel, or other inſtrument, to ſignify or denote any thing.

The word is Greek, χαρακτηρ, formed from the verb χαρασσειν, *inſculpere*, to ingrave, impreſs, &c.

The various kinds of characters may be reduced to three heads, viz. literal characters, numeral characters, and abbreviations.

Literal character, is a letter of the alphabet, ſerving to indicate ſome articulate ſound, expreſſive of ſome idea or conception of the mind. See Alphabet.

Theſe may be divided, with regard to their nature and uſe, into nominal characters, or thoſe we properly call letters; which ſerve to expreſs the names of things. Real characters; thoſe that inſtead of names expreſs things and ideas. Emblematical, or ſymbolical characters; which have this in common with real ones, that they expreſs the things themſelves; but have this further, that they in ſome meaſure perſonate them, and exhibit their form: ſuch are the hieroglyphics of the ancient Egyptians. See Hieroglyphic, Symbol, &c.

Literal Characters may be again divided, with regard to their invention and uſe, into particular and general or univerſal.

Particular Characters, or thoſe peculiar to this or that nation. Such are the Roman, Italic, Greek, Hebrew, Arabic, Gothic, Chineſe, &c. characters. See Hebrew, Gothic, Chineſe, &c.

Univerſal Characters, are alſo real characters, and make what ſome authors call a philoſophical language.

That diverſity of characters uſed by the ſeveral nations to expreſs the ſame idea, is found the chief obſtacle to the advancement of learning: to remove this, ſeveral authors have taken occaſion to propoſe plans of characters that ſhould be univerſal, and which each people ſhould read in their own language. The character here is to be real, not nominal: to expreſs things and notions; not, as the common ones, letters or ſounds: yet to be mute, like letters, and arbitrary; not emblematical, like hieroglyphics.

Thus, every nation ſhould retain its own language, yet every one underſtand that of each other, without learning it; only by ſeeing a real or univerſal character, which ſhould ſignify the ſame things to all people, by what ſounds ſoever each expreſs it in their particular idiom. For inſtance, by ſeeing the character deſtined to ſignify to drink, an Engliſhman ſhould read *to drink*; a Frenchman, *boire*; a Latin, *bibere*; a Greek, πινειν; a Jew, שתה, a German, *trincken*; and ſo of the reſt: in the ſame manner as ſeeing a horſe, each people expreſſes it after their own manner; but all mean the ſame animal.

The French character uſed in the chamber of accounts, and by perſons concerned in the management of the revenue, is, properly ſpeaking, nothing elſe than the Roman numerals, in letters that are not majuſcule: thus, inſtead of expreſſing fifty-ſix by LVI, they denote it by ſmaller characters lvj.

For the characters, or ſymbols, are now chiefly affected in the ſeveral parts of mathematics; particularly in algebra, geometry, trigonometry, and aſtronomy: as alſo in medicine, chemiſtry, muſic, &c. For which, ſee the Syſtems.

Characters *in Commerce.*

D° *Ditto*, the ſame.
N° *Numero*, or number.
F° *Folio*, or page.
R° *Recto*, } folio.
V° *Verſo*, }

l. or £. *ſterling*, pound ſterling.
s. Shilling.
d. Pence, or Deniers.

℔ Pound weight.
C. or ⊕ Hundred weight, or 112 pound.
qrs. Quarters.
⅌ *Per*, or by. As ⅌ *ann.* by the year. ⅌ *cent.* in the hundred, &c.
Rx Rixdollar.
Dc Ducat.
P. S. Poſtcript.

Characters *in Grammar, Rhetoric, Poetry, &c.*

, *Character* of a *Comma.*
; *Semicolon.*
: *Colon.*
. *Period.*
! *Exclamation.*
? *Interrogation.*
() *Parentheſis.*
- *Hyphen.*
' *Apoſtrophe.*

' *Emphaſis*, or accent.
˘ *Breve.*
¨ *Dialyſis.*
^ *Caret*, and *Circumflex.*
" *Quotation.*
† and * *References.*
§ *Section*, or *Diviſion.*
¶ *Paragraph.*

LL. D. *Doctor of Laws*, or, *of the Civil and Canon Law.*

SS. T. D. *Sacro-Sanctæ Theologiæ Doctor*, or D. D. i. e. *Doctor in Divinity.*

M. D. *Doctor in Phyſic.*

V. D M. *Verbi Dei Miniſter, Miniſter of the Word of God.*

A. M. *Artium Magiſter, Maſter of Arts.*

A. B. *Artium Baccalaureus, Bachelor of Arts.*

F. R. S. *Fellow of the Royal Society.*

F. A. S. *Fellow of the Antiquarian Society.*

Character is alſo uſed for certain viſible qualities, which claim reſpect or reverence to thoſe veſted therewith.

The majeſty of kings gives them a character, which procures reſpect from the people. A biſhop ſhould ſuſtain his character by learning and ſolid piety, rather than by worldly luſtre, &c.

Character is alſo uſed for a certain manner, air, or aſſemblage of qualities, reſulting from ſeveral particular marks, which diſtinguiſh a thing from any other, ſo as it may be known thereby.

Thus, we ſay, the character of Achilles; generoſity and greatneſs of mind formed the character of the Romans; Cicero had a character of politeneſs, which is wanting in Demoſthenes; every paſſion has its peculiar character.

Characters *of Fiſhes, charactereus piſceum*, are thoſe marks by which each particular fiſh is diſtinguiſhed from thoſe other ſpecies of the ſame genus to which it belongs, and by which it is to be referred to its genus. Theſe characters are the eſſential foundation of all the natural diviſions in this part of hiſtory, and by means of theſe alone the ſtudent is lead to the real knowledge of the bodies under conſideration, whether according to the works of other authors, or ſome new ſyſtem of his own. The naturaliſts of former ages did not pay a ſufficient regard to theſe marks, and conſequently could not hit upon the natural diviſions of bodies, but had recourſe to the artificial diſtinctions taken from accidents or variable properties in them, and the general external appearance uſually gave rules to them; hence the uncertainty and confuſion of the diviſions of the old authors, and method and regularity of thoſe of the moderns. See Generical *Name.*

Characters, among botaniſts, is ſynonimous with the definition of the genera of plants. The term character is not extended by Linnæus to the ſpecies of plants, becauſe he never gives the complete deſcription of any ſpecies; but only enumerates thoſe characters or circumſtances in which it differs from all the other ſpecies of the ſame genus. The characteriſtic mark of each genus is to be fixed from the figure, ſituation, connection, number, and proportion, of all the parts, ſee Botanical Table.

Linnæus has ſuggeſted four different characters; the artificial, the natural, and the habitual; which are all equally applicable to the higher and lower diviſions. The firſt is drawn indiſcriminately from different parts of the plant, and admits of more or fewer characteriſtical marks than are abſolutely neceſſary for diſtinguiſhing the claſſes, genera, and ſpecies. Linnæus eſtabliſhes for a criterion of the artificial character, that it can never diſtinguiſh the genera in a natural order; being calculated merely for diſcriminating ſuch as arrange themſelves under the ſame artificial order. In the ſexual ſyſtem the claſſical characters are only conſidered as artificial. The eſſential character diſtinguiſhes one plant from another by means of a ſingle mark ſo ſtriking and particular as to diſtinguiſh the plant in which it is found, from every other, at firſt ſight. It ſerves to diſtinguiſh ſuch genera as arrange themſelves under the ſame natural order. The eſſential character of the claſſes and genera ought to be taken from one of the ſeven parts of fructification; that of the ſpecies from any of the other parts; as the ſtem, leaf, root, buds, &c. The natural character includes the two former, and collects all the poſſible marks of plants. It is uſeful, ſays Linnæus, in every method; lays the foundation of the ſyſtems; remains unchanged though new genera are daily diſcovered; and is capable of emendation by the detection of new ſpecies alone, which afford an opportunity of excluding ſuch characteriſtical marks as are totally ſuperfluous. The habitual character drawn from the habit or port of plants, was the invention of the earlier botaniſts who knew no better rule for the diſtinction of vegetables. This character has never been employed but in diſtinguiſhing the ſpecies; though Linnæus ſeems to think that it may be uſed with caution, and in default of other characters, for aſcertaining the genera. See Botany.

CHARACTERISTIC, in the general, is that which characterizes a thing or perſon, i. e. conſtitutes its character, whereby it is diſtinguiſhed from all others.

Characteristic is peculiarly uſed in grammar, for the principal letter of a word; which is preſerved in moſt of its tenſes and moods, its derivatives and compounds.

The characteriſtic frequently ſhews its etymology; and ought conſtantly to be retained in its orthography; ſuch is the letter *r* in *courſe, fort*, &c.

The characteriſtics are of great uſe in the Greek grammar, eſpecially in the formation of the tenſes; as being the ſame in the ſame tenſes of all verbs of the ſame conjugation excepting in the preſent tenſe, which has ſeveral characteriſtics: and the future, the aoriſtus primus, the preterperfect, and the pluſquam perfect tenſe of the fourth conjugation, which have two characteriſtics.

CHARADRIUS, in the Linnæan ſyſtem of ornithology, is a diſtinct genus of birds, of the order of the grallæ; the diſtinguiſhing character of which is, that the feet have each three toes, the point of the bill is cylindrical and obtuſe, and the noſtrils linear. Of this genus there are twelve ſpecies.

CHARAG, the tribute which Chriſtians and Jews pay to the grand ſignior. It conſiſts of ten, twelve, or fifteen francs per annum, according to the eſtate of the party.

CHARAIMS, a ſect of the Jews in Egypt. They live by themſelves, and have a ſeparate ſynagogue; and as the other Jews are remarkable for their eyes, ſo theſe are for their large noſes, which run through all the families of this ſect. Theſe are the ancient Eſſenes. They ſtrictly obſerve the five books of Moſes, according to the letter, and receive no written traditions. It is ſaid that the other Jews would join the Charaims, but thoſe not having obſerved the exact rules of the law with regard to the divorces, theſe think they live in adultery.

CHARCOAL, a ſort of artificial coal, or fuel conſiſting of wood half burnt; chiefly uſed where a clear ſtrong fire, without ſmoke, is required; the humidity of the wood being here moſtly diſſipated and exhaled in the fire wherein it was prepared.

The microſcope diſcovers a ſurpriſing number of pores in charcoal: they are diſpoſed in order, and traverſe it lengthwiſe; ſo that there is no piece of charcoal, how long ſoever, but may be eaſily blown through. If a piece be broken pretty ſhort, it may be ſeen through with a microſcope. In a range the eighteenth part of an inch long Dr. Hook reckoned one hundred and fifty pores; whence he concludes, that in a charcoal of an inch diameter, there are no leſs than five millions ſeven hundred twenty-four thouſand pores.

It is to this prodigious number of pores, that the blackneſs of charcoal is owing: for the rays of light, ſtriking on the charcoal, are received and abſorbed in its pores, inſtead of being reflected; whence the body muſt of neceſſity appear black, blackneſs in a body being no more than a want of reflection.

The noxiouſneſs of air infected with the fumes of burning charcoal is well known: the cauſe of this has been ſufficiently explained by Dr. Prieſtley, &c. who accounts for it by the diminution of the air, in conſequence of being overcharged with phlogiſton, and the depoſition of fixed air. See Air, *fixed.* Prieſtley's Electricity, vol. ii. p. 193. Exper. and Obſ. on Air, vol. i. p. 129. and vol. ii. p. 241. or Phil. Tranſ. vol. lx. art. 19. p. 211.

Mathematical inſtrument-makers, engravers, &c. find charcoal of great uſe to poliſh their braſs and copper-plates, after they have been rubbed clean with powdered pumice-ſtone.

Method of making Charcoal. The beſt is that made of oak, cut into lengths of about three feet. The ground whereon the operation is to be performed, is bared of all the turf, and other combuſtible matter; and is in form circular, a ſtake being driven in the centre. This area is filled up with wood, eight feet high, placed alternatively lengthwiſe, and perpendularly, then coped a-top in the form of a ſugar-loaf, and all inequalities filled up with ſmall wood, till it lie very cloſe: the whole is then to be covered over moderately thick with turf, and other rubbiſh.

A moveable ſcreen being then ſet up againſt the wind, the ſtake is pulled up, and fire ſet to the pile, by pouring into the cavity ſome charcoal, and other coal fully kindled; the vent, or funnel a-top, is then covered with turf, and vent holes are made through the ſtuff that covers the pile, two or three feet apart, quite round, a foot from the top. The next day a new range of holes is made, a foot and a half below the firſt, and thus on to the bottom: obſerving, that as the pile cools, and ſinks to the centre, it muſt be continually fed with ſhort wood, that no part remain unfired; and that if any part chars faſter than the other, the vent holes there are to be ſtopped up. A parcel is thus burnt in five or ſix days: as it cools, the ſmoke grows thinner and bluer. The heap requires two or three days to cool; which is promoted by ſtopping the vents, and ſtripping off the covering by degrees, about a yard at a time: at firſt only taking off the coarſeſt part, and leaving the reſt, that the pile may neither cool too faſt, nor endanger the reduction of the whole into aſhes. Laſtly, the coals are taken out from round the bottom, by which means the whole maſs, coals, and rubbiſh, ſinks down, and extinguiſhes the fire at once.

Charcoal for powder-mills, is uſually made of elder-wood; the proceſs is the ſame; but is finiſhed in two days.

CHARGE, in heraldry, is applied to any figure, or thing, borne or repreſented in an eſcutcheon, or coat of arms; whether it be animal vegetable, or other matter.

Charge, in law, denotes the inſtructions given to the grand jury with reſpect to the articles of their inquiry, by the judge who preſides on the bench.

Charge, in law, alſo ſignifies a thing done that bindeth him who doth it; or that which is his to the performance of it; and diſcharge is the removal of that charge. Lands may be charged in various ways; as, by grant of rent out of it, by ſtatutes, judgments, conditions, warranties, &c.

CHARGED, in heraldry, a ſhield, carrying on it ſome figure or impreſs, is ſaid to be charged therewith.

CHARIOT, a kind of coach that has only one ſeat, which is behind.

The ancients made uſe of chariots in war. Theſe were of different kinds; but the moſt terrible were thoſe armed with pikes and ſcythes; between the ſpokes of the wheels were placed javelins, and the very fellies of the wheels were furniſhed with ſcythes, which tore every thing they met with to pieces. The charioteer was armed all over, and covered with iron.

Chariot, *Triumphal*, was one of the principal ornaments of the Roman celebration of a victory.

CHARITY, one of the three grand theological virtues; conſiſting in the love of God, and our neighbour.

Charity is the habit or diſpoſition of loving God with all our heart, and our neighbour as ourſelves. It has two material objects, therefore, as the ſchool expreſſes it; viz. God, and our neighbour.

Charity is alſo uſed for the effect of a moral virtue, which conſiſts in ſupplying the neceſſaries of others, whether with money, counſel, aſſiſtance, or the like.

Charity *Schools*, are ſchools erected and maintained in various pariſhes, by the voluntary contributions of the inhabitants, for teaching poor children to read, write, and other neceſſary parts of education.

Charity Schools have ſpread throughout moſt of the conſiderable towns of England and Wales. Several of thoſe of London, and its ſuburbs, meet annually in St. Paul's Cathedral; where, arranged in the dome, they make a moſt beautiful appearance. It was with this charming ſpectacle that the King and Queen expreſſed perſonally their higheſt ſatisfaction on the 23d of April laſt, a day conſidered as one of the moſt auſpicious in the annals of this country.

CHARLOCK, in huſbandry, a very troubleſome weed among corn, being more frequent than almoſt any other. There are two principal kinds of it; the one with a yellow flower, the other with a white.

When barley, as is often the caſe, is infeſted with this weed to ſuch a degree as to endanger the crop, it is a very good method to mow down the charlock in May, when it is in flower, cutting it ſo low as juſt to take off the tops of the leaves of the barley with it: by this means the barley will get above the weed.

CHARR, in ichthyology, a name given to a fiſh of the truttaceous kind, of which there are two ſpecies, diſtinguiſhed by the red charr, and the gilt charr; the former of which is called by ſome of the ichthyographiſts *umbla minor*, and by Linnæus *ſalmo alpinus*; and the latter, the *caprio lacus benaci.*

CHART, or Sea Chart, an hydrographical map, or a projection of ſome part of the earth's ſuperficies *in plano*, for the uſe of navigators.

Charts differ very conſiderably from geographical or land maps, which are of no uſe in navigation. Nor are ſea-charts all of the ſame kind, ſome being what we call plane charts, others mercator charts, and others globular charts.

Plane Chart, is a repreſentation of ſome part of the ſuperficies of the terraqueous globe, in which the meridians are ſuppoſed parallel to each other, the parallels of latitude at equal diſtances, and conſequently the degrees of latitude and longitude every where equal to each other.

Mercator's Chart, is that where the meridians are ſtraight lines, parallel to each other: but the diſtance between them increaſes from the equinoctial towards either pole, in the ratio of the ſecant of the latitude to the radius. See Navigation, Sect. iv.

Globular Chart, a meridional projection, wherein the diſtance of the eye from the plane of the meridian, upon which the projection is made, is ſuppoſed to be equal to the ſine of the angle 45°. This projection comes the neareſt of all to the nature of the globe, becauſe the meridians therein are placed at equal diſtances; the parallels alſo are nearly equidiſtant, and conſequently the ſeveral parts of the earth have their proper proportion of magnitude, diſtance, and ſituation, nearly as on the globe itſelf.

CHARTA primarily ſignifies a ſort of paper made of the plant *papyrus*, or *biblus*.

CHARTER, in law, a written inſtrument, or evidence of things acted between one perſon and another. The word comes from the Latin *carta*, anciently uſed for a public and authentic act, a donation, contract, or the like; from the

Greek χαρτης, " thick paper" or " paſteboard," whereon public acts were wont to be written. Britton divides charters into thoſe of the king, and thoſe of private perſons. 1. Charters of the king, are thoſe whereby the king paſſeth any grant to any perſon or body politic, as a *charter of exemption* of privilege, &c. *charter of pardon*, whereby a man is forgiven a felony, or other offence committed againſt the king's crown and dignity; *charter of the foreſt*, wherein the laws of the foreſt are compriſed, ſuch as the charter of Canutus, &c. 2. Charters of private perſons, are deeds and inſtruments for the conveyance of lands, &c. And the purchaſer of lands ſhall have all the charters, deeds, and evidences, as incident to the ſame, and for the maintenance of his title.

CHARTERPARTY, in commerce, denotes the inſtrument of freightage, or articles of agreement for the hire of a veſſel.

The charterparty is to be in writing; and is to be ſigned both by the proprietor, or the maſter of the ſhip, and the merchant who freights it.

The charterparty is to contain the name and the burden of the veſſel; thoſe of the maſter and the freighter; the price, or rate of freight; the time of loading, and unloading; and the other conditions agreed on.

It is properly a deed, or policy, whereby the maſter, or proprietor of the veſſel, engages to furniſh immediately a tight ſound veſſel, well equipped, caulked and ſtopped, provided with anchors, ſails, cordage, and all other furniture to make the voyage required, as equipage, hands, victuals, and other munitions; in conſideration of a certain ſum to be paid by the merchant for the freight. Laſtly, the ſhip, with all its furniture, and the cargo, are reſpectively ſubjected to the conditions of the charterparty.

The charterparty differs from a bill of lading, in that the firſt is for the entire freight, or lading, and that both for going and returning; whereas the latter is only for a part of the freight, or at moſt only for the voyage one way.

The common law conſtrues charterparties, as near as may be, according to the intention of them, and not according to the literal ſenſe of traders, or thoſe that merchandiſe by ſea; but they muſt be regularly pleaded.

CHARTOPHYLAX, the name of an officer of the church of Conſtantinople, who attends at the door of the rails when the ſacrament is adminiſtered, and gives notice to the prieſts to come to the holy table. He repreſents the patriarch upon the bench, tries all eccleſiaſtical cauſes, keeps all the marriage regiſters, aſſiſts at the conſecration of biſhops, and preſents the biſhop elect at the ſolemnity, and likewiſe all other ſubordinate clergy. This office reſembles in ſome ſhape that of the *bibliothecarius* at Rome.

CHARTREUSE, a celebrated monaſtery of Carthuſians; ſo called from the name of a ſteep rocky place, in a frightful deſart, five leagues from Grenoble in France; where S. Bruno retired from the world, and firſt inſtituted the order of Carthuſians.

The name has ſince paſſed to all houſes of Carthuſians; and that near Grenoble, is now diſtinguiſhed by the name of the *great Chartreuſe*.

That of London, corruptly called *Charter-houſe*, is now converted into a college, called alſo from its founder *Sutton's Hoſpital*; firſt endowed with 4000l. per annum, ſince improved to 6000l.

It is to conſiſt of decayed gentlemen, ſoldiers, and merchants; eighty of whom have a plentiful maintenance of diet, lodging, cloaths, phyſic, &c. living together in a collegiate manner: and of ſcholars, or youths, forty-four of whom are taught, and ſupplied with neceſſaries; and ſuch of them as are fit for the univerſity ſent thither, with an exhibition of 20*l. per ann.* for eight years; the reſt are put to trades.

For the ſuperintendency of this hoſpital there are ſixteen governors, generally of the prime quality; vacancies being ſupplied by the election of the remaining governors. The ordinary officers are, a maſter, preacher, regiſter, treaſurer, ſchoolmaſter, &c.

CHARYBDIS, in geography, originally the name of a rock in the ſtreights of Meſſina, between Italy and Sicily; much celebrated in the writings of the ancient poets.

Charybdis is alſo a word uſed by Dr. Plot to expreſs certain openings which he ſuppoſes in the bottom of the ſea, by which its waters are received and conveyed by a ſubterranean circulation to the origin of fountains and ſprings. The *fluxus moſchonichus*, or *maalſtrome* on the coaſt of Norway, is ſuppoſed to be owing to ſome ſuch ſubterranean indraught; and it is advanced alſo, that the Mediterranean ſea could not be emptied of the vaſt quantities of waters which it receives, but muſt overflow the land of Egypt, unleſs ſwallowed by ſome ſuch *charbydis*, which is either in ſome part of the baſon of that ſea, or near the mouth of it; in which caſe, it may be the occaſion of that ſtrong under current, deſcribed by all thoſe who have treated of this ſea. An immenſe *charybdis*, placed near the ſtreight's mouth, may be hid under the immenſity of waters there; but as it would abſorb the deep waters continually, and in large quantities, it would neceſſarily cauſe ſuch an under-current there.

CHASE, or Chace, in law, is uſed for driving of cattle to or from any place; as to a diſtreſs, a fortlet, &c.

Chace, or Chaee, is alſo a place of retreat for deer and wild beaſts; of a middle kind, between a foreſt and a park; being uſually leſs than a foreſt, and not poſſeſſed of ſo many privileges.

Wild Gooſe Chase, a term frequently applied to the viſſionary purſuits of capricious people. Thus we ſay of a man who has an abſurd project in his head, " he is running a wild gooſe chace."

Chase, in ſea language, ſignifies a veſſel purſued by another, apprehended or known to be an enemy. Hence to chaſe is to purſue a ſhip; which is alſo giving chaſe.

CHASING, a method of working, or enriching gold, ſilver, &c. properly called enchaſing.

CHASTITY, purity of the body, or freedom of obſcenity. The Roman law juſtifies homicide in defence of the chaſtity, either of one's ſelf or relations; and ſo alſo, according to Selden, ſtood the law in the Jewiſh republic. Our law likewiſe juſtifies a woman for killing a man who attempts to raviſh her. So the huſband or father may juſtify killing a man who attempts a rape upon his wife or daughter; but not if he takes them in adultery by conſent: for the one is forcible and felonious, but not the other. And without doubt the forcibly attempting a crime of a ſtill more deteſtable nature, may be equally reſiſted by the death of the unnatural aggreſſor. For the one uniform principle that runs through our own and all other laws ſeems to be this, that where a crime in itſelf capital is endeavoured to be committed by force, it is lawful to repel that force by the death of the party attempting.

CHATELET, the name of certain courts of juſtice eſtabliſhed in ſeveral cities in France. The grand chatelet at Paris, is the place where the preſidial or ordinary court of juſtice of the provoſt of Paris is kept; conſiſting of a preſidial, a civil chamber, a criminal chamber, and a chamber of policy. The little chatelet is an old fort, now ſerving as a priſon.

CHATTELS, all ſorts of goods, moveable or immoveable, except ſuch as are in nature of freehold, or parcel thereof.

Chattels *Perſonal*, are ſuch as do either belong immediately to the perſon of a man, as his horſe, ſword, &c. or ſuch things as being injuriouſly with-held from him, a man has no way to recover but by perſonal action: or, ſtrictly ſpeaking, they are things moveable, which the owner may carry with him from one place to another; ſuch as animals, houſhold furniture, money, jewels, corn, garments, and every thing that is capable of being removed.

Chattels *Perſonal*, are, immediately upon the death of a teſtator, in the actual poſſeſſion of the executors; other chattels real are not in his poſſeſſion till he hath made an entry, or recovered them. An owner of chattels is ſaid to be poſſeſſed of them; but a perſon is ſaid to be ſeiſed of a freehold.

Chattels *Real*, are either ſuch as do not appertain immediately to the perſon, but to ſome other thing, by way of dependence; as charters of land, apples upon a tree, &c. or ſuch as neceſſarily iſſue out of ſome immoveable thing to a perſon, as a leaſe, or rent for years. They are called chattels, becauſe their duration is limited to a certain time; and real, becauſe they are intereſts annexed to, and iſſuing out of real eſtates.

CHAYQUARONA, in ichthyology, a name given by the Portugueſe to a fiſh of the turdus kind, caught on the Braſilian ſhores, and more frequently called by authors by its Braſilian name, *Piraumbu*.

CHEATS, in law, are deceitful practices in defrauding, or endeavouring to defraud another of his known right, by ſome artful and diſhoneſt device; as by playing with falſe dice, by fraudulently obtaining the execution of deeds and truſts, by ſuppreſſing wills, by raiſing money under falſe pretences, &c. It is a diſagreeable truth, that the mal practices of impoſtors increaſe, in defiance of the laws, and the vigilance of magiſtrates. Sharpers of different deſcriptions infeſt the metropolis particularly, and exerciſe every poſſible impoſition on the unwary. To the diſhonour of human nature, even perſons of ſuppoſed reſpectability have been detected in the uſe of loaded dice: a recent inſtance ſtands on record in one of our faſhionable places of public amuſement. Any deceitful practice, whether in trade or otherwiſe, is puniſhable with fine, impriſonment, and pillory. And by the ſtatutes 33 Hen. VIII. cap. 1. and 30 Geo. II. cap. 24. if any man defraud another of any valuable chattels by any falſe token, counterfeit letter, or falſe pretences, or pawns or diſpoſes of another's goods without the conſent of the owner, he ſhall ſuffer ſuch puniſhment by impriſonment, fine, pillory, tranſportation, whipping, or other corporal pains, as the court ſhall direct. And by 9 Anne, cap. 14. if any perſon cheats at play, and at one time wins more than 10l. or any valuable thing, he may be indicted thereupon, and ſhall forfeit five times the value, ſhall be deemed infamous, and ſuffer ſuch corporal puniſhment as in caſe of wilful perjury. Black. Com. vol. iv. p. 158, and 173.

CHECK, or Check *Roll*, a roll or book, wherein are contained the names of ſuch perſons as are attendants and in the pay of the king, or other great perſonages, as their houſehold ſervants.

CHECKY, in heraldry, is where the ſhield, or a part thereof, as a bordure, &c. is chequered or divided into chequers, or ſquares.

CHEEK, in anatomy, that part of the face ſituated below the eyes on either ſide.

CHEEKS, a general name among mechanics, for almoſt all thoſe pieces of their machines and inſtruments, that are double, and perfectly alike.

CHEESE, a kind of food; being a preparation of milk curdled by means of rennet, and afterwards dried, and hardened.

CHEESE is nothing but milk purged of its ſerum, or whey; and ſometimes too of the cream, or butyrous part of the milk.

Cheeſe, when new, is found to load the ſtomach, by reaſon of its moiſture and viſcidity; and too old, it heats and inflames it by its ſalts. For the various methods of making cheeſe, ſee DAIRY. It is certain, however, the more it abounds with ſalts, the more will it contribute to digeſtion, and the clearing the ſtomach of other food. Some condemn all uſe of cheeſe; ſheltering themſelves under that ancient maxim, *Caſeus eſt nequam, quia concoquit omnia ſe equam.* Phyſicians adviſe it to be eat in ſmall quantities. The Laplanders make a ſort of cheeſe of the milk of their rein-deer, which is not only of great ſervice to them as food, but on many other occaſions. Scheffer's Hiſt. of Lapl.

CHEKAO, in natural hiſtory, the name of an earth found in many parts of the Eaſt Indies, and ſometimes uſed by the Chineſe in their porcelain manufactures.

CHELIDONIUS, in inſectology, the name of a fly called the ſwallow fly, by reaſon of its ſwift flight. It often ſits a long time together on the leaves of plants; but is very quick-ſighted, and when any perſon comes near it, it is gone in a moment, and uſually takes ſuch long flights, that it is not eaſily caught afterwards.

CHELON, in ichthyology, the name of a fiſh of the mullet kind, and much reſembling the common mullet in its general ſhape, but its eyes are more prominent, and its head ſmaller.

CHELYDRUS, in amphibiology, a ſpecies of ſerpents, the ſame with the Cherſydrus.

CHEMISE, in fortification, a wall wherewith a baſtion, or ditch, is lined, for its greater ſupport and ſtrength.

CHEMISE, *Fire,* is a piece of linen cloth, ſteeped in a compoſition of oil of petrol, camphor, and other combuſtible matters; uſed at ſea, to ſet fire to an enemy's veſſel.

CHEMISTRY, more properly CHYMISTRY.

We ſhall minutely treat of that uſeful and entertaining Science under CHYMISTRY, *and not under* CHEMISTRY, *becauſe, the true orthography is with a* Y, *and not an* E. *The Greek word* χυμος, *and the Latin word* Alchymia, *are both with a* Y; *and why ſhould the Engliſh introduce an* E, *when they directly borrow the word* Chymiſtry *from theſe languages. The Greek character* upſilon *is moſt certainly* Y *and not* E. *When we come to ſpeak of* Chymiſtry, *we ſhall lay before our numerous readers, ſuch a Syſtem of it as has not hitherto appeared.*

CHEQ, or CHERIF, the prince, or high prieſt of Mecca; ſovereign pontiff of the Muſſulmans; and owned as ſuch by all the ſects into which they are divided.

The grand ſignior, ſophies, moguls, khans of Tartary, &c. ſend him yearly preſents; eſpecially tapeſtry, to cover Mahomet's tomb, and tents for himſelf: for the cheq has a tent near the moſque of Mecca, wherein he lives during the ſeventeen days of devotion in pilgrimage to Mecca. The tapeſtry and tent are changed each year, and pieces thereof are ſent to the princes who furniſh new ones.

His revenue is very conſiderable, conſiſting of preſents made by the Mahometan princes, and pilgrims, to the moſque of Mecca and Medina.

The cheq ſubſiſts all the pilgrims during the ſeventeen days of devotion; on which account he is every year furniſhed with a very conſiderable ſum of money from the grand ſignior: the better to obtain this, he makes him believe, that there are conſtantly, during this time, ſeventy thouſand pilgrims; and that, ſhould the number fall ſhort, the angels, in form of men, would make it up.

CHERLERIA, in botany, a name given by Haller and Linnæus to a genus of plants of the decandria trigynia claſs.

CHERMES, in entomology, a genus of four winged inſects, the characters of which are theſe: its noſtrum, or trunk, is ſituated under its breaſt; the abdomen is mucronated, or pointed, at the hinder extremity; and the legs are formed for leaping.

Theſe inſects, which in Engliſh are called bugs, take particular denominations from the trees or plants on which they feed: as the elm-bug, fir-bug, the birch-bug, the maple-bug, the willow-bug, the nettle-bug, &c.

CHERRY *Tree,* a ſpecies of the prunus.

This tree is called ceraſus, according to Servius, from the name of a city in Pontus, which Lucullus deſtroyed; and the fruit of it was brought by him to Rome, in the year of the city 680, and into Britain about a hundred and twenty years afterwards, or A. D. 55. Soon after it was ſpread through moſt parts of Europe. The ſpecies of the cherry-tree enumerated by Miller are five, viz. 1. The common or Kentiſh cherry, from which many modern botaniſts ſuppoſe that moſt of the varieties cultivated in the Engliſh gardens are derived; ſuch as the early May cherry, the May-duke cherry, the arch-duke cherry, the Flemiſh cherry, the red heart, the white heart, the black heart, the amber heart, the ox heart, the luke-ward, the carnation, the Hertfordſhire heart, the morello, the bleeding-heart, and the yellow Spaniſh cherry, beſides two ſorts with double flowers, which are propagated for ornament. 2. The cherry tree with ſpear ſhaped ſawed leaves, or the greater wild cherry tree with a ſweetiſh fruit, whoſe juice yields a black colour. This is a black cherry, ſuppoſed to be a native of England. This tree grows to a large ſize, produces beautiful flowers, affords good food for birds, and the wood of it is uſeful for turners. The French plant them for avenues to their houſes, where other treees will not thrive, and cultivate them for the manufacture of hoops. The varieties raiſed by ſeeds from this tree are the black coroun, which is a good bearer, and yields excellent fruit, and the ſmall wild cherry. 3. The cherry tree with oval ſpear-ſhaped leaves, and flowers growing in cluſters, commonly called the cluſter cherry. 4. The cherry tree with flowers growing in round bunches, and oval-leaves, called the Mahaleb, or perfumed cherry. The wood of this ſort is eſteemed by the French for cabinet making, on account of its agreeable odour. 5. The cherry tree with ſmooth, ſpear-ſhaped entire leaves, of a bluiſh green on their under ſide, and ſpreading branches, called the dwarf Canady cherry.

The ſeveral ſorts of cherry-trees are propagated by binding or grafting the ſeveral kinds into ſtocks of the black or wild red cherries, which are ſtrong ſhooters, and of a longer duration than any of the garden kinds. The ſtones of theſe two kinds are ſown in a bed of light ſandy earth in autumn, and the young ſtocks produced from them are to remain where they riſe till the ſecond autumn after their ſowing, when in October they ſhould be planted out into a rich earth, at three feet diſtance from row to row, and at about ten inches diſtance in the rows. The ſecond year after the planting out, they will be fit to bud, if they are intended for dwarfs; but if they are intended for ſtandards, they will not be tall enough till the fourth year; for they ſhould be budded or grafted near ſix feet from the ground. The grafting is uſually performed in ſummer, and the head of the ſtock is to be cut off in the beginning of the March following, about ſix inches above the bud; and if the bud has ſhot well, and there is any fear of its being diſplaced by winds, it muſt be gently tied up to the part of the ſtock left above it. The autumn afterwards, theſe trees will be fit to remove, and be ſet where they are to remain; or they may be left two years. Many, when they plant theſe trees in their places, lop off a great part of their heads, but this is an injury that often kills them; and when they eſcape, they ſeldom get well over it for four or five years. If the trees are intended for walls, it is adviſeable to plant dwarfs between the ſtandards, that theſe may cover the lower part of the wall, while the others ſpread over the upperpart; and when the dwarfs riſe to fill the whole walls, the ſtandards ſhould be taken entirely away. When theſe trees are taken up from the nurſery, the dead fibres of the roots muſt be carefully taken off, and the upper part of the ſtock which is above the bud, muſt be cut off cloſe down to the back part of it; the bud muſt be placed directly from the wall.

Cherry trees thrive beſt in a dry hazley loam, and in a gravelly ſoil are very ſubject to blights, and ſeldom ſtand long good. They ſhould be placed at fourteen feet aſunder, with a ſtandard tree between each two. In pruning theſe trees, their ſhoots ſhould never be ſhortened, for they moſtly produce their fruit from their extreme part. All the fore-right ſhoots are to be diſplaced, and the others trained horizontally; and where there is a vacancy in the wall, the branches being ſhortened, will throw up a ſhoot or two to fill it.

CHERRY *Brandy,* and CHERRY *Wine,* a drink made of brandy, with the addition of cherries. For the method of making it, ſee the Syſtem of CONFECTIONARY.

CHERUB, or CHERUBIM, a celeſtial ſpirit, which, in the hierarchy, is placed next in order to the ſeraphim. The word is formed of the Hebrew כרוב, *cherub*; the plural whereof is *cherubim.*

The figure of the cherubim was not always uniform, ſince they are differently deſcribed in the ſhapes of men, eagles, oxen, lions, and in a compoſition of all theſe figures put together. Moſes likewiſe calls theſe ſymbolical or hyeroglyphical repreſentations, which were repreſented in embroideries upon the veils of the tabernacle, cherubim of coſtly work. Such were the ſymbolical figures which the Egyptians placed at the gates of their temples, and the images of the generality of their gods, which were commonly nothing but ſtatues compoſed of men and animals.

CHERUBIM was alſo the name of an ancient military order in Sweden, otherwiſe called the order of Seraphim. It was inſtituted by Magnus IV. in 1334, and aboliſhed by Charles IX. It took its denomination from the golden figures of cherubim, whereof the collar of the order was compoſed.

CHERVILL, *Chærophyllum,* in botany, a genus of the pentandria digynia claſs. It is a plant with umbellated flowers; the flowers have five heart-ſhaped inflexed petals, and five ſtamina. There are five ſpecies.

The firſt ſort grows naturally on the ſides of highways, and the borders of the fields in moſt parts of England. It is frequently called cow-parſley. It is a weed which ſhould be rooted out of all paſtures early in the ſpring, for it is one of the moſt early plants in ſhooting, and by the beginning of April the leaves are near two feet high.

Another ſort is the common garden chervil, and flowers in May and June. Its leaves and ſeeds are uſed in medicine; the ſeed contains the principal virtue of the plant, and is eſteemed a great medicine in jaundices and dropſies. It is a powerful diuretic, and recommended in the gravel and ſtone.

CHESS, a moſt ancient and univerſal game; and which, to be played well, requires much judgment and attention: the common opinion is, that it was invented by Palamedes at the ſiege of Troy. Others attribute the invention to Diomedes, who lived in the time of Alexander; the romance of the Roſe aſcribes it to one Attalus; but the truth is, the game is ſo very ancient, there is no tracing its author.

It is performed with different pieces of wood, on a board divided into 64 ſquares; in which chance has ſo ſmall a ſhare, that it may be doubted whether a perſon can loſe but by his own fault.

In China it makes a conſiderable part of the education of their females, and ſeems to take the place of dancing among us. In Spain, whole cities challenge each other at cheſs; and it has been much in uſe in moſt parts of Europe.

John of Saliſbury relates, that in a battle between the French and Engliſh in 1117, an Engliſh knight ſeized the bridle of Louis le Groſs, and crying to his comrades *the king is taken*, that prince ſtruck him to the ground with his ſword, ſaying, *Ne ſcais tu pas qu' aux echecs on ne prend pas le roy? Doſt thou not know, that at* cheſs *the king is never taken?* The reaſon is, that when the king is reduced to ſuch a paſs, that there is no way for him to eſcape, the game ends, without expoſing the royal piece to farther affront.

Cardinal Cajetan, and other caſuiſts, rank cheſs in the number of prohibited games, as requiring too much application; and Montagne blames it as too ſerious for a game. It is performed by two little armies drawn up in order of battle.

Each player has eight dignified pieces, viz. a king, a queen, two biſhops, two knights, and two rooks, and alſo eight pawns, which were anciently called *ſcachi*, q. d. *milites*, and made in different figures, and of various materials, moſtly of wood or ivory. Theſe pieces are diſtinguiſhed by being painted in white and black colours.

As to their diſpoſition on the board, the white king is to be placed on the fourth black houſe from the corner of the board, in the firſt and lower rank; and the black king is to be placed on the fourth white houſe on the oppoſite, or adverſary's ſide of the board. The queens are placed next to the kings, on houſes of their own colour. Next to the king and queen, on each hand, place the two biſhops; next to them, the two knights; and laſt of all, on the corners of the board, the two rooks. As to the pawns, they are placed, without diſtinction, on the ſecond rank of the houſe, one before each of the dignified pieces.

Having thus diſpoſed the men, the onſet is commonly begun by the pawns, which march ſtraight forward in their own file, one houſe at a time, except the firſt move, when they may advance two houſes, but they never move backwards: the manner of their taking the adverſary's men is ſideways, in the next houſe forward; where, having captivated the enemy, they move forward as before. The rook goes forward or croſs-ways through the whole file, and back again. The knight ſkips backward and forward to the next houſe, ſave one, of a different colour, with a ſidling march, or aſlope, and thus kills his enemies that fall in his way, or guards his friends that may be expoſed on that ſide. The biſhop walks always in the ſame colour of the field which he is placed in at firſt, forward or backward, aſlope or diagonally, as far as he pleaſes. The queen's walk is more univerſal, as ſhe takes all the ſteps of the fore-mentioned pieces excepting that of the knight; and as to the king's motion, it is one houſe at a time, and that in any direction. As to the value of the different pieces, next to the king is the queen, after her the rooks, then the biſhops, and laſt of all the knights. The difference of the worth of pawns is not ſo great as that of noblemen; however, the king's biſhop's pawn is the beſt, and therefore particular care is taken of them. It ought alſo to be obſerved, that, whereas any man may be taken, when he falls within the reach of any of the adverſary's pieces, it is otherwiſe with the king, who, in ſuch a caſe, is only to be ſaluted with the word *check* (*ſbak*), warning him of his danger, out of which he muſt move; and if he cannot move without expoſing himſelf to a ſimilar inconvenience, it is check-mate, and the game is loſt.

At this game the late king of Spain is ſaid to have been an expert player: and it is further ſaid of his majeſty, that during the memorable ſiege of Gibraltar (ſuch was the fervor of his wiſhes for conqueſt) his ſucceſſes at cheſs he enthuſiaſtically conſidered as omens of approaching victory at that important poſt of honour. But the hot balls of the gallant Elliott were heralds of the impregnability of the place, and of the unceaſing ardor of his garriſon.

CHEST, in commerce, a kind of meaſure, containing an uncertain quantity of ſeveral commodities.

CHESTNUT, *Caſtanea*, from Caſtana, a city in Theſſaly, where this tree anciently grew in great plenty, in botany, is ranged by Linnæus in the claſs of monœcia polyandria, and joined to the genus of fagus or beech.

The cheſnut tree is, a tree which deſerves our care as much as any of the trees which are propagated in this country, either for its uſe or beauty; being one of the beſt ſorts of timber, and affording a good ſhade. It will grow to a great ſize, and ſpread its branches finely on every ſide where it has room. The leaves are large, of a lucid green, nor are they ſo liable to be eaten by inſects are thoſe of the oak. There is no better food for deer, and many other animals, than their nuts; which moſt of them prefer to acorns: yet they ſhould not be planted near habitations; becauſe when they are in flower they emit a diſagreeable odour, very offenſive to moſt people.

Cheſnut trees may be cultivated in England, to afford equal profit with any of the large timber trees; the wood being of equal value with the beſt oak, and for many purpoſes far exceeding it. It is particularly good for veſſels of all kinds of liquor; having a property, when once thoroughly ſeaſoned, of maintaining its bulk conſtantly, without ſhrinking, or ſwelling, as other timber is too apt to do; and it is ſaid that all the large caſks for their wines in Italy, are made of this timber: it is for this and many more purpoſes, in greater eſteem among the Italians than any other timber whatever. It is alſo very valuable for pipes to convey water under ground, as enduring longer than elm, or any other wood.

Theſe trees are propagated by planting the nuts in February, in beds of freſh undunged earth. The beſt nuts for ſowing, are ſuch as are brought from Portugal or Spain, which are commonly ſold in winter for eating; provided they are not kiln dried, which is frequently done to foreign nuts to prevent their ſprouting in the paſſage. The time generally allowed them in the nurſery is three or four years; but the younger they are tranſplanted, the better they will ſucceed.

See an ingenious and an effectual method of preſerving cheſnuts, diſcovered by Mr. Ellis. Phil. Tranſ. vol. li. part i. p. 213. 1759.

Horſe CHESNUT, hippocaſtanum, æſculus, in botany, was brought from the northern parts of Aſia about the year 1550, and ſent to Vienna about the year 1588.

As this tree is quick in its growth, ſo in a few years it will arrive to a ſize large enough to afford a good ſhade in ſummer; as alſo to produce plenty of flowers. Trees raiſed from nuts, have in twelve or fourteen years become large enough to ſhade two or three chairs under the ſpread of their branches; and have been covered with flowers in the ſeaſon. But the wood is of little value.

The horſe cheſnut is employed for the purpoſe of bleaching yarn, in France and Switzerland; and it is recommended in the Memoirs of the Society of Berne, vol. ii. part 2. as capable of extenſive uſe in whitening not only flax and hemp, but alſo ſilk and wool.

Scarlet flowering Horſe, CHESNUT, *Pavia*, in botany, a plant growing naturally in Carolina and the Braſils; from the firſt, the ſeeds were brought to England, where the plants have been of late years much cultivated in the gardens.

CHEVAL, *de friſe*, in fortification, a large piece of timber, either round or cut into ſeveral faces, pierced, and traverſed with wooden ſpikes, armed or pointed with iron, five or ſix feet long.

The term is French, and properly ſignifies a *Frieſland horſe*; as having been firſt invented in that country. It is alſo called a turnpike, or tourniquet.

Its uſe is, to defend a paſſage, ſtop a breach, or make a retrenchment to ſtop the cavalry.

It is ſometimes alſo mounted on wheels, with artificial fires, to roll down in an aſſault.

CHEVALIER, a French term, ordinarily ſignifying a *knight*.

The word is formed of the French, *cheval*, *horſe*; and that of the Latin, *cavallus*.

It is uſed, in heraldry, to ſignify any cavalier, or horſeman, armed at all points.

CHEVRETTE, in artillery, an engine to raiſe guns or mortars into their carriages.

CHEVRON, or CHEVORON, in heraldry. See the SYSTEM.

CHIAOUS, an officer in the grand ſignior's court, doing the buſineſs of an uſher.

The word, in the original Turkiſh, ſignifies envoy.

He bears arms offenſive and defenſive, and has the care of priſoners of diſtinction. His badge is a ſtaff covered with ſilver; and he is armed with a ſcymitar, bow, and arrows.

The emperor uſually chooſes one of his rank to ſend as ambaſſador to other princes.

The chiaous are under the direction of the chiaous-baſchi, an officer who aſſiſts at the divan, and introduces thoſe who have buſineſs there.

CHICANE, or CHICANERY, in law, an abuſe of judiciary proceeding, tending to delay the cauſe, and deceive or impoſe on the judge, or the parties.

Some derive the word from *eiccum*, *the ſkin of a pomegranate*; whence the Spaniards formed their *chico*, *little*, *ſlender*; chicane being converſant about trifles.

The French call ſolicitors, attorneys, &c. *gens de chicane*.

CHICANE is alſo applied to vain ſophiſms, diſtinctions, and ſubtilties, which immortaliſe diſputes, and obſcure the truth: as, the chicane of courts does juſtice.

CHICKEN, in ornithology, the young of the gallinaceous order of birds, and eſpecially of the common hen. Chickens require no meat for two days after they are hatched: and they are firſt fed with ſmall oat-meal, dry or ſteeped in milk, and the crumbs of white bread: and as they acquire ſtrength, with curds, cheeſe-parings, &c. Green chives chopped with their food will preſerve them from the rye, and other diſeaſes of the head: and care ſhould be taken to furniſh them with a proper ſupply of clean water. In order to have fat crammed chickens, they ſhould be cooped up when the hen forſakes them, and fed with wheat meal mixed with milk, and made into a paſte: this diet will fatten them in about a fortnight.

CHICKWEED, *Alſine*, in botany, the name of a very large genus of plants; for a further account of which ſee ALSINE.

CHIEF, a term denoting head, or a principal thing or perſon. The word is formed of the French *chef*, head.

We ſay the chief of a party; the chief of a family, &c. Agamemnon was the chief of the Greeks who beſieged Troy. The Romans ſometimes refuſed triumphs to their victorious general, becauſe the conduct of the chief was not anſwerable to his ſucceſs.

CHIEF, in heraldry. See the Syſtem.

CHIEF *Juſtice*, in law. See JUSTICE.

CHIEF *Juſticiary of England*. See JUSTICIARY.

CHIEF *Lord*, denotes the feudal lord, or lord of an honour, on whom others depend.

CHILBLAIN, *Pernio*, in medicine, a tumor afflicting the feet and hands; accompanied with an inflammation, pain, and ſometimes an ulcer, or ſolution of continuity; in which caſe it takes the denomination of chaps on the hands; and kibes on the heels.

CHILBLAIN is compounded of chill and blain; q. d. a blain, or ſore, contracted by cold.

Chilblains are occaſioned by exceſſive cold ſtopping the motion of the blood in the capillary arteries and ſuperficial veins.

The tumor from white generally inclines to blueneſs. For the prevention of chilblains, the ſkin ſhould be rendered firmer by frequent waſhing and bathing in cold water; the vicious quality of the temperaments or humours which contributes to this diſorder, ſhould be corrected by the milder preparations of antimony, and moderate purges. For the cure of chilblains, it is uſual to waſh them with warm brine, urine, &c. but petrolium, or warm hungary water, with ſpirit of wine camphorated, uſed with a ſponge, are much better. For chaps and kibes, nothing exceeds the *unguentum deſiccativum rubrum*, or *diapompholyx*, mixed with a little camphor; and uſed, for the dreſſings, with *emplaſtrum de minio*, or *diachylon ſimplex*, let down with oil of roſes.

When theſe tumours tend to ſuppuration, it is proper to treat them like other recent abſceſſes: the beſt method is firſt to cleanſe the wound with ſome digeſtive ointment, then to dreſs it with balſam of Peru, or other ſimilar application; and, laſtly, to apply ſome of the lead or litharge plaſters. Oil of myrrh per deliquium is alſo found of great ſervice in theſe caſes; as is alſo the applying a compreſs, dipped in a mixture of equal parts of lime water, and camphorated ſpirit of wine over the other remedies.

In people who have been uſed to be afflicted with chilblains at the return of a certain ſeaſon, it will be found a great preſervative againſt thoſe troubleſome tumors, to anoint the parts where they are expected to appear both before and during the acceſs of the ſevere cold, with oil of turpentine or petrolium; and, when the diſorder firſt begins to ſhew itſelf, it is a very good method to wrap round the affected part a piece of a hog's bladder, well wetted with one or other of thoſe oils; and care muſt be taken to keep off the cold.

CHILD, a term of relation to parent.

We ſay, natural child, legitimate child, putative child, baſtard child, adoptive child, Poſthumous child, &c.

Bartholine, Paré, Licetus, and many other writers, give an account of a petrified child, which has ſeemed wholly incredible to ſome people. The child, however, which they deſcribe, is ſtill in being, and is kept as a great rarity in the king of Denmark's muſeum at Copenhagen. The woman who went big with this, lived at Sens in Champaign, in the year 1582; it was cut out of her belly, and was univerſally ſuppoſed to have lain there about twenty years. That it is a real human fœtus, and not artificial, is evident to the eye of any obſerver: and the upper part of it when examined, is found to be of a ſubſtance reſembling the gypſum or ſtone of which they make the plaſter of Paris: the lower part is much harder: the thighs and buttocks being perfect ſtone, of a reddiſh colour, and as hard as common quarry ſtone: the grain and ſurface of this part appear exactly like that of the calculi, or ſtones taken out of human bladders; and the whole ſubſtance examined ever ſo nearly, and felt ever ſo carefully, appears to be abſolute ſtone. It was carried from Sens to Paris, and there purchaſed by a goldſmith of Venice; and Frederic the third, king of Denmark, purchaſed it at Venice of this man for a very large ſum, and added it to his collection of rarities. Phil. Tranſ. No. 285, p. 1400.

CHILDERMASS *Day*, called alſo *Innocents Day*, an anniverſary feaſt of the church, held on the 28th of December in memory of the children of Bethlehem, maſſacred by order of Herod.

CHILMINAR, CHELMINAR, or TCHELMINAR, the nobleſt and moſt beautiful piece of architecture remaining of all antiquity: being the ruins of the famous palace of Perſepolis, to which Alexander the Great, being drunk, ſet fire, at the perſuaſion of the courteſan Thaïs.

Authors and travellers are exceedingly minute in their deſcriptions of the Chilminar; particularly Gracias de Silva Figueroa, Pietro de la Valle, Chardin, and Le Brun. A general idea thereof may be conceived as follows:

There appear the remains of near fourſcore columns; but there are only nineteen that can be called entire: with a twentieth all alone, 150 paces from the reſt.

A rock of black hard marble ſerves for the foundation of the edifice. The aſcent to the firſt plan of the building is by fourſcore and fifteen ſteps, cut in the rock. The gate of the palace is twenty feet wide; on one ſide is the figure of an elephant, and on the other of a rhinoceros; each 30 feet high, and of a ſhining marble; near theſe animals are two columns; and not far off the figure of a Pegaſus.

After this gate is paſſed, there are found a great number of columns of white marble; the remains whereof ſhew the magnificence of the work: the ſmalleſt of theſe columns is fifteen cubits high, the largeſt eighteen; each has forty flutings, three inches broad; whence the height of the whole may be gueſſed at, with the other proportions. Near the gate is an inſcription on a ſquare piece of marble, ſmooth as glaſs, containing about twelve lines: the characters are of a very extraordinary figure, reſembling triangles and pyramids.

Theſe noble ruins are now the ſhelter of beaſts, and birds of prey. Beſides the inſcription above mentioned, there are others in Arabic, Perſian, and Greek. Dr. Hyde obſerves, that the inſcriptions are very rude and unartful; and that ſome, if not all of them, are in praiſe of Alexander the Great; and therefore are later than that conqueror.

M. Le Brun took his voyage to the Eaſt Indies, merely for the ſake of viewing the Chilminar.

CHIMALATH, in botany, a name given by ſome authors to the great corona ſolis, or ſun-flower.

CHIMES *of a Clock*, a kind of periodical muſic, produced at equal intervals of time, by means of a particular apparatus added to a clock, ſuch as a chime barrel, bells and hammers, &c. See Syſtem of ÆROLOGY.

CHIMNEY, in architecture, a part of a houſe, or lodging, wherein the fire is made.

The word chimney comes from the French *cheminée*; and that from the Latin *caminata, a chamber wherein is a chimney: caminata* again, comes from *caminus*; and that from the Greek *καμινος, a chimney*; of *καιω, uro, I burn*.

To prevent ſmoking CHIMNEYS, M. Lucar adviſes two holes, or two pipes, one over the other, to be left in each ſide of the chimney; one ſloping upwards, the other downwards: through one of theſe, he ſays, the ſmoke will paſs in any poſition.

Others place a kind of moveable vane, or weathercock, on the top of the chimney: ſo that what way ſoever the wind comes, the aperture of the chimney will be ſcreened, and the ſmoke have free egreſs: but, in truth, the beſt prevention of a ſmoking chimney ſeems to lie in the proper ſituation of the doors of the room, and convenient gathering of the wings and breaſt of the chimney.

CHIMNEY *Money*, or *Hearth Money*, a tax impoſed by ſtatute 13 and 14 Car. II. c. 10. expreſſing, that every fire-hearth, and ſtove of every dwelling, or other houſe, within England and Wales, except ſuch as pay not to church and poor, ſhall be chargeable with two ſhillings per annum, payable at Michaelmas and Lady-day, to the king and his heirs. But this tax was declared to be an oppreſſion and badge of ſlavery, and accordingly aboliſhed by ſtat. 1 W. and M. c. 10. and the window-tax eſtabliſhed in its room.

CHIMNEY *Piece*, in building, a compoſition of certain mouldings, of wood or ſtone, ſtanding on the fore ſide of the jambs, and coming over the mantle tree.

CHIMPANZEE, in tetrapodology, the name of an Angolan animal, very much approaching to the human figure; but of a fierce diſpoſition, and remarkably miſchievous. In the year 1738, we had one of theſe creatures brought over into England, by the captain of a ſhip in the Guinea trade; it was of the female ſex, and was two feet four inches high: it naturally walked erect, and was hairy on ſome parts of the body and limbs, and of a ſtrong muſcular make. It would eat very coarſe food, and was very fond of tea, which it drank out of a cup with milk and ſugar, as we do; it ſlept in the manner of the human ſpecies, and in its voice made ſome imitation of the human ſpeech, when people ſpeak very haſtily, but without any articulate ſound. The males of this ſpecies are very bold, and will fight a man, though they ſee him armed. It is ſaid that they often ſet upon, and raviſh the negro women, when they meet them in the woods. The creature we ſaw here was but about twenty months old, and very tame; the parent had it in her arms in the country, and did not part with it till ſhe was killed with a ſpear by one of the Moors: ſhe was five feet high. Act. Eruditor. Germ. ann. 1739.

CHINA, *China ware*, a fine ſort of earthen ware. See PORCELAIN.

CHINA *Root*, a medicinal root, brought from the Eaſt Indies; and lately alſo from Peru, and New Spain.

It grows chiefly in fenny places, uſually covered with the ſea; which, upon its withdrawing, leaves great quantities thereof on the ſhore.

It is eſteemed a ſweetener of the blood; and uſed as ſuch in decoction, in venereal and ſcorbutic caſes.

It has indeed been a generally received opinion for a conſiderable time paſt, that China root is of ſervice in the gout, ſciatica, œdematous, tumors, ſtrumæ, imbecillity of the ſtomach, hemicranias, and in ulcers of the reins and bladder.

CHIN *Cough*, a diſeaſe which children are chiefly ſubject to. It conſiſts in a violent and immoderate coughing, to a danger of ſuffocation.

In the chin cough, Dr. Huxham uſes the common evacuations, and propoſes to correct the lentor of the blood, and to ſtrengthen the nerves and ſtomach by mercurials, the cortex, and proper ſtomachics.

Dr. Burton declares againſt bleeding, vomiting, and purging in the chin cough, except in very urgent caſes; the medicine which he ſays has had great ſucceſs, is a ſcruple of fine powder of cantharides, and as much camphor, mixed with three drams of the extract of Jeſuits bark. Of this mixture he gives eight or nine grains to children every third or fourth hour, in a ſpoonful of ſome ſimple water, or ſome julep, in which a little balſam of capivi had been diſſolved. He ſays this method is not proper in ſuch chin coughs as proceed from thin ſharp rheum; but, he believes, that in the chin cough from a tough viſcid phlegm, it will ſcarce ever fail, at leaſt it has not failed yet. Med. Eſſ. Edinb.

As this diſeaſe ariſes from obſtructed perſpiration, and a relaxation of the ſolids, its cure muſt depend on cleanſing and ſtrengthening the ſtomach, bracing the ſolids, and, at the ſame time promoting perſpiration and the different ſecretions. The diet, therefore, ſhould be light, and eaſy of digeſtion: the drink ſhould be hyſſop or penny-royal tea, ſweetened with honey or ſugar-candy; or ſmall wine whey. One of the moſt effectual remedies is change of air. When the diſeaſe is violent, and there is any danger of an inflammation of the lungs, or ſuffocation, repeated bleeding may be proper. Small doſes of ipecacuanha ſhould be adminiſtered in this diſorder. The preparations of rhubarb ſhould alſo be uſed, in order to keep the body open. Oily and balſamic medicines, though often exhibited, ſhould be avoided. Millepedes, bruiſed and infuſed in ſmall white wine, have been much recommended. Two ounces of theſe ſhould be allowed to a pint of wine, and a table ſpoonful taken three or four times a day. Opiates, as a little of the ſyrup of poppies, or five, ſix, or ſeven drops of laudanum, may be occaſionally repeated, to allay the violence of the cough. The feet ſhould be occaſionally bathed in luke-warm water, and a Burgundy pitch plaſter kept between the ſhoulders. If the diſeaſe continues, unattended with a fever, the bark and other bitters are proper medicines. Buchan's Domeſtic Medicine, ed. 5. p. 309, &c.

CHINESE, or CHINESE *Tongue*, the language of the people of China. F. le Comte obſerves, that the Chineſe has no analogy to any other language in the world. It only conſiſts of 330 words, which are all monoſyllables; at leaſt, they are pronounced ſo ſhort, that there is no diſtinguiſhing above one ſyllable, or ſound, in them. Yet they have four accents, which, by an inflexion of voice, multiply almoſt every word into four, and give alſo a harmony and pointed cadence to the moſt ordinary phraſes. Their characters are divided into ſix ſorts: the firſt exhibiting the ſhape or image of ſenſible things; the ſecond indicating the object by ſome viſible addition to the ſhape or ſymbol; the third aſſociating two characters to expreſs an object, which neither will denote ſeparately; the fourth expreſſing the ſound, in order to ſupply the defect of the figure, as *ya* adjoined to the figure of a bird, to repreſent a duck, &c. the fifth being a metaphorical application of their characters, whereby their language acquires a force and vivacity of colouring peculiar to itſelf, but at the ſame time rendering it extremely obſcure; the ſixth extending the primitive ſenſe of a character, ſo that the ſame character may denote a verb or adverb, an adjective or ſubſtantive. From theſe ſources their various characters are derived, and increaſed from 300 to 80,000.

The Chineſe language is one of the moſt ancient; and perhaps the only one that has been ſpoken without interruption; and yet remains as a living language, to which it is apprehended the ſmall number and ſhortneſs of its words have greatly contributed. The Chineſe characters have been repreſented as images for ſenſible things, and ſymbols for mental objects, which are tied to no ſound, and may be read in every tongue; and this ſeems to have been the caſe in the moſt remote antiquity, when their characters, which are now abbreviated and disfigured, might have been more ſimple and natural. See farther on this ſubject, Phil. Tranſ. Vol. LIX. N° 66. p. 489, &c.

CHINSE, in ſea language, is uſed for thruſting oakum into a ſeam or chink, with the point of a knife or chiſſel.

CHIO *Pear*, a name given to a ſmall ſpecies of pear, called alſo by ſome the baſtard muſk pear, from its reſembling the little muſk pear in its ſweet flavour. Its ſkin is yellow ſtreaked with red; it is of a roundiſh ſhape, and does not hang in cluſters, but ſingly on the tree.

CHIOCOCCA, in botany, a genus of the pentandria monogynia claſs, having a funnel-ſhaped flower, and a ſingle-celled berry containing two ſeeds.

CHIPPING, a phraſe uſed by the potters and china-men to expreſs that common accident both of our own ſtone and earthen ware, and the porcelain of China, the flying off of ſmall pieces, or breaking at the edges. Our earthen wares are particularly ſubject to this, and are always ſpoiled by it before any other flaw appears in them. Our ſtone wares eſcape it better than theſe, but leſs than the porcelain of China, which is leſs ſubject to it than any other manufacture in the world.

CHIRITES, in natural hiſtory, a name given by authors to a ſtone reſembling the human hand. The accounts we have of it ſay, that it is of a white colour, and of the nature of gypſum or plaſter-ſtone; and that it repreſents the palm of the hand, with the fingers, and their nails on the other ſide. This ſeems to have been a name given to ſome ſingle ſpecimen in a cabinet of ſome collector; for it is certainly no diſtinct ſpecies of foſſile, but a mere *luſus naturæ*, in the configuration of ſome accidental piece of gipſum.

CHIRONIA, in botany, a name by which ſome have called the black bryony. In the Linnæan ſyſtem it is a genus of the pentandria monogynia claſs.

CHIRURGERY, popularly called ſurgery, the third branch of medicine; conſiſting in operations performed by the hand, for the cure of wounds, and other diſorders.

The principal things that come under the conſideration of chirurgery are, tumors, ulcers, wounds, diſlocations, and fractures.

Chirurgery has the advantage of medicine, in the ſolidity of its foundation, the certainty of its operations, and the ſenſibility of its effect; inſomuch that thoſe who deny medicine to be of any ſignificancy, yet allow the uſefulneſs of chirurgery.

Chirurgery was cultivated with much more earneſtneſs by Hippocrates, than by any of the preceding phyſicians: it is ſaid to have been perfected in Egypt by Phyloxenus, who wrote ſeveral volumes on that ſubject. Among the Greeks, Gorgias, Soſtrates, Heron, the two Appollonii, Ammonius of Alexandria; and at Rome, Trypho the father, Euelpiſtus, and Meges, made it flouriſh, each in their time.

The authors, who have contribute moſt to the perfection of chirurgery, are, Paræus, Fab. ab Aquapendente, Harvey, Wharton, Gliſſon, Du Laurence, Diemerbroeck, Vieuſſens, Barbette, Dionis, Carriere, Heiſter, &c.

The art has flouriſhed in England, under the very diſtinguiſhed talents of a Sharpe, a Pott, and other celebrated proficients: nor muſt we omit a compliment to ſome foreign practitioners, who have given very ſignal inſtances of their profeſſional ſkill; witneſs the extraordinary operation in Moorfields of cutting off a ponderous wen, which ſo disfigured the object who bore it, as to render him a very ſhocking ſpectacle. The itinerant foreigner, who performed this operation, in an inſtant cut off the cyſtis of the wen by the root, and as inſtantly ſtopped the blood by a vitriolic powder. He then dexterouſly dreſſed the wound, and the patient was in a ſhort time perfectly cured. There are many perſons living who were ſpectators of this operation; nor is it any degredation to regular ſurgery to mention a circumſtance in which there was ſo much ſcientific judgment diſplayed.

In England there are two diſtinct companies now occupying the ſcience or faculty of ſurgery; the one company called Barbers, the other Surgeons: which latter were not till very lately incorporated. The two were united to ſue and be ſued, by the name of maſters or governors and commonalty of the myſtery of Barbers and Surgeons of London, 32 Hen. VIII. cap. 42.

No perſon uſing any barbery, or ſhaving, in London, was to occupy any ſurgery, letting of blood, or other matter; drawing of teeth only excepted. And no perſon uſing the myſtery or craft of ſurgery was to occupy or exerciſe the ſeal or craft of barbery, or ſhaving; neither by himſelf, nor any other for his uſe. 32 Hen. VIII. cap. 42. By the ſame ſtatute, ſurgeons were obliged to have ſigns at their doors.

The French chirurgeons, being refuſed to be admitted into the univerſities, notwithſtanding that their art makes a branch of medicine, one of the four faculties, on pretence of its bordering a little on butchery, or cruelty, aſſociated themſelves into a brotherhood, under the protection of St. Coſmus, and St. Damian: on which account, according to the laws of their inſtitution, they are obliged to dreſs and look to wounds *gratis*, the firſt Monday of each month.

They diſtinguiſh between a chirurgeon of the long robe, and a barber chirurgeon: the firſt has ſtudied phyſic, and is allowed to wear a gown.

The ſkill of the other, beſide what relates to the management of the beard, is ſuppoſed to be confined to the more ſimple and eaſy operations in chirurgery; as bleeding, tooth-drawing, &c. They were formerly diſtinguiſhed by badges: thoſe of the long gown bore a caſe of inſtruments; and the barber a baſon.

CHISSEL, an inſtrument much uſed in ſculpture, maſonry, joinery, carpentry, &c.

CHLORA, in botany, a genus of the octandria monogynia claſs.

CHLORIS, in ornithology, the name of the bird commonly called in Engliſh the greenfinch, a well known bird of the ſize of a common ſparrow, and remarkable for its green colour, whence it has its name, and for the largeneſs of its beak, in which it approaches to the coccothrauſtes; it builds in our hedges, and feeds on the ſeeds of vegetables.

CHLOROSIS, in medicine, a feminine diſeaſe, vulgarly called the green-ſickneſs, white jaundice, &c.

The word chloroſis, ſignifies greenneſs, verdure; formed from χλοη, *graſs.*

Its uſual ſubjects are, girls, maids, and widows: or even wives, whoſe huſbands are deficient, &c. It gives a pale, yellow, or greeniſh tincture to the complexion, with a circle of violet under the eyes. The patient is melancholy and uneaſy; has frequently a low wandering fever, with an unequal pulſe, vomiting, heavineſs, liſtleſſneſs, drowſineſs, difficulty of breathing, longing for abſurd foods, &c.

It comes on, commonly, antecedent to, or about the time of the eruption of the menſes. Though the ſtoppage of the menſes is not always the cauſe of this diſtemper; for they ſometimes, though but ſeldom, flow regularly, in the progreſs thereof. According to Etmuller, the ſuppreſſion of the menſes is rather the effect than the cauſe of this diſeaſe.

The cure is chiefly to be attempted by chalybeats and bitters. In the colder conſtitutions, decoctions of guaicum are found of uſe.

CHOCOLATE, a kind of cake, or confection, prepared of certain drugs; the baſis, or principal whereof, is the cacao-nut.

Chocolate, properly prepared, is very ſalutary to weak ſtomachs. The Engliſh is in general much better prepared than the Spaniſh chocolate.

Among us, in England, the chocolate is chiefly made ſimple and unmixed, though (perhaps not adulterated) of the kernel of the cacao; excepting that ſometimes ſugar, and ſometimes vanilla, is added: any other ingredients being ſcarce known among us.

The neweſt chocolate is eſteemed the beſt; the drug never keeping well above two years, but uſually degenerating much before that time.

It is to be kept in brown paper, put up in a box; and that in another, in a dry place.

The methods of preparing the maſs into a liquor, with the proportions, are various: ordinarily, the chocolate is boiled in water, ſometimes in milk; and ſometimes, by good œconomiſts, in water-gruel: when boiled, it is milled, or agitated with a wooden machine for the purpoſe, and boiled again, till it be of the proper conſiſtence for drinking, then ſugared, if the maſs were pure; then milled afreſh, and poured off.

The beſt chocolate is that which diſſolves entirely in the water; leaving no grounds, or ſediment, at the bottom of the pot.

The Spaniards eſteem it the laſt misfortune that can befal a man, to be reduced to want chocolate.

CHOIR, that part of a church, cathedral, &c. where the clergy and choriſters, or ſingers, are placed.

The word, according to Iſidore, is derived *à caronis cicumſtantiam*; becauſe, anciently, the choriſters were diſpoſed round the altar to ſing; which is ſtill the manner of building altars among the Greeks.

The patron is ſaid to be obliged to repair the choir of a church, and the pariſhioners the nave or body.

The choir was not ſeparated from the nave, till the time of Conſtantine: from that time it was railed in with a balluſtrade, with curtains drawn over, not to be opened till after the conſecration.

In the twelfth century they began to incloſe the choir with walls; but the ancient balluſtrades have been ſince reſtored; out of a view to the beauty of the architecture.

In nunneries, the choir is a large hall, adjoining to the body of the church, ſeparated by a grate, where the religious ſing the office.

CHOLERA MORBUS, a ſudden overflowing, or eruption of the bile, or bilious matters, both upwards and downwards.

It is ſuppoſed to have its riſe from the great abundance of bilious humours; which, being very acrimonious, vellicate the membranes of the ſtomach and inteſtines; and, by that means, occaſion unuſual and violent contractions.

It is very dangerous: whence the French anciently called it *trouſſe galand.*

The free uſe of the columbo root has been found an excellent remedy in this diſeaſe.

CHOLOMA, or Cholosis, ſignifies, according to Galen, any diſtortion of a member, or depravation of it with reſpect to motion. It is taken alſo, in a particular ſenſe, for halting or lameneſs of a leg, ariſing from luxation.

CHONDROPTERGII, in natural hiſtory, a name given by Artedi and Linnæus to one of the great claſſes or families of the fiſhes: the characters of which are, that the rays of the fins are not bony, but cartilaginous.

The bones of the body of theſe fiſhes are alſo cartilaginous, and and the mouth in moſt of the ſpecies is placed in the lower part of the body.

Of this order are the ſcate, ſturgeon, lamprey, &c.

CHOP-CHURCH, or Church-chopper, a name, or rather nick-name, given to perſons, who make a practice of exchanging benefices; yet ſurely an incumbent, with a ſmall income and large family, is juſtifiable in becoming a church-chopper, whilſt he ſees preferment the grand attractive object of the firſt dignitaries of the church.

Indeed Chop-church occurs in an ancient ſtatute as a lawful trade, or occupation; and ſome of the judges ſay, it was a good addition. Brook holds, that it was no occupation, but only a thing permiſſible by law.

CHORAL, ſignifies any perſon that, by virtue of any of the orders of the clergy, was in ancient times admitted to ſit and ſerve God in the choir.

Dugdale, in his hiſtory of St. Paul's church, ſays, that there were with the chorus formerly ſix vicars choral belonging to that church.

CHORD, or Cord, primarily denotes a ſlender rope, or cordage.

The word is formed of chorda, and that from χοδρη, a *gut*; whereof ſtrings may be made.

Chord, Chorda, in anatomy, a little nerve extended over the *membrana tympani*, or drum of the ear.

Chords, or Cords, in muſic, denote the ſtrings, or lines, by whoſe vibrations the ſenſation of ſound is excited; and by whoſe diviſions the ſeveral degrees of tune are determined. They are called cords, or chords, from the Greek χορδη, a name which the phyſicians give to the inteſtines; in regard the ſtrings of muſical inſtruments are ordinarily made of guts: though others are made of braſs or iron wire; as thoſe of ſpinets, harpſichords, &c.

Chords of gold wire in harpſichords, yield a ſound almoſt twice as ſtrong as thoſe of braſs: chords, or ſtrings, of ſteel, yield a feebler ſound than thoſe of braſs; as being both leſs heavy, and leſs ductile.

Mr. Perrault obſerves, that of late they have invented a way of changing the chords, to render the ſound ſtronger, without altering the tone.

The ſixth chord of baſs viols, and the tenth of large theorbus, conſiſt of fifty threads, or guts: there are ſome of them a hundred feet long twiſted and poliſhed with equiſetum, or horſe tail.

Chord is ſometimes alſo uſed for accord. Thus we ſay the common chords to ſuch a baſs note, meaning its third, fifth, and octave.

Chord is alſo uſed in muſic, for the note or ſtring to be touched, or ſounded; in which ſenſe it is applicable to all the intervals of muſic.

CHORDAPSUS, in medicine, a diſeaſe of the inteſtines, otherwiſe called *volvulus*, the *iliac paſſion*, and *miſerere mei:* though others make it a diſtinct ſpecies of the *miſere.*

CHORDEE, in medicine, an inflammation and contraction of the frænum, and under part of the penis; ſo as to render erection painful.

It happens in gonorrhæas, and is generally proportional to the degree of the virus received; ſo that in virulent gonorrhœas, it is uſually a very troubleſome ſymptom.

It proceeds from the acrimony of the matter which runs from the urethra, irritating the under part of the penis; by which it is, as it were, tied or held forcibly downwards in erection, eſpecially its frænum. Dr. Rutherford of Edinburgh, in his Clinical Lectures, attributes it to the inflammation and ſwelling of the corpus cavernoſum urethræ. When the acrimony is conſiderable, it ſometimes gives riſe to unnatural erections, or the ſymptom called a priatiſm.

If it be violent, or does not decreaſe proportionally to the other ſymptoms in gonorrhœas, an emetic of turbith mineral is uſually given with ſucceſs; it cauſing a revulſion from the part.

Though women have no glans or frænum to be affected with the ſharp running, yet the ſphincter of the vagina, clitoris, and lips themſelves, are inflamed after the ſame manner; and therefore the method of their cure muſt be the ſame; which is by ſuch medicines as allay the preſſing inflammation, and ſecure the parts againſt their being corroded by the ſharpneſs of the corruption.

CHOREPISCOPUS, the name of a dignity ſubſiſting in ſome cathedrals, particularly in Germany; ſignifying the ſame with chori epiſcopus, or biſhop of the choir.

It alſo ſignifies an officer in the antient church, who held a middle rank between biſhop and preſbyters.

CHORIZANTES, the name of a ſect in Germany, in the year 1374, ſaid to be Demoniacs that aſſembled in ſtreets and churches.

CHOROGRAPHY, the art of making a map, or deſcription of ſome country or province.

The word comes from χωρος, *region*, and γραφω, *I deſcribe.* Chorography is diſtinguiſhed from geography, as the deſcription of a particular country is from that of the whole earth. And from topography, as the deſcription of the ſame country is from that of a ſingle place, town, or diſtrict in it.

CHOROIDES, or Choroeides, in anatomy, a term applied to ſeveral parts of the body; but particularly uſed for the inner membrane which immediately inveſts the brain; ſo called as being intermingled with a great number of blood veſſels, like the chorion.

Choroides is alſo applied to the inner, and poſterior tunic of the eye, immediately under the ſclerotica.

It is ſoft, thin, and black; and its inner, or concave ſurface, is very ſmooth and poliſhed. It has its name from its being interſperſed with veſſels. Its anterior part is called the uvea; or rather the iris, as the internal ſurface is called the Ruyſchian coat.

CHORUS, in comedy, was at firſt no more than a ſingle perſon, who ſpoke in the ancient compoſures for the ſtage; the poets, by degrees, added to him another; then two, afterwards three, and at laſt more: ſo that the moſt ancient comedies had nothing but the chorus, and were only ſo many lectures of virtue.

Chorus, uſed in muſic, where, at certain periods of a ſong, the whole company are to join the ſinger in repeating certain couplets, verſes, or clauſes.

CHOWDER *Beer*, a provincial phraſe of Devonſhire, denoting a cheap and eaſy prepared drink, highly commended for preventing the ſcurvy in long voyages, or for the cure of it where it may have been contracted. It is prepared in the following manner: take twelve gallons of water, in which put three pounds and a half of black ſpruce; boil it for three hours, and having taken out the fir or ſpruce, mix with the liquor ſeven pounds of melaſſes, and juſt boil it up; ſtrain it through a ſieve, and, when milk warm, put to it about four ſpoonfuls of yeaſt to work it. In two or three days ſtop the bung of the caſk, and in five or ſix days, when fine, bottle it for drinking. Two gallons of melaſſes are ſufficient for an hogſhead of liquor; but if melaſſes cannot be procured, treacle or courſe ſugar will anſwer the purpoſe.

CHRISM, from χριω, *I anoint*, oil conſecrated by the biſhop, and uſed in the Romiſh and Greek churches, in the adminiſtration of baptiſm, confirmation, ordination, and extreme unction, which is prepared on holy Thurſday with much ceremony. In Spain, it was anciently the cuſtom for the biſhop to take one third of a ſol for the chriſm diſtributed to each church, on account of the balſam that entered its compoſition.

The Jeſuit Dandini, who went to mount Libanus in quality of the pope's nuncio, ordained, in a ſynod held there in 1596, that *chriſm*, for the future, ſhould be made only of two ingredients, oil and balm; the one repreſenting the human nature of Chriſt, the other his divine nature.

The action of impoſing the *chriſm*, is called *chriſmation:* this the generality of the Romiſh divines hold to be the next matter of the ſacrament of confirmation.

The *chriſmation* in baptiſm is performed by the prieſt; that in confirmation by the biſhop; that in ordination, &c. is more uſually ſtiled *unction*.

Chrism *Pence*, Chrismatis *Denarii*, or Chrismalis *Denarii*, a tribute anciently paid to the biſhop by the pariſh-clergy, for their chriſm, conſecrated at Eaſter for the enſuing year: this was afterwards condemned as ſimoniacal.

CHRISOM, Chrismale, was anciently the face cloth, or piece of linen laid over the child's head when it was baptized.

Whence, in our bills of mortality, children who die in the month are called chriſoms. The time between the child's birth and baptiſm, was alſo called chriſomus.

CHRIST, χριςος, an appellation uſually given to our Saviour, anſwering exactly to the Hebrew Meſſiah, and ſignifying one that is anointed. His anointing muſt be underſtood in a figurative, ſpiritual ſenſe, to denote his deſignation or appointment to the office of a Meſſiah.

As the holy unction was anciently given to kings, prieſts, and prophets, ſo by deſcribing the promiſed Saviour of the world under the name of anointed, it was ſufficiently made appear that the qualities of king, prophet, and high prieſt, would all evidently meet in him.

CHRISTIAN, ſomething that relates to Chriſt.

The king of France bears the title of the Moſt Chriſtian King: the origin of which is traced up to Gregory the Great.

Christian *Religion*, or *Chriſtianity*, the religion inſtituted by Jeſus Chriſt, comprehending doctrines of faith, and rules of practice; all of which are contained in the Old and New Teſtaments, and are deſigned to recover mankind from ignorance and vice, from guilt and death, to true knowledge and virtue, to the divine favour, and everlaſting life.

As to the precepts of chriſtianity, they are unqueſtionably holy and excellent. The pureſt morality is taught in all its juſt and noble extent, as taking in the whole of our duty towards God, our neighbours, and ourſelves.

Christians, thoſe who profeſs to believe and practice the chriſtian religion, and are baptized in the name of Jeſus Chriſt.

When chriſtianity was firſt planted in the world, thoſe who embraced it were known among themſelves by the names of diſciples, believers, elect, ſaints, and brethren; nor did they aſſume the name of chriſtians till the year 43, at Antioch, where Paul and Barnabas jointly preached the chriſtian religion.

CHRISTMAS, a feſtival of the Chriſtian church, obſerved on the 25th of December, in memory of the nativity of Jeſus Chriſt.

Whether this feſtival was always obſerved on the 25th of December, is a matter of doubt. Dr. Cave is of opinion that it was firſt kept by the Eaſtern church in January, and confounded with the Epiphany, till, receiving better information from the weſtern churches, they changed it to that day. St. Chryſoſtom affirms, that it was not above ten years ſince Chriſtmas began to be celebrated in the church of Antioch upon that day: Clemens Alexandrinus reckons, from the birth of Chriſt to the death of Commodus, exactly one hundred and ninety-four years, one month, and thirteen days; which time, being taken according to the Egyptian account, and reduced to the Julian or Gregorian ſtyle, makes the birth of Chriſt fall on the 25th or 26th of December; yet, notwithſtanding this, the ſame father tells us, that there were ſome who more curiouſly ſearching after the year and day of Chriſt's nativity, aſſixed the latter to the 25th of the month Pachon. Now in that year in which Chriſt was born, the month Pachon commenced the 20th of April; ſo that according to this computation, Chriſt was born on the 16th of May. Hence we may ſee how little certainty there is in this matter, ſince ſo ſoon after the event, the learned were divided in opinion concerning it. As to the antiquity of this feſtival, the firſt footſteps we find of it were in the ſecond century, about the time of the emperor Commodus.

CHRISTOMACHI, Χριςομαχοι, in church hiſtory, an appellation given to all ſorts of heretics who deny the divinity of our Saviour, or hold heteredox opinions concerning his incarnation.

The word comes from the Greek Χριςος, *Chriſt*, μαχομαι, *I fight or oppoſe*.

CHROASTACES, in natural hiſtory, a genus of pellucid gems, comprehending all thoſe of variable colours, as viewed in different lights; of which kind are the opal and the aſteria, or the *cati oculus*.

CHROMA, in the Italian muſic. The Italians take this term from the Greeks, but uſe it to ſignify a note or character of time, by us called a quaver, and when the word ſemi is added thereto, it means our ſemiquaver. Eight of the former are contained in a bar, and ſixteen of the latter in common time.

Chroma, in the botanical writings of the ancients, a word uſed to expreſs a famous root brought from Syria into Greece, and uſed by the women of that country to paint their cheeks red. It was alſo called *rhizium* and *fucus*, and by the Latins *radicula*.

CHROMATIC, that part of optics which explains the ſeveral properties of the colours of light, and of natural bodies.

CHROMIS, in ichthyology, the name of a little fiſh caught frequently in the Mediterranean, which ſeldom exceeds three inches in length, is moderately thick, and of a duſky brown colour.

Artedi, who very accurately examined this fiſh, does not allow it a diſtinct generical name, but makes it only a ſpecies of his genus of the ſpari, calling it the ſparus with the ſecond ray of each belly-fin carried to a great length.

CHRONIC, *Chronical*, in medicine, is applied to a ſlow diſeaſe, which laſts a long time; at leaſt upwards of forty days: ſuch are the gout, dropſy, aſthma, &c.

The word comes from χρονος, *time*.

Chronic diſeaſes ſtand in oppoſition to acute diſeaſes, which are ſpeedy, and haſten to a criſis; as fevers, ſmall-pox, &c.

Chronic diſeaſes are uſually owing either to ſome natural defect in the conſtitution, or to an irregular manner of living; and moſt of the chronical diſeaſes, ſays Dr. Cheyne, the infirmities of old age, and the ſhort periods of the lives of Engliſhmen, are owing to repletion: this is evident hence, that evacuation, of one kind or another, is nine parts in ten of their remedy.

The ſources of chronical diſtempers, ſays the ſame author, are, 1. Viſcidity in the juices, or the over-largeneſs of their conſtituent particles; which, not being ſufficiently broken by the concoctive powers, ſtop and retard the circulation. Or, 2. Too great abundance of ſharp acrimonious ſalts; whereby the juices themſelves are rendered ſo corroſive, as to burſt or wear out the ſolids. Or, 3. A relaxation, or want of due force or ſpringineſs of the ſolids themſelves.

An exceſs in the quantity of our meats and drinks begets the firſt; the ſad condition of the ſame food the ſecond; and both together, with want of due exerciſe, the third.

The cauſes of all chronical diſorders according to Dr. Cadogan, in his Eſſay on the Gout, &c. are indolence, intemperance, or vexation. And Dr. Fothergill obſerves, that in the cure of all chronic complaints, however diſtant their ſeat may be from the ſtomach, thoſe will have the greateſt ſucceſs who attentively conſider the preſent ſtate of the organ; who remove every obſtruction to its performing the office of digeſtion with eaſe, conſtancy, and expedition. Lond. Med. Obſ. vol. i. p. 314.

CHRONICLE, Chronicon, denotes a hiſtory digeſted in order of time; though the term is ſeldom uſed but in ſpeaking of our old Engliſh hiſtories, as Holinſhed's Chronicle, Stow's Chronicle, &c.

CHRONICLES, in the *Canon of Scripture*, are two ſacred books called by the Greeks *Paralipomena*, Παραλειπμενα, becauſe they contain many ſupplemental relations omitted in the other hiſtorical books. They are an abridgment of ſacred hiſtory, to the return of the Jews from the Babyloniſh captivity. The firſt book traces the genealogies of the Iſraelites from Adam, relates the death of Saul, and gives a brief account of David's reign. The ſecond traces the progreſs of the kingdom of Judah, its various revolutions, its period under Zedekiah, and the reſtoration of the Jews by Cyrus.

CHRONOLOGY

IS the ſcience that teaches the method of meaſuring time and diſtinguiſhing its parts. It is more difficult, than may at firſt appear, to determine the preciſe idea, and clearly to explain the nature, of time. That ingenious and ſubtile impoſtor Mahomet has given in his Alcoran ſome traces of very refined ideas of this ſubject. But, leaving theſe metaphyſical reſearches, we ſhall content ourſelves with ſaying, that by time we here mean the duration and ſucceſſion of created beings.

The term chronology, when taken in its full extent, has two objects: the firſt is the meaſuring of time and its different diviſions. This part of chronology is regulated by aſtronomical calculation, and conſequently makes a part of mathematics; and it is by this method that we are enabled to make complete calendars or almanacs. The ſecond part of chronology conſiſts in fixing the dates of all thoſe events that are related in hiſtory, and of ranging them in the ſeveral diviſions of time in which they occurred: and by this means chronology becomes one of the eſſential parts of hiſtory. This ſecond part draws its principles from the firſt; but it has need of other ſupports, as of criticiſm, of the teſtimony of authors, of ancient coins, medals, inſcriptions, &c. of ſuch epochs in hiſtory as are inconteſtable; of eclipſes of the ſun and moon, and other aſtronomical obſervations, &c. The ſubject of the firſt part has been treated under Aſtronomy. That of the ſecond falls to be conſidered in the preſent article.

A NEW CHRONOLOGICAL TABLE *of Remarkable Events, and Improvements: comprehending, in one View, the Analyſis or Outlines of general Hiſtory, from the* Birth of Chriſt *to the preſent Time.*

JESUS CHRIST is born, on Monday, December 25.

12 —— Diſputes with the doctors in the Temple;

27 —— is baptized in the Wilderneſs by John;

33 —— and crucified on Friday, April 3, at three o'clock P.M. His Reſurrection on Sunday, April 5; his Aſcenſion, Thurſday, May 14.

36 St. Paul converted.

39 St. Matthew writes his Goſpel.
Pontius Pilate kills himſelf.

40 The name of Chriſtians firſt given at Antioch to the followers of Chriſt.

43 Claudius Cæſar's expedition into Britain.

44 St. Mark writes his Goſpel.

49 London is founded by the Romans; 368, ſurrounded by ditto with a wall, ſome parts of which are ſtill obſervable.

51 Caractacus, the Britiſh king, is carried in chains to Rome.

52 The council of the apoſtles at Jeruſalem.

55 St. Luke writes his Goſpel.

59 The emperor Nero puts his mother and brothers to death.
—— Perſecutes the Druids in Britain.

61 Boadicia, the Britiſh queen, defeats the Romans; but is conquered ſoon after by Suetonius, governor of Britain.

62 St. Paul is ſent in bonds to Rome — writes his Epiſtles between 51 and 66.

63 The acts of the Apoſtles written.
Chriſtianity is ſuppoſed to be introduced into Britain by St. Paul or ſome of his diſciples about this time.

64 Rome ſet on fire, and burned for ſix days; upon which began (under Nero) the firſt perſecution againſt the Chriſtians.

67 St. Peter and St. Paul put to death.

70 Whilſt the factious Jews are deſtroying one another with mutual fury, Titus, the Roman general, takes Jeruſalem, which is razed to the ground, and the plough made to paſs over it.

83 The philoſophers expelled Rome by Domitian.

85 Julius Agricola, governor of South-Britain, to protect the civilized Britons from the incurſions of the Caledonians, builds a line of forts between the rivers Forth and Clyde; defeats the Caledonians under Galgacus on the Grampian hills; and firſt ſails round Britain, which he diſcovers to be an iſland.

96 St. John the evangeliſt wrote his revelation — his Goſpel in 97.

121 The Caledonians reconquer from the Romans all the ſouthern parts of Scotland; upon which the emperor Adrian builds a wall between Newcaſtle and Carliſle; but this alſo proving ineffectual, Pollius Urbicus, the Roman general, about the year 144, repairs Agricola's forts, which he joins by a wall four yards thick.

135 The ſecond Jewiſh war ends, when they were all baniſhed Judea.

139 Juſtin writes his firſt Apology for the Chriſtians.

141 A number of hereſies appear about this time.

152 The emperor Antoninus Pius ſtops the perſecution againſt the Chriſtians.

217 The Septuagint ſaid to be found in a caſk.

222 About this time the Roman empire begins to ſink under its own weight. The Barbarians begin their eruptions, and the Goths have annual tribute not to moleſt the empire.

260 Valerius is taken priſoner by Sapor, king of Perſia, and flayed alive.

274 Silk firſt brought from India; the manufactory of it introduced into Europe by ſome monks, 551; firſt worn by the clergy in England, 1534.

291 Two emperors and two Cæſars march to defend the four quarters of the empire.

306 Conſtantine the Great begins his reign.

308 Cardinals firſt began.

313 The tenth perſecution ends by an edict of Conſtantine, who favours the Chriſtians, and gives full liberty to their religion.

314 Three biſhops, or fathers, are ſent from Britain to aſſiſt at the council of Arles.

325 The firſt general council at Nice, when 318 fathers attended, againſt Arius, the founder of Arianiſm, where was compoſed the famous Nicene Creed, which we attribute to them.

328 Conſtantine removes the ſeat of empire from Rome to Byzantium, which is thereafter called Conſtantinople.

331 —— orders all the heathen temples to be deſtroyed.

363 The Roman emperor Julian, ſurnamed the Apoſtate, endeavours in vain to rebuild the Temple of Jeruſalem.

364 The Roman empire is divided into the eaſtern (Conſtantinople the capital) and weſtern (of which Rome continued to be the capital) each being now under the government of different emperors.

400 Bells invented by biſhop Paulinus, of Campagnia.

404 The kingdom of Caledonia or Scotland revives under Fergus.

406 The Vandals, Alans, and Suevi, ſpread into France and Spain, by a conceſſion of Honorius, emperor of the Weſt.

410 Rome taken and plundered by Alaric, king of the Viſi Goths.

412 The Vandals begin their kingdom in Spain.

420 The kingdom of France begins upon the Lower Rhine, under Pharamond.

426 The Romans, reduced to extremities at home, withdraw their troops from Britain, and never return; adviſing the Britons to arm in their own defence, and truſt to their own valour.

446 The Britons, now left to themſelves, are greatly haraſſed by the Scots and Picts, upon which they once more make their complaint to the Romans (which they entitle *The Groans of the Britons*), but receive no aſſiſtance from that quarter.

447 Attila (ſurnamed the Scourge of God) with his Huns ravage the Roman empire.

449 Vortigern, king of the Britons, invites the Saxons into Britain, againſt the Scots and Picts.

455 The Saxons having repulſed the Scots and Picts, invite more of their countrymen, and begin to eſtabliſh themſelves in Kent, under Hengiſt.

476 The weſtern empire is finiſhed, 523 years after the battle of Pharſalia; upon the ruins of which ſeveral new ſtates ariſe in Italy and other parts, conſiſting of Goths, Vandals, Huns, and other Barbarians, under whom literature is extinguiſhed, and the works of the learned are deſtroyed.

496 Clovis, king of France baptiſed, and Chriſtanity begins in that kingdom.

508 Prince Arthur begins his reign over the Britons.

513 Conſtantinople beſieged by Vitalianus, whoſe fleet is burnt by a ſpeculum of braſs.

516 The computing of time by the Chriſtian æra is introduced by Dionyſius the monk.

529 The code of Juſtinian, the Eaſtern emperor, is publiſhed.

557 A terrible plague all over Europe, Aſia, and Africa, which continues near fifty years.

580 Latin ceaſed to be ſpoke about this time in Italy.

596 Auguſtin the monk comes into England with forty monks.

606 Here begins the power of the popes, by the conceſſions of Phocas, emperor of the Eaſt.

622 Mahomet, the falſe prophet, flies from Mecca to Medina, in Arabia, in the 44th year of his age and 10th of his miniſtry, when he laid the foundation of the Saracen empire, and from whom the Mahometan princes to this day claim their deſcent. His followers compute their time from this æra, which in Arabic is called Hegira, i. e. the Flight.

637 Jeruſalem is taken by the Saracens or followers of Mahomet.

640 Alexandria in Egypt is taken by ditto, and the grand library there burnt by order of Omar their caliph or prince.

653 The Saracens now extend their conqueſts on every ſide, and retaliate the barbarities of the Goths and Vandals upon their poſterity.

664 Glaſs invented in England by Benalt a monk.

685 The Britons, after a brave ſtruggle of near 150 years, are totally expelled by the Saxons, and drove into Wales and Cornwall.

713 The Saracens conquer Spain.

726 The controverſy about images begins, and occaſions many inſurrections in the Eaſtern empire.

CHRONOLOGY.

748 The computing of years from the birth of Chriſt began to be uſed in hiſtory.

749 The race of Abbas became caliphs of the Saracens, and encourage learning.

762 The city of Bagdad upon the Tigris is made the capital for the caliphs, of the houſe of Abbas.

800 Charlemagne, king of France, begins the empire of Germany, afterwards called the weſtern empire; gives the preſent names to the winds and months; endeavours to reſtore learning in Europe, but mankind are not yet diſpoſed for it, being ſolely engroſſed in military enterprizes.

826 Harold, king of Denmark, dethroned by his ſubjects for being a Chriſtian.

828 Egbert, king of Weſſex, unites the heptarchy, by the name of England.

836 The Flemings trade to Scotland for fiſh.

838 The Scots and Picts have a deciſive battle, in which the former prevail, and both kingdoms are united by Kenneth, which begins the ſecond period of the Scottiſh hiſtory.

867 The Danes begin their ravages in England.

896 Alfred the Great, after ſubduing the Daniſh invaders, (againſt whom he fought 56 battles by ſea and land) compoſes his body of laws; divides England into counties, hundreds, tythings; erects county courts, and founds the univerſity of Oxford about this time.

915 The univerſity of Cambridge founded.

936 The Saracen empire is divided by uſurpation into ſeven kingdoms.

975 Pope Boniface VII. is depoſed and baniſhed for his crimes.

979 Coronation oath firſt uſed in England.

Juries firſt inſtituted in ditto.

991 The figures in arithmetic are brought into Europe bth e Saracens from Arabia. Letters of the alphabet were hitherto uſed.

996 Otho III. makes the empire of Germany elective.

999 Boleſlaus, the firſt king of Poland.

1000 Paper made of cotton rags was in uſe; that of linen rags in 1170; the manufactory introduced into England at Dartford 1588.

1005 All the old churches are rebuilt about this time in a new manner of architecture.

1015 Children forbidden by law to be ſold by their parents in England.

1017 Canute, king of Denmark, gets poſſeſſion of England.

1040 The Danes, after ſeveral engagements with various ſucceſs, are about this time driven out of Scotland, and never again return in a hoſtile manner.

1041 The Saxon line reſtored under Edward the Confeſſor.

1043 The Turks (a nation of adventurers from Tartary, ſerving hitherto in the armies of contending princes) become formidable, and take poſſeſſion of Perſia.

1054 Leo IX. the firſt pope that kept up an army.

1057 Malcolm III. king of Scotland, kills the tyrant Macbeth at Dunſinane, and marries the princeſs Margaret, ſiſter to Edgar Atheling.

1065 The Turks take Jeruſalem from the Saracens.

1066 The conqueſt of England by William (ſurnamed the Baſtard) duke of Normandy, in the battle of Haſtings, where Harold is ſlain.

1070 William introduces the feudal law.

Muſical notes invented.

1075 Henry IV. emperor of Germany, and the pope, quarrel about the nomination of the German biſhops. Henry, in penance, walks barefooted to the pope towards the end of January.

1076 Juſtices of the peace firſt appointed in England.

1080 Doomſday book began to be compiled by order of William, from a ſurvey of all the eſtates in England, and finiſhed in 1086.

The Tower of London built by ditto, to curb his Engliſh ſubjects; numbers of whom fly to Scotland, where they introduce the Saxon or Engliſh language, are protected by Malcolm, and have lands given them.

1091 The Saracens in Spain, being hard preſſed by the Spaniards, call to their aſſiſtance Joſeph, king of Morocco; by which the Moors get poſſeſſion of all the Saracen dominions in Spain.

1096 The firſt cruſade to the Holy Land is begun under ſeveral Chriſtian princes, to drive the infidels from Jeruſalem.

1110 Edgar Atheling, the laſt of the Saxon princes, dies in England, where he had been permitted to reſide as a ſubject.

1118 The order of the Knights Templars inſtituted, to defend the Sepulchre at Jeruſalem, and to protect Chriſtian ſtrangers.

1151 The canon law collected by Gratian, a monk of Bologna.

1163 London bridge, conſiſting of 19 ſmall arches, firſt built of ſtone.

1164 The Tentonic order of religious knights begins in Germany.

1172 Henry II. king of England, (and firſt of the Plantagenets) takes poſſeſſion of Ireland; which, from that period, has been governed by an Engliſh viceroy, or lord lieutenant.

1176 England is divided, by Henry, into ſix circuits, and juſtice is diſpenſed by itinerant judges.

1180 Glaſs windows began to be uſed in private houſes in England.

1181 The laws of England are digeſted about this time by Glanville.

1182 Pope Alexander III. compelled the kings of England and France to hold the ſtirrups of his ſaddle when he mounted his horſe.

1186 The great conjunction of the ſun and moon and all the planets in Libra, happened in September.

1192 The battle of Aſcalon, in Judea, in which Richard, king of England, defeats Saladin's army, conſiſting of 300,000 combatants.

1194 *Dieu et mon Droit* firſt uſed as a motto by Richard, on a victory over the French.

1200 Chimnies were not known in England.

Surnames now began to be uſed; firſt among the nobility.

1208 London incorporated, and obtained their firſt charter for electing their Lord Mayor and other magiſtrates from king John.

1215 Magna Charta is ſigned by king John and the barons of England.

Court of Common Pleas eſtabliſhed.

1227 The Tartars, a new race of heroes, under Gingis-Kan, emerge from the northern parts of Aſia, overrun all the Saracen empire; and, in imitation of former conquerors, carry death and deſolation wherever they march.

1233 The Inquiſition begun in 1204, is now truſted to the Dominicans.

The houſes of London, and other cities in England, France and Germany, ſtill thatched with ſtraw.

1253 The famous aſtronomical tables are compoſed by Alonſo, king of Caſtile.

1258 The Tartars take Bagdad, which finiſhes the empire of the Saracens.

1263 Acho, king of Norway, invades Scotland with 160 ſail, and lands 20,000 men at the mouth of the Clyde, who are cut to pieces by Alexander III. who recovers the weſtern iſles.

1264 The commons of England firſt ſummoned to parliament about this time.

1269 The Hamburgh company incorporated in England.

1273 The empire of the preſent Auſtrian family begins in Germany.

1282 Lewellyn, prince of Wales, defeated and killed by Edward I. who unites that principality to England.

1284 Edward II. born at Carnarvon, is the firſt prince of Wales.

1285 Alexander III. king of Scotland, dies, and that kingdom is diſputed by twelve candidates, who ſubmit their claims to the arbitration of Edward, king of England; which lays the foundation of a long and deſolating war between both nations.

1293 There is a regular ſucceſſion of Engliſh parliaments from this year, being the 22d of Edward I.

1298 The preſent Turkiſh empire begins in Bithynia under Ottoman.

Silver-hafted knives, ſpoons, and cups, a great luxury.

Tallow-candles ſo great a luxury, that ſplinters of wood were uſed for lights.

Wine ſold by apothecaries as a cordial.

1302 The mariner's compaſs invented, or improved by Givia, of Naples.

1307 The beginning of the Swiſs cantons.

1308 The Popes remove to Avignon in France for 70 years.

1310 Lincoln's inn ſociety eſtabliſhed.

1314 The battle of Bannockburn between Edward II. and Robert Bruce, which eſtabliſhes the latter on the throne of Scotland.

The cardinals ſet fire to the conclave and ſeparate. A vacancy in the papal chair for two years.

1320 Gold firſt coined in Chriſtendom; 1344 in England.

1336 Two Brabant weavers ſettle at York, which, ſays Edward III. may prove of great benefit to us and our ſubjects.

1337 The firſt comet whoſe courſe is deſcribed with an aſtronomical exactneſs.

1340 Gunpowder and guns firſt invented by Swartz, a monk of Cologn; 1346 Edward III. had four pieces of cannon, which gained him the battle of Creſſy; 1346 bombs and mortars were invented.

Oil painting firſt made uſe of by John Vaneck.

Herald's college inſtituted in England.

1344 The firſt creation to titles by patents uſed by Edward III.

1346 The battle of Durham, in which David, king of Scots, is taken priſoner.

1349 The order of the Garter inſtituted in England by Edward III. altered in 1557, and conſiſts of 26 knights.

1352 The Turks firſt enter Europe.

1354 The money in Scotland till now the ſame as in England.

1356 The battle of Poictiers, in which king John of France and his ſon are taken priſoners by Edward the black prince.

1357 Coals firſt brought to London.

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1358 Arms of England and France firſt quartered by Edward III.

1362 The law pleadings in England changed from French to Engliſh as a favour of Edward III. to his people.

John Wickliffe an Engliſhman begins to call in queſtion the doctrines of the church of Rome about this time, whoſe followers are called Lollards.

1386 A company of linen weavers from the Netherlands eſtabliſhed in London.

Windſor caſtle built by Edward III.

1388 The battle of Otterburn between Hotſpur and the earl of Douglas.

1391 Cards invented in France for the king's amuſement.

1399 Weſtminſter Abbey rebuilt and enlarged—Weſtminſter Hall ditto.

Order of the Bath inſtituted at the coronation of Henry IV. renewed in 1725; conſiſting of 38 knights.

1410 Guildhall, London, built.

1411 The univerſity of St. Andrews in Scotland founded.

1415 The battle of Agincourt gained over the French by Henry V. of England.

1428 The ſiege of Orleans, the firſt blow to the Engliſh power in France.

1440 Printing invented by L. Koſter at Harlaem in Holland; brought into England by W. Caxton, a mercer of London, 1471.

1446 The Vatican Library founded at Rome.

The ſea breaks in at Dort, in Holland, and drowns 100,000 people.

1453 Conſtantinople taken by the Turks, which ends the Eaſtern empire, 1123 years from its dedication by Conſtantine the Great, and 2206 years from the foundation of Rome.

1454 The univerſity of Glaſgow, in Scotland, founded.

1460 Engraving and etching on copper invented.

1477 The univerſity of Aberdeen, in Scotland, founded.

1483 Richard III. king of England, and laſt of the Plantagenets, is defeated and killed at the battle of Boſworth, by Henry (Tudor) VII. which puts an end to the civil war between the houſes of York and Lancaſter, after a conteſt of 30 years, and the loſs of 100,000 men.

Henry eſtabliſhes fifty yeomen of the guards, the firſt ſtanding army.

1489 Maps and ſea charts firſt brought to England by Bartholomew Columbus.

1491 William Groceyn introduces the ſtudy of the Greek language into England.

The Moors, hitherto a formidable enemy to the native Spaniards, are entirely ſubdued by Ferdinand, and become ſubjects to that prince on certain conditions, which are ill obſerved by the Spaniards, whoſe clergy uſe the Inquiſition in all its tortures; and in 1609, near one million of the Moors are driven from Spain to the oppoſite coaſt of Africa, from whence they originally came.

1492 America firſt diſcovered by Columbus, a Genoeſe, in the ſervice of Spain.

1494 Algebra firſt known in Europe.

1497 The Portugueſe firſt ſail to the Eaſt-Indies by the Cape of Good Hope.

South America diſcovered by Americus Veſpuſius, from it has its name.

1499 North America ditto, for Henry VII. by Cabot, a Venetian.

1500 Maximilian divides the empire of Germany into ſix circles, and adds four more in 1512.

1505 Shillings firſt coined in England.

1509 Gardening introduced into England from the Netherlands, from whence vegetables were imported hitherto.

1513 The battle of Flowden, in which James IV. king of Scotland is killed, with the flower of his nobility.

1517 Martin Luther began the reformation.

Egypt is conquered by the Turks.

1518 Magellan, in the ſervice of Spain, firſt diſcovers the ſtraits of that name in South America.

1520 Henry VIII. for his writing in favour of popery, receives the title of Defender of the Faith from his holineſs.

1529 The name of Proteſtant takes its riſe from the Reformed proteſting againſt the church of Rome, at the diet of Spires in Germany.

1534 The Reformation takes place in England, under Henry VIII.

1537 Religious houſes diſſolved by ditto.

1539 The firſt Engliſh edition of the Bible authorized; the preſent tranſlation finiſhed 1611.

About this time cannon began to be uſed in ſhips.

1543 Silk ſtockings firſt worn by the French king; firſt worn in England by queen Elizabeth 1561; the ſteel frame for weaving invented by the Rev. Mr. Lee, of John's college, Cambridge, 1589.

Pins firſt uſed in England, before which time the ladies uſed ſkewers.

1544 Good lands let in England at one ſhilling per acre.

1545 The famous council of Trent begins, and continues 18 years.

1546 Firſt law in England eſtabliſhing the intereſt of money, and at ten per cent.

1549 Lords lieutenants of counties, inſtituted in England.

1550 Horſe guards inſtituted in England.

1555 The Ruſſian company eſtabliſhed in England.

1558 Queen Elizabeth began her reign.

1560 The reformation in Scotland completed by John Knox.

1563 Knives firſt made in England.

1569 Royal Exchange firſt built.

1572 The great maſſacre of proteſtants at Paris.

1579 The Dutch ſhake off the Spaniſh yoke, and the republic of Holland begins.

Engliſh Eaſt-India company incorporated—eſtabliſhed 1600.

——— Turkey company incorporated.

1580 Sir Francis Drake returns from his voyage round the world, being the firſt Engliſh circumnavigator.

Parochial regiſter firſt appointed in England.

1582 Pope Gregory introduces the New Stile in Italy; the 5th of October being counted 15.

1583 Tobacco, firſt brought from Virginia into England.

1587 Mary queen of Scots is beheaded by order of Elizabeth, after 18 years impriſonment.

1588 The Spaniſh Armada deſtroyed by Drake and other Engliſh Admirals. Henry IV. paſſes the edict of Nantes, tolerating the proteſtants.

1589 Coaches firſt introduced into England; hackney act 1693; increaſed to 1000, in 1770.

1590 Band of Penſioners inſtituted in England.

1591 Trinity college, Dublin, founded.

1597 Watches firſt brought into England from Germany.

1602 Decimal arithmetic invented at Bruges.

1603 Queen Elizabeth (the laſt of the Tudors) dies, and nominates James VI. of Scotland (and firſt of the Stuarts) as her ſucceſſor; which unites both kingdoms under the name of Great Britain.

1605 The gunpowder plot diſcovered at Weſtminſter; being a project of the Roman catholics to blow up the king and both houſes of parliament.

1606 Oaths of allegiance firſt adminiſtered in England.

1608 Galileo, of Florence, firſt diſcovers the ſatellites about the planet Saturn, by the teleſcope, then juſt invented in Holland.

1610 Henry IV. is murdered at Paris, by Ravaillac, a prieſt.

1611 Baronets firſt created into England, by James I.

1614 Napier, of Marcheſton, in Scotland, invents the logarithms.

Sir Hugh Middleton brings the new river to London from Ware.

1616 The firſt permanent ſettlement in Virginia.

1619 W. Harvey, an Engliſhman, confirms the doctrine of the circulation of the blood, which had been firſt broached by Servetius, a French Phyſician, in 1553.

1620 The broad ſilk manufacture from raw ſilk, introduced into England.

1621 New England planted by the Puritans.

1625 King James dies, and is ſucceeded by his ſon, Charles I.

The iſland of Barbadoes, the firſt Engliſh ſettlement in the Weſt Indies, is planted.

1632 The battle of Lutzen, in which Guſtavus Adolphus, king of Sweden, and head of the proteſtants in Germany, is killed.

1635 Province of Maryland planted by Lord Baltimore.

Regular poſts eſtabliſhed from London to Scotland, Ireland, &c.

1640 King Charles diſobliges his Scottiſh ſubjects, on which their army, under general Leſley, enters England, and takes Newcaſtle, being encouraged by the malecontents in England.

The maſſacre in Ireland, when 40,000 Engliſh proteſtants were killed.

1642 King Charles impeaches five refractory members, which begins the civil wars in England.

1643 Exciſe on beer, ale, &c. firſt impoſed by parliament.

1649 Charles I. beheaded by Cromwell, at Whitehall, January 30, aged 49.

1654 Cromwell aſſumes the protectorſhip.

1655 The Engliſh, under admiral Penn, take Jam aica from the Spaniards

1658 Cromwell dies, and is ſucceeded in the protectorſhip, by his ſon Richard.

1660 King Charles II. is reſtored by Monk, commander of the army, after an exile of twelve years, in France and Holland.

The people of Denmark, being oppreſſed by the nobles, ſurrender their privileges to Frederic III. who becomes abſolute.

1662 The royal ſociety, eſtabliſhed at London, by Charles II.

1663 Carolina planted; 1728 divided into two ſeparate governments.

1664 The New Netherlands, in North America, conquered from the Swedes and Dutch by the Engliſh.

1665 The plague rages in London, and carries off 68,000 perſons.

1666 The great fire of London began Sept. 2, and continued three days, in which were deſtroyed 13,000 houſes, and 400 ſtreets.

Tea firſt uſed in England.

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1667 The peace of Breda, which confirms to the Engliſh the New Netherlands, now known by the names of Penſylvania, New York, and New Jerſey.

1668——ditto, Aix la Chapelle.

St. James's park planted, and made a thorough-fare for public uſe, by Charles II.

1670 The Engliſh Hudſon's Bay company incorporated.

1672 Lewis XIV. overruns great part of Holland, when the Dutch opened their ſluices, being determined to drown their country, and retire to their ſettlements in the Eaſt-Indies.

African company eſtabliſhed.

1678 The peace of Nimeguen.

The habeas corpus act paſſed.

1680 A great comet appeared, and from its nearneſs to our earth alarmed the inhabitants. It continued viſible from Nov. 3, to March 9.

William Penn, a Quaker, receives a charter for planting Penſylvania.

1683 India ſtock ſold from 360 to 500 per cent.

1685 Charles II. dies, aged 55, and is ſucceeded by his brother James II.

The duke of Monmouth, natural ſon to Charles II. raiſes a rebellion, but is defeated at the battle of Sedgmore, and beheaded.

The edict of Nantes is revoked by Lewis XIV. and the proteſtants are greatly diſtreſſed.

1687 The palace of Verſailles, near Paris, finiſhed by Lewis XIV.

1688 The revolution in Great Britain begins November 5. King James abdicates, and retires to France, December 3.

King William and queen Mary, daughter and ſon in law to James, are proclaimed February 16.

Viſcount Dundee ſtands out for James in Scotland, but is killed by general Mackay, at the battle of Killycrankie, upon which the Highlanders, wearied with repeated miſfortunes, diſperſe.

1689 The land tax paſſed in England.

The Toleration Act paſſed in ditto.

Several biſhops are deprived for not taking the oaths to William.

William Fuller, who pretended to prove the prince of Wales ſpurious, was voted by the commons to be a notorious cheat, impoſtor, and falſe accuſer.

1690 The battle of Boyne, gained by William againſt James, in Ireland.

1691 The war in Ireland finiſhed, by the ſurrender of Limerick to William.

1692 The Engliſh and Dutch fleets, commanded by admiral Ruſſel, defeat the French fleet off La Hogue.

1693 Bayonets at the end of loaded muſkets firſt uſed by the French againſt the confederates in the battle of Turin.

The duchy of Hanover made the ninth electorate.

Bank of England eſtabliſhed by King William.

The firſt public lottery was drawn this year.

Maſſacre of Highlanders, at Glencoe, by king William's army.

1694 Queen Mary dies at the age of 33, and William reigns alone.

Stamp duties inſtituted in England.

1696 The peace of Ryſwick.

1699 The Scots ſettled a colony at the iſthmus of Darien, in America, and called it Caledonia.

1700 Charles XII. of Sweden, begins his reign.

King James II. dies at St. Germains, in the 68th year of his age.

1701 Pruſſia erected into a kingdom.

Society for the propagation of the goſpel in foreign parts eſtabliſhed.

1702 King William dies, aged 50, and is ſucceded by queen Anne, daughter to James II. who, with the Emperor and States General, renews the war againſt France and Spain.

1704 Gibraltar taken from the Spaniards, by admiral Rooke.

The battle of Blenheim, won by the duke of Marlborough and allies, againſt the French.

The court of Exchequer inſtituted in England.

1706 The treaty of union betwixt England and Scotland ſigned July 22.

The battle of Ramillies won by Marlborough and the allies.

1707 The firſt Britiſh parliament.

1708 Minorca taken from the Spaniards by general Stanhope.

The battle of Oudenarde won by Marlborough and the allies.

Sardinia erected into a kingdom and given to the duke of Savoy.

1709 Peter the Great, czar of Muſcovy, defeats Charles XII. at Pulcowa, who flies to Turkey.

The battle of Malplaquet won by Marlborough and the allies.

1710 Queen Ann changes the wig miniſtry for others more favourable to the intereſt of her brother, the late pretender.

The cathedral church of St. Paul, London, rebuilt by Sir Chriſtopher Wren, in 37 years, at one million expence, by a duty on coals.

The Engliſh South-ſea company began.

1712 Duke Hamilton and lord Mohun killed in a duel in Hyde park

1713 The peace of Utrecht, whereby Newfoundland, Nova Scotia, New Britain, and Hudſon's Bay, in North America, were yielded to Great Britain; Gibraltar and Minorca, in Europe, were alſo confirmed to the ſaid crown by this treaty.

1714 Queen Anne dies, at the age of fifty, and is ſucceded by George I. Intereſt reduced to five per cent.

1715 Lewis XIV. dies, and is ſucceeded by his great grandſon, Lewis XV. the late king of France.

The rebellion in Scotland begins in September under the earl of Mar, in favour of the pretender. The action of Sheriff Muir, and the ſurrender of Preſton, both in November, when the rebels diſperſe.

1716 The pretender married the princeſs Sobieſki, grand daughter of John Sobieſki, late king of Poland.

An act paſſed for ſeptennial parliaments.

1719 The Miſſiſſipi ſcheme at its height in France.

Lombes's ſilk-throwing machine, containing 26,586 wheels, erected at Darby; takes up one-eighth of a mile; one water wheel moves the reſt; and in 24 hours, it works 318,504,960 yards of organzine ſilk thread.

The South-ſea ſcheme in England begun April 7, was at its height at the end of June, and quite ſunk about September 29.

1727 King George dies, in the 68th year of his age; and is ſucceeded by his only ſon, George II.

Inoculation firſt tried on criminals with ſucceſs.

Ruſſia, formerly a dukedom, is now eſtabliſhed as an empire.

1732 Kouli Khan uſurps the Perſian throne, conquers the Mogul empire, and returns with two hundred thirty one millions ſterling.

Several public ſpirited gentlemen begin the ſettlement of Georgia, in North America.

1736 Captain Porteus having ordered his ſoldiers to fire upon the populace at an execution of a ſmuggler, is himſelf hanged by the mob at Edinburgh.

1738 Weſtminſter Bridge, conſiſting of fifteen arches, begun; finiſhed in 1750, at the expence of 389,000l. defrayed by parliament.

1739 Letters of marque iſſued out in Britain againſt Spain, July 21, and war declared October 23.

1743 The battle of Dettingen won by the Engliſh and allies, in favour of the queen of Hungary.

1744 War declared againſt France. Commodore Anſon returns from his voyage round the world.

1745 The allies loſe the battle at Fontenoy.

The rebellion breaks out in Scotland, and the Pretender's army defeated by the duke of Cumberland, at Culloden, April 16, 1746.

1746 Britiſh Linen Company erected.

1748 The peace of Aix-la-Chapelle, by which a reſtitution of all places taken during the war, was to be made on all ſides.

1749 The intereſt on the Britiſh funds reduced to three per cent.

Britiſh herring fiſhery incorporated.

1751 Frederic, prince of Wales, father to his preſent majeſty, died.

Antiquarian ſociety at London incorporated.

1752 The new ſtile introduced into Great Britain; the third of September being counted the fourteenth.

1753 The Britiſh Muſeum erected at Montague houſe.

Society of Arts, Manufactures, and Commerce, inſtituted in London.

1755 Liſbon deſtroyed by an earthquake.

1756 146 Engliſhmen are confined in the black hole at Calcutta, in the Eaſt Indies, by order of the nabob, and 123 found dead next morning.

Marine ſociety eſtabliſhed at London.

1757 Damien attempted to aſſaſſinate the French king.

1759 General Wolf is killed in the battle of Quebec, which is gained by the Engliſh.

1760 King George II. dies October 25, in the 77th year of his age, and is ſucceeded by his preſent majeſty, who on 22d of September 1761 married the princeſs Charlotte, of Mecklenburgh Strelitz.

Black-friars bridge, conſiſting of 9 arches, begun; finiſhed 1770, at the expence of 152,840l. to be diſcharged by a toll.

1762 War declared againſt Spain.

Peter III. emperor of Ruſſia, is depoſed, impriſoned, and murdered.

American Philoſophical Society eſtabliſhed in Philadelphia.

George Auguſtus Frederic, prince of Wales, born Aug. 12.

1763 The definitive treaty of peace between Great Britain, France, Spain and Portugal, concluded at Paris, February 10, which confirms to Great Britain the extenſive provinces of Canada, Eaſt and Weſt Florida, and part of Louiſiana, in North America; alſo the iſlands of Granada, St. Vincent, Dominica, and Tobago, in the Weſt Indies.

1764 The parliament granted 10,000l. to Mr. Harriſon, for his diſcovery of the longitude by his time-piece.

1765 His

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1765 His majeſty's royal charter paſſed for incorporating the ſociety of artiſts.

An act paſſed annexing the ſovereignty of the iſland of Man to the crown of Great Britain.

1766 April 21, a ſpot or macula of the ſun, more than thrice the bigneſs of our earth, paſſed the ſun's centre.

1768 Academy of painting eſtabliſhed in London.

The Turks impriſon the Ruſſian ambaſſador, and declare war againſt that emperor.

1771 Dr. Solander and Mr. Banks, in his majeſty's ſhip the Endeavour, lieutenant Cooke, return from a voyage round the world, having made ſeveral important diſcoveries in the South Seas.

1772 The king of Sweden changes the conſtitution from ariſtocracy to a limited monarchy.

The pretender marries a princeſs of Germany, grand daughter of Thomas, late earl of Ayleſbury.

The emperor of Germany, empreſs of Ruſſia, and the king of Pruſſia, ſtrip the king of Poland of a great part of his dominions, which they divide among themſelves, in violation of the moſt ſolemn treaties.

1773 Captain Phipps is ſent to explore the North Pole, but having made 81 degrees is in danger of being locked up by the ice, and his attempt to diſcover a paſſage in that quarter proves fruitleſs.

The Jeſuits expelled from the Pope's dominions.

The Engliſh Eaſt-India company having, by conqueſt or treaty, acquired the extenſive provinces of Bengal, Orixa, and Barar, containing fifteen millions of inhabitants, great irregularities are committed by their ſervants abroad, upon which government interferes, and ſends out judges, &c. for the better adminiſtration of juſtice.

The war between the Ruſſians and Turks proves diſgraceful to the latter, who loſe the iſlands in the Archipelago, and by ſea are every where unſucceſsful.

1774 Peace is proclaimed between the Ruſſians and Turks.

The Britiſh parliament having paſſed an act, laying a duty of three pence per pound upon all teas imported into America; the coloniſts, conſidering this as a grievance, deny the right of the Britiſh parliament to tax them.

1775 Deputies from the ſeveral American colonies meet at Philadelphia, and aſſume the title of "The Congreſs of the United Colonies of America."

April 19, The firſt action happens in America between the king's troops and the provincials at Lexington.

June 17, A bloody action at Bunker's Hill, between the royal troops and the Americans.

1776 March 17, The town of Boſton evacuated by the king's troops.

An unſucceſsful attempt, in July, made by commodore Sir Peter Parker, and lieutenant general Clinton, upon Charles Town, in South Carolina.

The Congreſs declare the American colonies Free and Independent States, July 4.

The Americans are driven from Long Iſland, New York, in Auguſt, with great loſs, and great numbers of them taken priſoners; and the city of New York is afterwards taken poſſeſſion of by the king's troops.

December 25, General Waſhington takes 900 of the Heſſians priſoners at Trenton.

1777 General Howe takes poſſeſſion of Philadelphia.

Lieutenant-general Burgoyne is obliged to ſurrender his army, at Saratoga, in Canada, by convention, to the American army under the command of the generals Gates and Arnold, October 17.

1778 A treaty of alliance concluded at Paris between the French king and the thirteen united American colonies, in which their independence is acknowledged by the court of France, February 6.

The remains of the earl of Chatham interred at the public expence in Weſtminſter Abbey, June 9, in conſequence of a vote of parliament.

The earl of Carliſle, William Eden, Eſq. and George Johnſtone, Eſq. arrive at Philadelphia, at the beginning of June, as commiſſioners for reſtoring peace between Great Britain and America.

Philadelphia evacuated by the king's troops, June 18.

The congreſs refuſe to treat with the Britiſh commiſſioners, unleſs the independence of the American colonies was firſt acknowledged, or the king's fleet and armies withdrawn from America.

An engagement fought off Breſt between the Engliſh fleet under the command of admiral Keppel, and the French fleet under the command of the count d'Orvilliers, July 27.

Dominica taken by the French, September 7.

Pondicherry ſurrenders to the arms of Great Britain, October 17.

St. Lucia taken from the French, December 28.

1779 St. Vincent's taken by the French.

Grenada taken by the French, July 3.

1780 Admiral Rodney takes twenty-two ſail of Spaniſh ſhips, January 8.

The ſame admiral alſo engages a Spaniſh fleet under the command of Don Juan de Langara, near Cape St. Vincent, and takes five ſhips of the line, one more being driven on ſhore, and another blown up, January 16.

Three actions between admiral Rodney and the count de Guichen, in the Weſt Indies, in the months of April and May; but none of them deciſive.

Charles-Town, South Carolina, ſurrenders to Sir Henry Clinton, May 4.

Penſacola, and the whole province of Weſt Florida, ſurrender to the arms of the king of Spain, May 9.

The Proteſtant Aſſociation, to the number of 50,000, go up to the Houſe of Commons, with their petition for the repeal of an act paſſed in favour of the Papiſts, June 2.

That event followed by the moſt daring riots in the cities of London and Southwark, for ſeveral ſucceſſive days, in which ſome Popiſh chapels are deſtroyed, together with the priſons of Newgate, the King's Bench, the Fleet, ſeveral private houſes, and other edifices: but theſe alarming riots are at length ſuppreſſed by the interpoſition of the military, and many of the rioters tried and executed for felony.

Five Engliſh Eaſt Indiamen, and fifty Engliſh merchants ſhips bound for the Weſt Indies, taken by the combined fleets of France and Spain, Auguſt 8.

Earl Cornwallis obtains a ſignal victory over general Gates, near Camden, in South Carolina, in which above 1000 American priſoners are taken, Auguſt 16.

Mr. Laurens, late preſident of the congreſs, taken in an American packet, near Newfoundland, September 3.

General Arnold deſerts the ſervice of the Congreſs, eſcapes to New York, and is made a brigadier-general in the royal ſervice, September 24.

Major André, adjutant-general to the Britiſh army, hanged as a ſpy at Tappan, in the province of New York, October 2.

Mr. Laurens is committed priſoner to the Tower, on a charge of high treaſon, October 4.

Dreadful hurricanes in the Weſt Indies, by which great devaſtation is made in Jamaica, Barbadoes, St. Lucia, Dominica, and other iſlands, October 3 and 10.

A declaration of hoſtilities publiſhed againſt Holland, December 20.

1781 The Dutch iſland of St. Euſtatia taken by admiral Rodney and general Vaughan, February 3.

Earl Cornwallis obtains a victory, but with conſiderable loſs, over the Americans under general Green, at Guildford, in North Carolina, March 15.

The iſland of Tobago taken by the French, June 2.

A bloody engagement fought between an Engliſh ſquadron under the command of admiral Parker, and a Dutch ſquadron under the command of admiral Zoutman, off the Dogger-bank, Auguſt 5.

Earl Cornwallis, with a conſiderable Britiſh army, ſurrendered priſoners of war to the American and French troops, under the command of general Waſhington, and count Rochambeau, at York Town, in Virginia, October 19.

Trincamale, on the iſland of Ceylon, taken by admiral Hughes, January 11.

The iſland of Nevis, in the Weſt Indies, taken by the French, January 14.

1782 Minorca ſurrendered to the arms of the king of Spain, February 25.

The iſland of St. Chriſtopher taken by the French, February 13.

The Houſe of Commons addreſs the king againſt any farther proſecution of offenſive war on the continent of North America, March 1.

The Houſe of Commons reſolve, that that Houſe would conſider all thoſe as enemies to his Majeſty, and this country, who ſhould adviſe, or by any means attempt, the further proſecution of offenſive war on the continent of North America, for the purpoſe of reducing the revolted colonies to obedience by force.

Admiral Rodney obtains a ſignal victory over the French fleet, under the command of the count de Graſſe, near Dominica, in the Weſt Indies, April 12.

Admiral Hughes, with eleven ſhips, beat off, near the iſland of Ceylon, the French admiral Suffrein, with twelve ſhips of the line, after a ſevere engagement, in which both fleets loſt a great number of men, April 13.

Proviſional articles of peace ſigned at Paris between the Britiſh and American commiſſioners, by which the Thirteen United American colonies are acknowledged by his Britannic majeſty to be free, ſovereign, and independent ſtates, November 30.

1783 Preliminary articles of peace between his Britannic majeſty, and the kings of France and Spain, ſigned at Verſailles, January 20.

1783 Ratification of the definitive treaty of peace between Great Britain, France, Spain, and the United States of America, September 3.

Britiſh fiſhing ſociety incorporated.

1784 The definitive treaty with Holland was ſigned at Paris, on the 20th of May; and in the beginning of July, proclamation of peace between Great Britain and the United Provinces, and alſo with the United States of America, which was read by the city common crier at the Royal Exchange, and other public places of the metropolis, and a day of thankſgiving was appointed for the 29th on that memorable occaſion.

Advices were ſoon after received of the peace being ſigned between the Eaſt India company and Tippoo Saib, an event that was followed by the royal aſſent being given to Mr. Pitt's Eaſt India regulating bill.

1786 The firſt material incident that occurred this year, was the melancholy fate of the Halſewell Eaſt Indiaman, Richard Pierce, commander; and on January 3, Tueſday morning, ſhe ſprung a leak. In this deplorable ſituation ſhe continued, expoſed to violent winds and a raging ſea, when ſhe ſtruck on the rocks near Seacombe, on the iſland of Purbeck; and, in two hours after, not an atom of her was to be ſeen. One hundred and ſeventy men were ſuppoſed to have got on ſhore; but, from the darkneſs of the morning, and ſurging of the ſea, the greateſt part of them were daſhed to pieces and drowned.

Beſides the captain, his two daughters, five other young ladies, and the firſt, fourth, and fifth mates, were all loſt, together with about 160 or 170 ſeamen and ſoldiers.

His Royal Highneſs the prince of Wales, in conſequence of the diſappointment of an addition made to his revenue this ſeſſion, by parliament, on the 9th of July dropt his eſtabliſhment, and appointed four gentlemen to arrange his affairs, and appropriate the greater part of his income to the payment of his debts.

An attempt was made on the life of his majeſty, on the 2d day of Auguſt, by one Margaret Nicholſon, as he was alighting from his carriage at the gate of St. James's palace. This woman had been obſerved to wait the king's arrival for ſome time, and, previous to the appearance of the carriage, had taken her ſtation between two women that were unknown to her. On the ſight of the carriage ſhe begged with ſome earneſtneſs, that they would not impede her from delivering a memorial to his majeſty. As the king was alighting, ſhe puſhed forward, and preſented a paper, which his majeſty received with great condeſcenſion. At that inſtant ſhe ſtruck a concealed knife at the king's breaſt, which his majeſty happily avoided by bowing as he received the paper. As ſhe was making a ſecond thruſt, one of the yeomen caught her arm; and, at the ſame inſtant, one of the king's footmen wrenched the knife out of her hand. His majeſty with amazing temper and fortitude, exclaimed, "*I have received no injury, Do not hurt the woman; the poor creature appears inſane.*" The woman was immediately taken into cuſtody, and, upon examination, appeared to be inſane; in conſequence of which ſhe was afterwards ſent to the hoſpital of Bethlehem.

On the 19th of September a plan was ſet forth for eſtabliſhing a colony in Botany bay, in New Holland, for the convenience of tranſporting convicts, and with a future view of improving and cultivating the ſoil, ſo as to render it beneficial to Great Britain. But the perſons who embarked on the expedition, finding themſelves much diſappointed in the fertility of the ſoil of Botany Bay, transferred their operations to Port Jackſon; for an account of which, its produce, arrangements, &c. See Bank's Geography, No. I.

1786 In the courſe of this month, a commercial treaty with France was ſigned at Verſailles by Mr. Eden and Monſieur Vergennes, as miniſters plenipotentiary for their reſpective kings.

1787 Diſputes in the republic of the United Provinces of Holland. The malecontents, deſirous of abridging the Stadtholder of his power, become turbulent, and offer the higheſt indignities to his royal conſort, ſiſter to the king of Pruſſia. His Britannic Majeſty takes every method to effect the reſtoration of tranquility, and the maintenance of lawful government among them, and as the French king had promiſed the party that had uſurped the government of Holland, his aſſiſtance, the Britiſh forces by ſea and land are augmented with the greateſt alacrity. The exertions of the Pruſſian troops under the duke of Brunſwick in the mean time obtain reparation for the inſult offered to the ſiſter of their ſovereign, and the re-eſtabliſhment of lawful government in the United Provinces. Explanation takes place between the courts of London and Verſailles, they mutually diſarmed and tranquility is reſtored.

1788 On the 17th of January Lord George Gordon, having been found guilty, in the month of June foregoing, in the court of King's Bench, of publiſhing two libels, one againſt the queen of France, and the other againſt the criminal juriſprudence of this country, was ſentenced to three years impriſonment in Newgate, then to pay a fine of 500 l. and find ſecurity for his good behaviour for fourteen years.

On the 31ſt died, at Rome, Prince Charles Lewis Caſſimir Stewart, who, ſince the death of his father in 1765, aſſumed to himſelf the title of king of England. He was commonly known on the continent by the name of the Chevalier de St. George, and in England by that of the young Pretender. He was juſt 67 years and two months old on the day of his death.

This perſon was ſon to James Francis, prince of Wales, ſon to James II. who was recognized, by ſeveral courts of Europe, as king of England, immediately after the death of his father. As ſuch he received kingly honours, had his palace and his guards, and enjoyed the privilege allowed by the Pope to catholic kings, of beſtowing a certain number of cardinals hats. But his ſon, prince Charles, who lately died, did not enjoy thoſe honours. He was, indeed, called prince of Wales, during the life of his father; but, after that event, he no longer bore that title; nor would the catholic courts ſtile him king.

His mother was the greateſt fortune in Europe. She was the princeſs Maria Clementina Sobieſki, grand daughter of the famous John Sobieſki, king of Poland, who beat the Turks near Vienna, made them raiſe the ſiege of that capital, and thus ſaved Chriſtendom from deſtruction.

Great part of her fortune, which amounted to a million ſterling, was loſt in the fruitleſs attempt made by her ſon, in 1745, to place his father on the throne of England. She had two ſons by her huſband; Charles, who lately died, and Henry Benedict, who, by his father, was created duke of York, and who, having been promoted to the purple, has been generally known by the name of Cardinal York.

The elder ſon married, ſome years ago, a princeſs of Stolberg, in Germany; but by her, who is ſtill alive, he has no iſſue. He has left, however, a natural daughter, whom, by his pretended royal power, he lately created ducheſs of Albany, and to whom he has bequeathed all the property he had in the French funds, which was very conſiderable. To his brother, the cardinal, he bequeathed his empty pretenſions to the crown of England.

On the 13th of June a proviſional treaty of defenſive alliance was ſigned between the miniſters plenipotentiary of their majeſties the kings of Great Britain and Pruſſia.

Cheltenham, viſited by George III. July 12.

Dr. Franklin of Philadelphia, died January 16.

His Majeſty indiſpoſed from October 1788 to March 1789.

1789 His Majeſty's viſit of thankſgiving at St. Paul's, April 23.

General illumination on the king's recovery, April 24.

Great inſurrections in Paris. Monſieur Neckar diſmiſſed from his employments. The populace arm, and joined by the military, force the convent of St. Lazare. The hoſpital of invalids ſurrenders. The Baſtile aſſaulted. The guard by the governor's order fire on the people, who ruſhing forward to the aſſault, make a breach in the gates and capture the place. The governor (Marquis de Launay) ſeized and beheaded, and his head carried on a pike through the ſtreets of Paris.

Theſe inſurrections originated from the body of the people, being long oppreſſed by the burthen of enormous taxes, from which the nobility and clergy were exempt, and of which they inſiſted on their bearing a proportionate part. Having carried their point in ſubjecting the two ſuperior claſſes to taxation, the people contended for a right of repreſentation, as forming one of the three eſtates, according to the conſtitution of Great Britain. This being oppoſed by Government, tumults took place, and the popular party eventually prevailed; the Court relaxing in their ſeverities, and the King having made ſuch conceſſions as ſeem to foretel the abolition of abſolute monarchy and eſtabliſhment of a free, and conſequently an happy conſtitution.

It is remarkable, that notwithſtanding the Salique law, which precludes females from any ſhare of the government in France; the preſent queen, with the count d'Artois, were at the head of the faction ſo inimical to the rights of the people, and when the king, after his conceſſion to the ſtates, ſhewed himſelf to the populace at Verſailles, and was kindly received by them with repeated huzzas, and *vive le roi*, the queen preſuming, on this favourable reception of her conſort, advanced to his ſide, and preſented herſelf to the view of the people; but was obliged immediately to retire on account of the various inſults ſhe received.

It is likewiſe worthy of obſervation, that the Duke d'Orleans, who is extremely attached to the Engliſh nation, ſpeaks the Engliſh language fluently, and has been much at the Britiſh court, is the moſt popular man in the French dominion.

Newtonian Principles of CHRONOLOGY.

Sir Iſaac Newton has ſhewn, that the chronology of ancient kingdoms is involved in the greateſt uncertainty; that the Europeans in particular had no chronology before the Perſian empire, which began five hundred and thirty-ſix years before Chriſt, when Cyrus conquered Darius the Mede; that the antiquities of the Greeks are full of fables, becauſe their writings were in verſe only, till the conqueſt of Aſia by Cyrus the Perſian, about which time Pherecydes Syrius, and Cadmus Mileſius introduced proſe. After this time ſeveral of the Greek hiſtorians introduced the computation by generations. The chronology of the Latins was ſtill more uncertain: their old records were burnt by the Gauls a hundred and twenty years after the expulſion of their kings, ſixty-four years before the death of Alexander the Great, and before Chriſt 388. The chronologers of Gaul, Spain, Germany, Scythia, Sweden, Britain, and Ireland, are of a ſtill later date. For Scythia, beyond the Danube, had no letters, till Ulphilas, their biſhop, formed them, about ſix hundred years after the death of Alexander the Great, or about A. D. 276. Germany had none, till it received them from the weſtern empire of the Latins, about A. D. 400. The Huns had none in the days of Procopius, about A. D. 526. Sweden and Norway received them ſtill later.

Sacred CHRONOLOGY.

The ſyſtems of ſacred chronology have been very various. Nor is this to be wondered at, ſince our three biblical copies of principal note give a very different account of the firſt ages of the world. The Hebrew text reckons about 4000 years from Adam to Chriſt, and to the flood 1656 years; the Samaritan makes this interval longer, and reckons from Adam to the flood only 1307 years; and the verſion of the Septuagint removes the creation of the world to 6000 years before Chriſt. The interval between the creation and flood, according to Euſebius and the Septuagint, is 2242 years; according to Joſephus and the Septuagint 2256 years; and according to Julius Africanus, Epiphanius, Petavius, and the Septuagint, it is reckoned at 2262 years. Many attempts have been made to reconcile theſe differences; but none are quite ſatisfactory.

Chineſe CHRONOLOGY. No nation has boaſted more of its antiquity than the Chineſe: in their computation they make uſe of a cycle of ſixty years, called kiatſe, from the denomination given to the firſt year of it, which ſerves as the baſis of their whole chronology. Every year of this circle is marked with two letters, which diſtinguiſh it from the others; and all the years of the emperors for above two thouſand years, have names in hiſtory common to them with the correſponding years of the cycle. Phil. Tranſ. abr. vol. viii. part iv. p. 13, &c. According to M. Freret, in his eſſays, the Chineſe date the epocha of Yao, one of their firſt emperors, about the year 2145, or as others ſtate it, 2057 years before Chriſt; and reckon their firſt aſtronomical obſervations, and the compoſition of their famous calendar, to have preceded Yao a hundred and fifty years: and thence it is inferred, that the aſtronomical obſervations of the Chineſe and Chaldeans coincide.

Later authors date the riſe and progreſs of the ſciences in China from the grand dynaſty of Teheou, about twelve hundred years before the Chriſtian æra, and ſhew that all hiſtorical relations of events prior to the reign of Yao are fabulous. Mem. de l'Hiſtoire des Sciences, &c. Chinois; a work compiled by the miſſionaries of Pekin, vol. i. Paris, 1776. But it may be expected that ſome new light will be thrown on this obſcure and uncertain ſubject of inveſtigation by the general hiſtory of China, in 12 vol. 4to. announced to the public by the abbe Groſſier.

CHRONOMETER, or CHROMETER, as it is ſometimes writen, a general name for any inſtrument uſed in the meaſuring of time.

The word is compoſed of χρονος, time, and μετρον, meaſure.

In this ſenſe, clocks, watches, dials, &c. are chronometers; though there are ſome other inſtruments peculiarly called by the name chronometer; particularly one deſcribed by M. Sauveur, in his Principles of Acouſtics; ſo contrived as to meaſure a ſmall part of time very exactly, even to the ſixteenth part of a ſecond.

We have a deſcription of one of theſe, made by the ingenious Mr. George Graham, in Deſaguliers's Experim. Philoſoph. Tranſ. vol. i. p. 373, 374.

A chronometer is of great uſe for meaſuring ſmall parts of time in aſtronomical obſervations, the time of the fall of bodies, the velocity of running waters, &c. But long ſpaces of time cannot be meaſured by it with ſufficient exactneſs, unleſs its pendulum be made to vibrate in a cycloid; becauſe, otherwiſe, it is liable to err conſiderably, as all clocks are which have ſhort pendulums that ſwing large arcs of a circle.

CHRONOSCOPE, a word ſometimes uſed for a pendulum, or machine, to meaſure time.

The word is formed of χρονος, time, and σκεϖτομαι, I conſider.

CHROSTASIMA, in natural hiſtory, a name uſed by Dr. Hill, for all pellucid jems, which have one ſimple and permanent appearance in all lights.

Of this kind are the diamond, the carbuncle, the amethiſt, the ſapphire, the beril, emerald, and the topaz.

CHRYSALIS, a term uſed by modern writers of natural hiſtory of inſects, in the ſame ſenſe with nympha and aurelia.

The word ſeems to imply a peculiar yellow, uſually in the nymphæ of ſome ſpecies of inſects: from χρυσος, gold: but this is purely accidental, and is not found in all nymphæ.

Some confine the word chyſalis to the nymphæ of butterflies and moths.

CHRYSANTHEMUM, baſtard, in botany, ſilphium, a genus of the ſyngeneſia polygamia neceſſaria claſs. There are four ſpecies, natives of America.

CHRYSANTHEMUM, hard-ſeeded, chryſanthemoides, or oſteeſpermum, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs.

Miller enumerates five ſpecies, ſome of which are brought from America, and others from the Cape of Good Hope.

CHRYSARGYRUM, a tribute formerly levied on courteſans, and perſons of ill fame.

Hoffman ſays, it was paid in gold and ſilver; whence its name χρυσος, *gold*, and αργυρος, *ſilver*.

CHRYSITES, a name given by the ancients to yellow litharge, ſuch as we call litharge of gold. We diſtinguiſh this only in regard to the colour, and ſo did the ancient Greeks; but Avicenna and the reſt of the Arabians have uſed this word only for the name of ſuch litharge as was made from gold, or whatever colour it happened to be: the reſt they called by the name of argyrites, as they tell us, whether it was made of ſilver, copper, or even of the marcaſite melted, and refined by lead.

CHRYSOBERYL, a precious ſtone; being a kind of pale beryl, with a tincture of yellow.

CHRYSOCOLLA, in the materia medica of the ancients, the name of a fine green arenaceous powder, properly one of the ſaburræ, and found on the ſhores of the Red Sea, on thoſe of ſome parts of America, and in Ruſſia; mentioned by the ancients. It ſerves to the ſoldering of gold and other metals, and given internally as a violent and dangerous emetic.

It is of a very elegant colour, ferments violently with aqua fortis, and is wholly diſſolved by it, and tinges it with a bluiſh green: and being calcined, it loſes all its green colour.

CHRYSOGONON, or CHRYSOGONUM, in botany, a name by which ſome authors have expreſſed the moth mullein, or blattaria. In the Linnæan ſyſtem, it is a diſtinct genus of the ſyngeneſia polygamia neceſſaria claſs.

CHRYSOLITE, with us, a precious ſtone, of a duſky green colour, with a caſt of yellow.

The chryſolite of the ancients was no other than the topaz of the moderns; even in its moſt pure and perfect ſtate, it is a gem of ſmall beauty, and of no great value.

The chryſolite has been found to exhibit electrical appearances ſimilar to thoſe of the tourmalin. The fluid moves always along the ſlender threads or columns, which form the grain of it, without ſuffering any change from their direction; one end being electrified plus, and the other minus. Phil. Tranſ. vol. lii. p. 445.

CHRYSOMELA, in entomology, a genus of inſects frequently confounded with the beetles, the antennæ of which are made in form of bracelets, or necklaces of beads, and are thickeſt toward their extremity: the body, in figure, approaches to oval, and the thorax is oblong and rounded. Of this genus Dr. Hill enumerates a great many ſpecies.

CHRYSOLITE is a general name, which the ancients gave to all precious ſtones, wherein the yellow, or golden, was the prevailing colour.

We know but few of theſe chryſolites now; or rather, they are referred to the ſpecies of ſtones which they approach the neareſt to: the green to the emerald, the red to the ruby; and ſo of the reſt.

CHRYSOLITE *Paſte.* The way of making an artificial chryſolite paſte is this: take of prepared chryſtal two ounces, ordinary red lead eight ounces; mix theſe well together, and add crocus martis made with vinegar, twelve grains: mix all together; put them into a crucible, lute it over, and bake the whole for twenty-four hours, or longer, in a potter's kiln, and it will produce a very elegant reſemblance of the true chryſolite.

CHRYSOMELA, in entomology, a genus of inſects, belonging to the order of coleoptera. The antennæ are ſhaped like bracelets, and thicker on the outſide; and neither the breaſt nor the elytra are marginated. There are no leſs than 122 ſpecies enumerated by Linnæus, principally diſtinguiſhed by differences in their colour.

CHRYSOPIS, the golden eye, in natural hiſtory, the name of a ſpecies of fly, ſo called from the beautiful gold colour of its eyes. It is a long bodied fly, with extremely thin and tranſparent wings of a ſilvery colour, with green ribs or nerves; the body is green, and the antennæ very ſlender and blackiſh. This is a very ſlow flyer, and is common in gardens; it is frequently found on the common elder; it is of a very ſtrong ſmell.

CHRYSTAL. See CRYSTAL.

CHUB, the Engliſh name for the fiſh called the capito an cephalus by authors, and by ſome of the ancient Romans ſqualus. It is, according to the Artedian and Linnæan ſyſtem, a ſpecies of the cyprinus.

The reſorts of this fiſh are eaſily found; for they are generally holes overſhaded by trees, and this fiſh will be ſeen floating in ſuch almoſt on the ſurface of the water in a hot day in great numbers. They are but a poor fiſh for the table, and are very full of bones; but they entertain the angler very much, and are of the number of thoſe that are eaſily taken. The beſt manner of fiſhing for him is thus: prepare a very ſtrong rod of a ſufficient length; fix to the hook a graſshopper; place yourſelf ſo as to be perfectly out of ſight of the fiſh, and drop in the bait about two feet from the place where a large chub lies; if he does not ſee the angler he very ſeldom fails biting, and is immediately taken; but he is ſo ſtrong a fiſh that he ſhould be taken out carefully, after a great deal of playing, otherwiſe the tackle will be in danger; a beetle, or any large fly, will anſwer the purpoſe in the place of a graſshopper; and if none of them are to be had, the method of fiſhing muſt be altered, and the line be long enough for fiſhing at the bottom. In March and April the fiſh is to be caught with large red worms; in June and July with flies, ſnails, and cherries; but in Auguſt and September the proper bait is good cheeſe pounded in a mortar, with ſome ſaffron, and a little butter: ſome make paſte of cheeſe and Venice turpentine for the chub in winter, at which ſeaſon this fiſh is better than at any other; the bones are leſs troubleſome in this ſeaſon, and the fleſh is firmer and better taſted; the row is alſo well flavoured in general. The angler muſt keep his bait for this fiſh at the bottom in cold weather, and near the top in hot, and the fiſh will bite eagerly.

CHUPMESSAHITES, a ſect among the Mahometans who believe that Jeſus Chriſt is God, and the true Meſſiah, the redeemer of the world; but without rendering him any public, or declared worſhip.

The word in the Turkiſh language, ſignifies, *protector of the Chriſtians*.

Ricaut ſays, there are abundance of theſe *Chupmeſſahites* among the people of faſhion in Turky, and ſome even in the ſeraglio.

CHURCH has different ſignifications, according to the different ſubjects to which it is applied.

1. It is underſtood of the collective body of Chriſtians, or all thoſe over the face of the whole earth, who profeſs to believe in Chriſt, and acknowledge him to be the Saviour of mankind. This is what the ancient writers call the catholic or univerſal church. Sometimes the word church is conſidered in a more extenſive ſenſe, and divided into ſeveral branches; as the church militant, is the aſſembly of the faithful on earth; the church triumphant, that of the faithful already in glory; to which the papiſts add the church patient, which, according to their doctrines, is that of the faithful in purgatory.

2. Church is applied to any particular congregation of Chriſtians, who at one time, and in one place, aſſociate together and concur in the participation of all the inſtitutions of Jeſus Chriſt, with their proper paſtors and miniſters. Thus we read of the church of Antioch, the church of Alexandria, the church of Theſſalonica, and the like.

3. Church denotes a particular ſect of Chriſtians diſtinguiſhed by peculiar doctrines and ceremonies. In this ſenſe we ſpeak of the Romiſh church, the Greek church, the Reformed church, the church of England, &c.

4. The word church is uſed to ſignify the body of eccleſiaſtics, the clergy, in contradiſtinction to the laity.

The Greek or Eaſtern CHURCH.

This comprehends the churches of all the countries anciently ſubject to the Greek, or Eaſtern empire; and through which their language was carried, i. e. all the ſpace extended from Greece to Meſopotamia and Perſia, and thence into Egypt; which has been divided ever ſince the emperor Phocas, from the Roman church.

The Greek church, properly ſpeaking, is that ſociety of Chriſtians, who live in religious communion with the patriarch of Conſtantinople; and it is divided into two parties; one of which acknowledges his ſupreme authority and juriſdiction; whilſt the other, though joined with him in communion of doctrine and worſhip, is governed by it's own laws, under the juriſdiction of ſpiritual rulers, independent of all foreign authority.

CHURCH, *Latin* or *Weſtern*, comprehends all the churches of Italy, France, Spain, Africa, the North, and all other countries, whither the Romans carry their language. Great Britain, part of the Netherlands, of Germany, and of the North, have been ſeparated fnom hence ever ſince the time of Henry VIII. and conſtitute what we call the reformed church, and what the Romaniſts call the weſtern ſchiſm.

The Gallican CHURCH.

Denotes the church of France, under the direction and government of it's biſhops and paſtors. This church has always enjoyed certain immunities and franchiſes, not as grants from the pope, but derived to her from her firſt original, which ſhe has carefully maintained. Theſe privileges depend on two maxims; viz. 1. That the pope has no authority or right to command or order any thing, general or particular, in which the temporalities and civil rights of this kingdom are concerned. 2. That notwithſtanding the pope's ſupremacy is owned in caſes purely ſpiritual, yet in France, his power is limited and regulated by the decrees and canons of ancient councils received in that realm.

High CHURCH

Was a denomination originally given to thoſe, otherwiſe called nonjurors, who refuſed to acknowledge the title of William III. to the crown of Great Britain, under a notion that James II. though excluded, was ſtill their rightful ſovereign. This appellation was given them, becauſe they entertained high notions of the dignity and power of the church, and the extent of its prerogatives and juriſdiction. And thoſe, on the contrary, of more moderate principles, are ſtyled low churchmen.

The New Jeruſalem CHURCH.

This church is ſo called, becauſe it is ſaid to be that ſignified by the New Jeruſalem in the Revelation of St. John.

Emanuel Swedenborg, the founder of this New church, whoſe tenets are peculiarly diſtinct from every other ſyſtem of divinity in Chriſtendom, ſays his doctrines are taken from the holy ſcriptures, and grounded in philoſophy. The author points out an intire new and ſingular way of reconciling the apparent contradictions in ſcripture, by having recourſe to two kinds of truth, which he diſtinguiſhes into genuine and apparent. He maintains, that the holy ſcripture, as well as every thing in nature, is reſolvable into one or the other of theſe two kinds of truth. Thus when it is ſaid, that the ſun riſes or ſets, this is only an apparent truth, as the genuine truth is, that the earth revolves round it's own axis, and cauſes that appearance: yet there is no impropriety in ſpeaking according to appearances; nay, it would be a manifeſt abſurdity, in the above inſtance, to ſpeak in common converſation according to the genuine truth. Juſt ſo (ſays Swedenborg) it is with the ſcriptures, which are written in a ſtyle adapted to the comprehenſion of the ſimple, and in many parts are not genuine, but apparent truths. Thus, when it is ſaid, that God is angry, and revengeful, that he puniſhes and caſts into hell, we are to underſtand, that it is man who is angry with God, and that it is man who brings puniſhment upon himſelf, and caſts himſelf into hell. So in numberleſs other paſſages to the ſame purpoſe; and particularly in the New Teſtament, where the Father, Son, and Holy Ghoſt, are mentioned apparently as three diſtinct perſons (which, the author maintains, naturally leads to the idea of three Gods), when the genuine truth is, that there is only one God in one perſon.

Theſe, and a variety of other points equally new and extraordinary, are treated very copiouſly by the author in his theological works. But as they are voluminous, and many of our readers may not have had an opportunity of conſulting them, we ſhall here ſtate the principal doctrines of the New Church, which have been collected with great care from the whole of his writings, and are contained in the following ſummary.

1. Contrary to Unitarians who deny, and to Trinitarians who hold, a Trinity of perſons in the Godhead, they maintain, that there is a Divine Trinity in the perſon of Jeſus Chriſt, conſiſting of Father, Son, and Holy Ghoſt, juſt like the human Trinity in every individual man, of ſoul, body, and operation; and that as the latter Trinity conſtitutes one man, ſo the former Trinity conſtitutes one Jehovah God, who is at once the Creator, Redeemer, and Regenerator.

2. That Jehovah God himſelf came down from heaven, and aſſumed human nature for the purpoſe of removing hell from man, of reſtoring the heavens to order, and of preparing the way for a new church upon earth; and that herein conſiſts the true nature of redemption, which was effected ſolely by the omnipotence of the Lord's Divine Humanity.

3. They hold the notion of pardon obtained by a vicarious ſacrifice or atonement, as a fundamental and fatal error; but that repentance is the foundation of the church in man, that it conſiſts in a man's abſtaining from all evils, becauſe they are ſins againſt God, &c. that it is productive of regeneration, which is not an inſtantaneous, but a gradual work, effected by the Lord alone, through charity and faith, during man's co-operation.

4. That man has free will in ſpiritual things, whereby he may join himſelf by reciprocation with the Lord.

5. That the imputation of the merits and righteouſneſs of Chriſt is a thing as abſurd and impoſſible, as it would be to impute to any man the work of creation; for the merits and righteouſneſs of Chriſt conſiſt in redemption, which is as much the work of a divine and omnipotent Being, as creation itſelf. They maintain, however, that the imputation, which really takes place, is an imputation of good and evil; and that this is according to a man's life.

6. That the doctrine of predeſtination and juſtification by faith alone, is a mere human invention, and not to be found in the Word of God.

7. That the two ſacraments of baptiſm and the holy ſupper are eſſential inſtitutions in the new church, the genuine and rational uſes of which are now diſcovered, together with the ſpiritual ſenſe of the holy Word.

8. That there is not a ſingle genuine truth remaining in the old church, but what is falſified, and that therefore the old and the new church cannot poſſibly be reconciled together.

9. That the holy Word or ſacred Scripture contains a threefold ſenſe, namely celeſtial, ſpiritual, and natural, which are united by correſpondencies; and that in each ſenſe, it is divine truth, accommodated reſpectively to the angels of the three heavens, and alſo to men on earth.

10. That the books of the Word (or the Scriptures) are thoſe which have the internal ſenſe, and are, the five books of Moſes (Geneſis, &c.), the books of Joſhua, Judges, Samuel, Kings, the Pſalms, and all the Prophets; alſo, the four Evangeliſts, and the Revelation; and that the other books (namely, the book of Ruth, the Chronicles, Ezra, Nehemiah, Eſther, Job, Proverbs, Eccleſiaſtes, Song of Solomon, in the Old Teſtament; and the Acts, together with all the Epiſtles, in the New), not having the internal ſenſe, are not the word, or divine revelation.

11. That in the ſpiritual world there is a ſun diſtinct from that of the natural world, the eſſence of which is pure love from Jehovah God, who is in the midſt thereof; that the heat alſo proceeding from that ſun is in it's eſſence love, and the light thence proceeding is in it's eſſence wiſdom; and that by the inſtrumentality of that ſun all things were created, and continue to ſubſiſt, both in the ſpiritual and in the natural world.

12. They maintain, that there is not in the univerſal heaven a ſingle angel that was created ſuch at firſt, nor a ſingle devil in all hell, that had been created an angel of light, and was afterwards caſt out of heaven; but that all both in heaven and hell are of the human race, in heaven ſuch as had lived in the world in heavenly love and faith, and in hell ſuch as had lived in helliſh love and faith.

13. That the material body never riſes again; but that man, immediately on his departure from this life, riſes again as to his ſpiritual or ſubſtantial body (which was incloſed in his material body, and formed from his predominant love, whether it be good or evil), wherein he continues to live as a man, in a perfect human form, in all reſpects as before, ſave only the groſs material body, which he puts off by death, and which is of no further uſe.

14. That the ſtate and condition of man after death is according to his paſt life in this world; and that the predominant love, which he takes with him into the ſpiritual world, continues with him for ever, and can never be changed to all eternity; conſequently if it be good, he abides in heaven to all eternity; but if evil, he abides in hell to all eternity.

15. That true conjugal love, which can only ſubſiſt between one huſband and one wife, is a primary characteriſtic of the new church, being grounded in the marriage of goodneſs and truth, and correſponding with the marriage of the Lord and his church; and therefore it is more celeſtial, ſpiritual, holy, pure, and clean, than any other love in angels or men.

16. That the ſcience of correſpondencies (which has been loſt for ſome thouſands of years, but is now revived in the theological works of the Hon. Emanuel Swedenborg), is the only key to the ſpiritual or internal ſenſe of the holy word, every page of which is written by correſpondencies, that is, by ſuch things in the natural world as correſpond unto and ſignify things in the ſpiritual world.

17. That all thoſe paſſages in Scripture, generally ſuppoſed to ſignify the deſtruction of the world by fire, &c. commonly called the laſt judgment, muſt be underſtood according to the above ſcience, which teaches, that by the end of the world, or conſummation of the age, is not ſignified the deſtruction of the world, but the deſtruction or end of the preſent Chriſtian church, both among Roman Catholics and Proteſtants of every deſcription; and that this laſt judgment actually took place in the ſpiritual world in the year 1757.

18. That the ſecond advent of the Lord, which is a coming, not in perſon, but in the ſpiritual or internal ſenſe of his holy word, has already commenced; that it is effected by means of his ſervant Emanuel Swedenborg, before whom he hath manifeſted himſelf in perſon, and whom he hath filled with his ſpirit, to teach the doctrines of the new church by the word from him; and that this is what is meant in the Revelation by the new heaven and new earth, and the New Jeruſalem thence deſcending.

Such are the general outlines of the doctrines of the New Jeruſalem church, which we have taken ſome pains to collect from the beſt authority, and on the merits of which we ſhall leave to the judgment of our readers to decide.

As a ſpecimen of the author's mode of interpreting the ſcripture, we ſhall ſelect a paſſage on the ſubject of the reſurrection, from the beginning of his treatiſe on heaven and hell, which is as follows:

"In our Lord's diſcourſe with his diſciples on the conſummation of the age, or laſt time of the church, at the end of his prophecies concerning it's ſucceſſive ſtates in regard to love and faith, he ſaith thus: "Immediately after the tribulation of thoſe days ſhall the ſun be darkened, and the moon ſhall not give her light, and the ſtars ſhall fall from heaven, and the powers of the heavens ſhall be ſhaken; and then ſhall appear the ſign of the Son of man in heaven: and then ſhall all the tribes of the earth mourn, and they ſhall ſee the Son of man coming in the clouds of heaven with power and great glory: and he ſhall ſend his angels with a great ſound of a trumpet, and they ſhall gather together his elect from the four winds, from one end of heaven to the other." Matt. xxiv. 29, &c. They who underſtand theſe words according to the ſenſe of the letter, ſuppoſe that all theſe things are to come to paſs, as they are literally deſcribed, at that time which is called the laſt judgment; and accordingly, not only that the ſun and moon ſhall be darkened, the ſtars fall from heaven, the ſign of the Lord appear in heaven, and that they ſhall ſee him in the clouds and with him his angels with trumpets; but alſo, according to predictions of the like ſound in other parts of the ſacred writings, that the whole viſible world ſhall periſh, and be ſucceeded by a new heaven and a new earth; and this is the general belief of Chriſtians at this time. But all ſuch are ſtrangers to the interior of the Scriptures, which have a hidden ſenſe throughout, holding forth to us things ſpiritual and heavenly, by ſuch as are natural and mundane in the expreſſion of the letter; and this not only in ſentences taken collectively, but alſo in every particular word: for the ſcriptures are written intirely according to correſpondencies, in order to repreſent to us inward and ſpiritual things, by ſuch as are outward and natural, as will evidently appear by what is delivered and ſhewed in many places concerning this ſenſe. According to which, we are to underſtand the things of which our Lord ſpeaks, in the place before cited, concerning his coming in the clouds of heaven; viz. by the ſun there being darkened, is ſignified the Lord in regard to love: by the moon, the Lord with regard to faith: by ſtars, the knowledges of goodneſs and truth, or love and faith: by the ſign of the Son of man in heaven, the manifeſtation of divine truth: by the tribes of the earth mourning, all particulars and circumſtances relating to goodneſs and truth, or love and faith: by the coming of the Lord in the clouds of heaven with power and glory, his preſence in the word, and right interpretation of it; clouds ſignifying the literal, and glory the inward and ſpiritual ſenſe of the word: and by angels with a trumpet giving a loud ſound, is ſignified heaven, and divine truth proceeding thence. Hence we are given to underſtand by theſe words of our Lord, that at the conſummation of the age, or end of the church period, when there ſhall be no longer faith or charity on earth, the Lord will open the ſcriptures in their ſpiritual ſenſe, and reveal the heavenly ſecrets therein contained."

His principal works, written originally in Latin, are the following:

1. Arcana Cœleſtia, or heavenly myſteries contained in the ſacred Scriptures, being an explanation of the books of Geneſis and Exodus.

2. A treatiſe on heaven and hell; or an account of the wonderful things therein heard and ſeen.

3. Of the New Jeruſalem, and its heavenly doctrine.

4. Of the laſt judgment, and the deſtruction of Babylon, which took place in the Spiritual World in the year 1757.

5. Of the white horſe mentioned in the apocalypſe.

6. Of the earths or planets in the univerſe, and of their inhabitants.

7. The delights of wiſdom on the ſubject of conjugal love, and the pleaſures of inſanity concerning ſcortatory love.

8. Angelic wiſdom, concerning divine love and divine wiſdom.

9. The doctrine of the new Jeruſalem concerning the Lord; concerning the ſacred Scripture; concerning faith.

10. The doctrine of life for the New Jeruſalem.

11. Continuation of the ſubject on the laſt judgment, and of the ſpiritual world.

12. Angelic wiſdom concerning Divine Providence.

13. The apocalypſe revealed.

14. A brief expoſition of the doctrine of the new church.

15. A treatiſe on the nature of influx, or of the communication between the ſoul and body.

16. True chriſtian religion, or the univerſal theology of the new church.

17. A ſummary expoſition of the internal ſenſe of all the prophets, and the pſalms.

After the above circumſtantial account of the principal doctrines taught by the Swediſh Theologian, which are the doctrines of the New Jeruſalem church, it will be expected we ſhould give a compendious hiſtory of their wonderful author, which we here preſent to our readers.

Emanuel Swedenborg, ſon of Jeſper Swedberg, a Swediſh dignitary, was born at Stockholm, Jan. 29, 1688, and related to ſome of the moſt illuſtrious families in that kingdom: his ſtudies were ſo various in his youth, and his acquiſitions in the mathematics, natural hiſtory, phyſic, chemiſtry, anatomy, &c. ſo rapid, that they ſoon recommended him to the patronage of Charles XII. who made him extraordinary aſſeſſor to the royal college of the mines, &c. which office (he ſays, in a letter to the Rev. Thomas Hartley) he quitted, that he might be at liberty to apply himſelf to that new function to which he had been called. He retained, however, the ſalary annexed to the above office; and declined accepting a place of higher dignity in the ſtate, leſt it ſhould prove a ſnare to him.

"In 1719 (he obſerves in the letter above mentioned)

I was ennobled by Queen Ulrica Eleonora, and named Swedenborg, from which time I have taken my ſeat with the nobles of the equeſtrian order, in the triennial aſſemblies of the ſtates. I am a fellow, by invitation, of the Royal Academy of ſciences at Stockholm; but have never deſired to be of any other community, as I belong to the ſociety of angels, in which things ſpiritual and heavenly are the only ſubjects of diſcourſe and entertainment: whereas, in our literary ſocieties, the attention is wholly taken up with things relating to the body and this world."

It is remarkable, that his firſt publication in 1710 was a collection of poems in Latin verſe; which, though denoting a ſingular vivacity of mind, was not his object, for he afterwards wrote voluminouſly upon the ſciences, particularly metallurgy, &c. and after making at leaſt eight voyages into England and Holland, he finally ſettled in theology. From the latter, as he profeſſed to have frequent converſation with angels and ſouls departed, it ſeems he ſoon attracted the notice of all ranks; and though he had many powerful enemies, they could not deprive him of the protection of the royal family, and the eſteem of all the nobles in his own country. Speaking of his call to teach the doctrines of the New Church, he makes uſe of the following remarkable language: "The Lord himſelf was graciouſly pleaſed to manifeſt himſelf to me his unworthy ſervant, in a perſonal appearance in the year 1743, to open in me a ſight of the ſpiritual world, and to enable me to converſe with ſpirits and angels, and this privilege has continued with me to this day (1769). From that time I began to print and publiſh various unknown arcana, that have been either ſeen by me or revealed to me, concerning heaven and hell, the ſtate of men after death, the true worſhip of God, the ſpiritual ſenſe of the ſcriptures, and many other important truths tending to ſalvation and true wiſdom."

Swedenborg lived in much eſteem with the biſhops and nobles of his own country, and his acquaintance was alſo ſought after by the moſt diſtinguiſhed characters in various parts of Europe, with many of whom he continued to correſpond till his death. He ſuffered, however, the enmity of ſome of the clergy, who, it is ſuppoſed, hired a perſon to aſſaſſinate him, but was diſcovered and prevented, by his dropping a dagger from under his cloak, at the door of the houſe where Swedenborg then was, who never offered to recriminate.

He moſtly reſided, when in London, at a houſe in Bath-ſtreet, Cold Bath-fields, where he died on the 29th of March, 1772, at the advanced age of 84 years.

Some of the followers of theſe doctrines, holding a mental reſervation with reſpect to their declaring themſelves members of the New Church, have maintained, that they are at liberty to continue in connection with the old Church, although in their own minds they diſavow all it's doctrines, and privately inculcate the tenets of the New. Some of the clergy, belonging to the eſtabliſhed church, have adopted this mode of proceeding, either through fear of conſequences, or with a view gradually to inſinuate the doctrines among their congregation.

A diviſion has, in conſequence of this opinion, taken place, and ſeveral of their members, judging ſuch conduct to be inconſiſtent with uprightneſs and the character of good men, have openly ſeparated themſelves from the old church, and now carry on public worſhip in Great Eaſtcheap, London, agreeable to the principles and doctrines of their founder.

CHURCH is alſo uſed for a Chriſtian temple, built and conſecrated to the honour of God; and, anciently, under the invocation of ſome particular ſaint, whoſe name it aſſumed.

In this ſenſe, churches are variouſly denominated, according to the rank, degree, diſcipline, &c. as metropolitan church, patriarchal church, cathedral church, parochial church, cardinal church, &c. See each under its proper article, METROPOLIS, PATRIARCH, &c. In eccleſiaſtical writers, we meet with grand church, for the chief church of a place, particularly in the Greek liturgy, for the church of St. Sophia at Conſtantinople, the ſee of the patriarch, founded by Conſtantine, and conſecrated under Juſtinian. It was at that time ſo magnificent, that Juſtinian is ſaid to have cried out in the conſecration thereof, Ενικησα σε, Σολομων; *I have out-done thee, Solomon.* The dome, which is ſaid to have been the firſt that was built, is 330 feet diameter. The Latin churches are generally either in the form of a ſhip, or of a croſs.

CHURCH *Yard*, a place adjoining to a church, employed for the interment of the deceaſed.

CHURCH *Wardens*, anciently called *Church Reves*, are officers choſen yearly in Eaſter week, by the parſon, and his pariſhioners, according to the cuſtom of the place; to look to the church, church yard, church revenues, &c. obſerve the behaviour of the pariſhioners with regard to faults that come under the juriſdiction of the eccleſiaſtical court; preſent ſcandalous livers to the biſhop; take care none preach without licence, &c.

Counſellors and attornies, ſurgeons and apothecaries, and diſſenting miniſters, are exempt from this office; and perſons who have ſued a felon to conviction, and the firſt aſſignee of the certificate thereof, are exempted from the office of church warden in the pariſh where the offence was committed. The ſame exemption extends to perſons ſerving in the militia, during ſuch ſervice. Diſſenters are allowed to execute the office by a ſufficient deputy. A perſon, refuſing the office, is liable to excommunication. They are ſworn into their office by the archdeacon, who is compellable by a mandamus to admit thoſe whom the pariſh appoints.

The church wardens are a kind of corporation; and are enabled by law to ſue, and be ſued, for any thing belonging to the church, or the poor of the pariſh.

CHURCHING *of Women after Child Birth*, denotes a thankſgiving publicly made by women after being delivered from the great pain and peril of child birth. This practice took its riſe from the Jewiſh rite of purification. In the Greek church, it was limited to the fortieth day after delivery; but in the weſtern parts of Europe no certain time is obſerved.

CHYLE, in the animal œconomy, a milky fluid ſecreted from the aliments by means of digeſtion. See Syſtem of ANATOMY.

CHYLIFICATION, the formation of the chyle, or the act whereby the food is changed into chyle.

Chylification is begun by comminuting, or breaking the aliment in the mouth, mixing it with ſaliva, and chewing it with the teeth.

By ſuch means, the food is reduced into a kind of pulp, which falling through the *æſophagus* into the warm ſtomach, there mixes with the juices thereof; and being thus diluted, begins to ferment, or putrefy, and aſſumes a very different form from what it had before; growing either acid or rancid.

Here it mixes with a juice ſeparated from the blood by the glands of that part, whoſe excretory ducts open into the ſtomach; as alſo with the remains of the former aliment: and thus it becomes better macerated, diluted, diſſolved, and acquires ſtill a greater likeneſs to the animal fluids, and is called *chyme*.

Add to this, that the fleſhy membrane of the ſtomach continually contracting and preſſing its contents by its periſtaltic motion, occaſions a more intimate mixture, and by degrees works the more fluid parts through the *pylorus* into the *duodenum*; along the ſides whereof, and the reſt of the *inteſtina tenuia*, the lecteals are planted; into the minute orifices whereof the finer part of the maſs is received.

The fabric of the ſtomach being conſidered, the heat of the circumambient parts, the pulſations of innumerable arteries, the great ſtrokes of the *aorta* underneath, the conſtant compreſſion of the *diaphragma*, and abdominal muſcles; it muſt neceſſarily follow, that the finer part of the aliment will be firſt expelled the ſtomach; and that the groſſer will remain; till, by the repeated action of the fluids, and the contraction and pulſation of the ſolids, they alſo become fine enough to go off: thus is the ſtomach left empty; and by means of its muſcular coat, reduced to a ſtate of contraction, and appetite is renewed.

Thus will even the fleſhy membranes, cartilages, &c. of animals fed on, be ſqueezed, and be obliged to give out their juices; and thus is a fluid obtained, that ſhall have in ſome meaſure the ſame properties with thoſe of our bodies.

This juice being got through the pylorus into the duodenum and ſmaller inteſtines, its liquefaction is ſtill promoted by its mixture with two other diſſolvents, the pancreatic juice, and the bile; and by continued fermentation; which divide and ſubtilize thoſe parts that were left too groſs; and by the periſtaltic motion of the guts it is protruded forwards. In the paſſage through the ſmall inteſtines, the finer part of the maſs, which we call the chyle, enters the orifices of the lacteal veins of the firſt kind, wherewith the whole meſentery is intermixed; which either alone, or together with the meſeraic veins, diſcharge themſelves into the glands at the baſis of the meſentery.

Then the chyle is taken up by the lacteals of the ſecond kind, and is conveyed into the glands between the two tendons of the diaphragma, known heretofore under the name of the lumbary glands, now called Pecquet's reſervatory, and receptaculum chyli; whence, being mixed with great quantities of lymph, it is carried to the heart, by the thoraic duct, and ſubclavian vein: wherein it begins to be mixed with the blood, and to circulate, and in time becomes aſſimilated thereto. A ſpirit of vapour, which is nothing elſe than the fixed air of the alimentary ſubſtances, is ſet free from the various mixtures during their fermentation in the firſt paſſages, enters the compoſition of the chyle, and is tranſmitted with it to the blood, communicating to its inteſtine motion, and thus preventing the natural tendency of the fluids to putrefaction.

CHYME, or CHYMUS, in the common ſignification of the word, denotes every kind of humour which is incraſſated by concoction; under which notion it comprehends all the humours fit or unfit for preſerving and nouriſhing the body, whether good or bad. It frequently imports the fineſt part of the chyle, when ſeparated from the fæces, and contained in the lacts and thoracic duct.

The following Syſtem of Chymiſtry, *is the Production of* A. G. SINCLAIR, *M. D. late of the Univerſities of* Edinburgh, Paris, *&c.*

A NEW SYSTEM OF CHYMISTRY.

CHYMISTRY is derived from the Greek χυμος, an analyſis of a body into the parts of which it conſiſts; and ſhould be thus defined; *the Study of the Nature, the Properties, Diviſion, Combination*, and *Union of Bodies*. Chymiſtry, *is nothing more, than the Study of the Effects of Heat, Mixture, and Motion in all Bodies*. This ſcience is undoubtedly of very high antiquity; and, like moſt other ſciences its origin cannot be traced. About thirty ſix thouſand books are ſaid to have been written under the name of *Hermes*. This ſtory is aſcertained as a fact in moſt of our Encyclopædias, and in ſeveral other literary productions; but, ſurely, ſuch authors never underſtood what the word *Hermes* means. Jambilictius ſeems to have had the moſt rational idea of it. He ſays, that at a certain time, a cuſtom prevailed of inſcribing all books of ſcience with or rather to the name *Hermes*, which then and long after allegorically ſignified Muſe or a Deity, ſuppoſed by the Heathens to preſide over works of genius, and to aid the writer in any particular branch of ſcience, when addreſſed to.

About the middle of the laſt age, ſeveral of the parts of chymiſtry began to be collected, examined, and compared, with a view to diſcover their principles, and obſerve their relations, ſo as to unite them into one body of rational doctrine. This, which we may conſider as the foundation of chymiſtry, conſidered as a ſcience, was firſt begun by Dr. James Barner, phyſician to the king of Poland, who arranged into order the principal chymical experiments, and added rational explanations.

PART I.

SECT. I.

Objects and Uſe of CHYMISTRY.

The theory of chymiſtry ought to conſiſt in a thorough knowledge of all the phenomenæ which reſult from every poſſible combination of its objects with one another, or from expoſing them in all poſſible ways to thoſe ſubſtances which chymiſts have found to be the moſt active in producing a change. So various, however, and ſo widely extended are the objects of chymiſtry, (comprehending all terreſtrial bodies whatever), that a knowledge of this kind is utterly unattainable by man. The utmoſt that can be done in this caſe is, to give ſome account of the phenomena which accompany the mixtures of particular ſubſtances, or the appearances they put on when expoſed to heat, which have been already ſo well aſcertained that they may now be laid down as rules, whereby we may, with a certainty, judge of the event of our experiments, even before they are made.

Here we muſt obſerve, that though the objects of chymiſtry are as various as there are different ſubſtances in the whole ſyſtem of nature, yet they cannot all be examined with equal eaſe. Some of theſe ſubſtances act upon others with great violence; and the greater their activity, the more difficultly are they themſelves ſubjected to a chymical examination. Thus, fire, which is the moſt active body in nature, is ſo little the ſubject of examination, that it hath hitherto baffled the ingenuity of the greateſt philoſophers to underſtand its compoſition. This ſubſtance therefore, though it be the principal, if not the only agent in chymiſtry, is not properly an object of it, becauſe it cannot be made a ſubject of any chymical operation.

It hath been cuſtomary to conſider all bodies as compoſed of certain permanent and unchangeable parts, called elements; and that the end of chymiſtry was to reſolve bodies into thoſe elements, and to recompoſe them again by a proper mixture of the elements when ſo ſeparated. Upon this ſuppoſition the alchymiſts went; who, ſuppoſing that all bodies were compoſed of ſalt, ſulphur, and mercury, they endeavoured to find out the proportions in which theſe exiſted in gold, and then to form that metal by combining them in a ſimilar manner.

Whatever men may imagine reſpecting the properties of bodies, it is very certain that they all contain the ſame thing, but are ſo wonderfully arranged and ſo minutely combined and ordered, that it is impoſſible that two things ſhould be alike in nature. To the four elements, fire, air, earth, and water, a kind of fifth element, which has an equal, if not a greater right to the title of element than any of the others. I do aſſert that this *phlogiſton*, or inflammable principle is what the ignition of all bodies depends on. Thoſe who imagine this ſubſtance to be the ſame with fire, or the matter of heat and light, are miſtaken: becauſe phlogiſton is always diſplaced, and to appearance deſtroyed by fire; which it could not be of itſelf were it either heat or light.

The moſt remarkable operations in chymiſtry, and by which the greateſt changes are made upon thoſe bodies which are the objects of that ſcience, may be comprehended under the following names. 1. *Solution*. 2. *Filtration*. 3. *Precipitation*, or *Coagulation*. 4. *Evaporation*. 5. *Cryſtallization*. 6. *Diſtillation*. 7. *Sublimation*. 8. *Deflagration*. 9. *Calcination*. 10. *Fuſion*. 11. *Maceration*, or *Digeſtion*. To which we may add, 12. *Trituration*, or *Levigation*.

Before we proceed to a particular account of each of theſe operations, it is neceſſary to take notice, that there are two different things propoſed by thoſe who enter on the practice of chymiſtry. Some have nothing farther in view than the enlargement of their knowledge, or making improvements in arts which are to be practiſed by others for their own advantage. Others deſign to follow chymiſtry as a trade, by which they hope to enrich themſelves, or to get a comfortable livelihood. But the apparatus and utenſils neceſſary for performing the very ſame operations are exceedingly different when experiments only are to be made, from what they muſt be when theſe operations are performed with a view to profit; and ſo great is this difference, that thoſe who purſue chymiſtry with a view to advantage, will always find themſelves very conſiderable loſers if they follow the plan of an apparatus or a laboratory deſigned only for making experiments. Along with the apparatus, therefore, which is commonly deſcribed in chymical books, and proper only for experiments, we ſhall alſo give that which is neceſſary for preparing great quantities of any chymical article in the way of trade.

In general, thoſe who practice chymiſtry merely with an experimental view, ought, as much as poſſible, to make uſe of glaſs veſſels, as not being liable to be corroded by the moſt powerful ſolvents; and, by their tranſparency, giving an opportunity of obſerving what paſſes within them during the operation. But, by thoſe who practice chymiſtry with a different view, theſe veſſels ought, with equal care, to be avoided, on account of their expence, and brittleneſs. This laſt quality, indeed, is poſſeſſed by glaſs in ſo eminent a degree, that glaſs veſſels will ſometimes fly to pieces, and that with conſiderable violence, when ſtanding by themſelves, and nothing touching them. The principal objects which a chymiſt ought to have in view, in performing his operations, ought to be to ſave time and fuel, eſpecially the firſt; and for this purpoſe, he would find himſelf a conſiderable gainer, though he ſhould be at much greater expence in his apparatus than he would otherwiſe have occaſion for.

We ſhall now proceed to a particular deſcription of each of the operations above-mentioned.

To give a view of the numerous advantages mankind derive from this ſcience, would require a ſeparate treatiſe; and as the nature of this work does not admit of our purſuing that ſubject at large, we ſhall content ourſelves with exhibiting the principal outlines, and dwelling more particularly on ſuch ſubjects, as in our opinion have not been ſeen in a proper point of view.

The great number of arts that are indebted to chymiſtry, may be ranged under two principal diviſions. The firſt comprehends all the mechanical arts, which are reducible to geometrical principles. The ſecond contains all thoſe arts, whoſe manipulations depend on chymiſtry, and may be properly termed chymical arts. This laſt claſs is much more numerous than the other. As they are all founded on chymical phenomena, it is eaſy to imagine that the rules of chymiſtry ought to direct the practice, and that this ſcience may ſimplify the proceſſes by new diſcoveries, render their ſucceſs more certain, and even extend their limits. Among theſe are; 1. The arts of making bricks, tiles, and the varieties of pottery, all which conſiſt in the preparation of different kinds of clay, and bringing them by baking to the requiſite degree of hardneſs. 2. The art of glaſs-making, which by uniting a vitrifiable earth with a ſaline ſubſtance, produces a new ſubſtance poſſeſſing great hardneſs, tranſparency, and durability, on expoſure to the air. A wonderful art, which, in its various applications, has been of the moſt eſſential ſervice to mankind. 3. The arts of extracting metals from their ores, of caſting, of purifying, or of alloying them with each other, owe their origin and progreſs to chymiſtry, and daily receive new advantages from the ſame ſource. 4. The vegetable kingdom affords materials to a great number of arts, which, like the foregoing, are under the dominion of chymiſtry: the arts of converting ſaccharine juices, or farinaceous bodies, into vinous liquors; of extracting from thoſe liquors the ardent ſpirit they contain; of ſeparating the ſpirit from the water, with which it is diluted in its firſt ſtate; of uniting this ſpirit to the aromatic parts of plants: the art of extracting the colouring matter of plants, and applying it to different ſtuffs: of changing wine into vinegar, and uniting this laſt with various ſubſtances; of ſeparating from grain, and other parts of vegetables, the precious matter deſtined to form bread, a digeſtible and light ſubſtance prepared from a dry and inſipid farinaceous powder; all theſe arts, and a very great number of others, that cannot be enumerated in this place, are entirely chymical, and are indebted to that ſcience for their preſent perfection, and, in many inſtances, for their firſt invention.

This valuable ſcience has claims equally extenſive and important on the arts that convert the parts of animals to our uſe and advantage. Among theſe is the uſeful, though too little conſidered, art of cookery, whoſe true purpoſe is leſs to flatter the organs of taſte by capricious variations of form and flavour, than to render aliments of eaſy digeſtion, by developing their taſte by boiling, or by mild and natural ſeaſoning. Some readers will, doubtleſs, be ſurpriſed to find the art of cookery, which is ordinarily thought of ſo ſmall conſequence, placed in the rank of thoſe which chymiſtry is capable of advancing. It will be ſufficient on this occaſion to anſwer, that all the proceſſes uſed in the preparation of food are chymical; and that it is not beneath the chymiſt, to pay ſome attention to an art that ſo materially affects the health. The arts of dreſſing, tanning, and currying ſkins, and of making hats, are of the ſame claſs; but one of the moſt important arts which occupies the middle rank between the arts, properly ſo called, and the ſciences, is pharmacy. Every perſon concerned in pharmacy, has need of a very extended knowledge of chymiſtry, in order to know the alterations the matters he uſes are ſubject to, that he may prevent and correct them; to diſcover the changes compound medicines undergo; and, in a word, to determine inſtantly, the combinations and decompoſitions that may follow from the mixture of ſimple drugs in extemporaneous preſcriptions. Every impartial perſon who reflects on this ſubject, will determine, that ſuch as are neceſſarily employed in pharmacy ſhould, after acquiring the previous knowledge of natural hiſtory, indiſpenſable in becoming acquainted with the Materia Medica, pay the moſt ſerious and unremitting attention to chymiſtry. By theſe means, and by theſe alone, it is, that the art of medicine can be reduced to principles, and rendered equal to the performance of thoſe ſervices, which have long ſince placed it in the honourable eſtimation of ſociety.

A very tranſient proſpect of the ſciences, will ſufficiently ſhew the great benefits to which they may derive from chymiſtry. Natural hiſtory is among thoſe that receive the higheſt advantages from it. The characters employed by the early naturaliſts to diſtinguiſh minerals, were taken only from their phyſical properties, as colour, form, conſiſtence, &c. but theſe properties, being ſubject to great variation, the bodies mentioned or deſcribed by the ancient philoſophers are no longer known, and the immenſe labours of the firſt naturaliſts are almoſt entirely loſt. The moderns have perceived, that in order to avoid this inconvenience, ſo deſtructive to the progreſs of natural hiſtory, it was neceſſary to follow another method. The method of chymical analyſis appeared to deſerve the preference; and the buſineſs is already in ſuch forwardneſs, that claſſes are eſtabliſhed among minerals, founded on the nature and quantity of the principles which enter into their compoſition. It is to the labours of Meſſrs. Bergman, Bayen, Monnet, &c. that we are indebted for the advancement of this part of natural hiſtory. Wallerius, Cronſtedt, and ſeveral other learned men, began the taſk of claſſing mineralogy upon chymical principles. M. Bucquet, in his latter courſes of lectures, improved on the knowledge theſe two celebrated naturaliſts have tranſmitted to us, by adopting a method of claſſing minerals, on principles entirely chymical. M. Sage, who has analyzed a great number of minerals, has followed a method purely chymical in his diſpoſition of theſe bodies; and, though his theory is not univerſally received, it is certain that mineralogy is under great obligations to him; and that he ranks among thoſe who have cultivated it with the greateſt ſucceſs in France. M. Daubenton has availed himſelf of the labours of all his cotemporaries, and has adopted their methods and concluſions with that caution, which is the true character of a philoſopher, whoſe only aim is to diſcover and obtain the truth, ſeparated from the numerous uncertainties and errors with which, unhappily for mankind, it is too often attended. Nothing, therefore, can be ſhewn more evidently, than the advantages reſulting from the application of chymiſtry to natural hiſtory, as it is the only means of removing that obſcurity that muſt attend ſimple deſcriptions of external appearances. The juſt and truly valuable obſervation of M. Daubenton, deſerves to be conſtantly attended to by all chymical philoſophers. He warns them to be very careful in deſcribing the ſpecimens on which they make their experiments, in order that they may be underſtood by all naturaliſts, and to avoid that confuſion, which, according to that celebrated profeſſor, prevails throughout the works of many modern chymiſts. M. Bucquet, and myſelf, have found no other means of avoiding this error, than that of uniting both ſciences in our lectures, and aſſociating the knowledge obtained from the works of naturaliſts, with that which chymical experiments daily produce.

It is not ſo clearly determined in the opinion of the world in general, that chymiſtry is uſeful in medicine. The errors of the chymical phyſicians of the laſt century, and the indifference many practitioners of the preſent time ſeem to have for this ſcience, have produced a diſadvantageous opinion in the minds of many perſons, which time alone can remove. In the mean time, however, it would be more prudent, inſtead of entertaining an ill-founded prejudice, to inquire with impartiality into the cauſe of the errors committed by chymiſts, into the means of preventing them, and of reſtoring to chymiſtry that eſtimation it has unjuſtly been deprived of. If the enthuſiaſm of the firſt phyſicians, who cultivated chymiſtry, miſled them, it does not follow that any concluſion can be drawn from thence that may be applied to the preſent time. The exactneſs which the moderns have introduced into every part of experimental philoſophy, ought to remove the apprehenſions of ſuch, as for want of acquaintance with the ſubject, are apt to imagine that chymiſtry is ſtill the dark, myſterious ſcience it was a century ago. By a due attention to the extent of its powers, and a careful uſe of them, there cannot be a doubt but it will be found of the higheſt utility to medicine. After this acknowledgment of the wanderings of the early chymiſts, let us finiſh the juſtification of the ſcience, by enquiring what departments of medicine are capable of deriving the greateſt advantages from its aſſiſtance. The two great branches of this vaſt ſcience, are theory and practice; which ought not to be ſeparated from each other, as ſome authors have thought fit to do. The ſtudy of medicine ought neceſſarily to commence with the anatomical hiſtory of man, and of animals. Anatomy can only be employed on the ſolids. But phyſiologiſts muſt be well aware, that the greateſt part of animal bodies is formed of fluids; by the motion of which, life is maintained. If therefore the attention were confined to the veſſels, without attempting to arrive at the nature and properties of theſe fluids, we ſhould be acquainted only with a part of the living œconomy. It belongs to chymiſtry to examine them; and it is chymiſtry alone, that can throw any light on their compoſition, and the changes they undergo, by the proceſſes there are carried on during life. We cannot avoid having recourſe to this ſcience, in our endeavours to diſcover the true mechaniſm of the animal functions; the properties of the fluids ſeparated by the different viſcera; or the alterations ſuch fluids undergo, during their time of remaining in the reſervoirs into which they are ſecreted. A knowledge of compoſition of animal fluids being once acquired, it will be neceſſary to enlarge and multiply our reſearches on ſubjects of different age, ſex, and temperament, in various climates and ſeaſons; and to purſue them among the different claſſes of animals; that by eſtabliſhing uſeful points of compariſon, the limits of ſcience may be extended.

The labour of the medical inquirer is not confined to the ſtudy and examination of the properties of animal fluids in a ſtate of health; but requires to be carried farther. The kinds of alterations they are ſubject to, in the ſeveral diſorders that afflict the human frame, muſt be inquired into. A diſcovery what part of the animal liquids predominate in inflammatory, putrid, ſcorbutick, or ſcrophulous diſorders; or the analytical knowledge of the ſaline ſubſtances developed, and the nature of the extravaſated matters, with numberleſs other object of reſearch, cannot but be of the utmoſt value and importance in the ſcience of medicine. We think it equally neceſſary to examine the ſolids by chymical methods, as well in the diſeaſed ſtate, and by a compariſon of their properties, endeavour to diſcover to which of the fluids they owe their formation; and this being known, we may proceed to conjecture in morbific diſpoſitions, the ſolid or fluid that has ſuffered a change. This poſition, which we ſlightly mention in this place, will be more largely explained in the chapters relating to animal matters.

If it be thus eſtabliſhed, that the theory of medicine is capable of receiving the moſt eſſential advantage from chymiſtry, it is equally certain that the practice is no leſs in need of the ſame aſſiſtance; ſince both muſt of neceſſity accompany each other, and are promoted by the ſame means. And, in fact, it is eaſy to ſhew the immediate dependence of the practice upon the ſcience we are juſtly commending, without having recourſe to the ſecondary advantage the practical part of medicine cannot but receive from every real improvement of the theory. To begin with the art of preſerving health: nothing can be more evident than that the choice of aliments, and of air, cannot be made with any certainty, but in conſequence of chymical reſearches into the nature of foods, and the properties of the atmoſpheric fluid. Chymiſts alone can inform us of the quantity of nutritive matter contained in the aliments we make uſe of; the ſtate it is found in; the nature and quantity of the ſubſtances it may be combined with; the means of extracting, purifying, and preparing it, ſuitably to different ſtomachs; or giving it the due degree of attenuation appropriated to every conſtitution of the internal parts. It is to this ſcience that we muſt apply for information, reſpecting the nature of the fluids that ſerve us for drink; the properties which water ought to poſſeſs for the purpoſes of life, and the means of examining into its purity, or diſcovering thoſe ſubſtances that vitiate it; the principles and properties of fermented liquors; and the methods of examining into their compoſition, as well to determine their ſalubrity, as the adulterations which they may have undergone. In a word, it is chymiſtry which ſhews the properties of the air which we reſpire, and without which, life could not for a moment be ſupported. The change this ſubtle fluid is liable to, from various agents, and the nature of thoſe agents, the truly precious means of correcting its bad qualities, and rendering it fitter for the grand purpoſe of reſpiration, are among the diſcoveries of modern chymiſts.

The phyſician ought not to make uſe of medicines, unleſs he is acquainted with their nature; and in the inquiry, he muſt have recourſe to chymiſtry. This truth has been always ſo well eſtabliſhed, that writers on the materia medica have claſſed the medicaments according to their chymical principles. The obſervation of all ages has ſhewn, that there is an intimate connection between the taſte of drugs, and the manner of their acting on the human frame:-ſo that a good judgment may be formed of the medical properties of a ſubſtance from its taſte. Thus it is that bitters are ſtomachic, inſipid ſubſtances are mild and relaxing, and acid matters are active, penetrating, and inciſive. Now, as the taſte is truly a chymical property, depending entirely on the tendency of bodies to combination, as we ſhall elſewhere ſhew, chymiſtry muſt of courſe be of great ſervice in the adminiſtration of medicines. It muſt not, however, be concluded according to the chymiſts of the laſt century, that the ſtomach reſembles a veſſel, in which operations are performed as in a chymical laboratory;

where acids, for example, meet and efferveſce with alkalis. The inteſtines are endued with ſenſibility, and a peculiar motion, that modify the nature and effects of remedies; and the diſcretion of an enlightened obſerver, ought always to regulate his imagination, ſo as to prevent his falling into any ridiculous hypotheſis. It cannot be denied, but there are caſes wherein medicines act in the firſt paſſages by means of their chymical properties; and in theſe caſes the phyſician may reaſon and conduct himſelf according to immediate deductions from chymical principles. Thus it is proved, by long experience, that in the diſeaſes of infants, the ſtomach and inteſtines are coated with a tenacious viſcous matter, of a manifeſtly acid nature. The abſorbent earths, and even the alkalis miniſtered on ſuch occaſions, deſtroy this acid by combining with it, and form a neutral purgative ſalt that evacuates this noxious matter, by ſtimulating the inteſtines. Every diſorder which is attended with an accumulation of obſtructing matter in the firſt paſſages, neceſſarily demands a knowledge of chymiſtry in the exhibition of medicines. But the greateſt advantage the practitioner can derive from this knowledge, is, without doubt, in thoſe unhappy caſes, wherein by miſtake or deſign, corroſive ſubſtances have been taken that might prove mortal by attacking the viſcera, and deſtroying their organization. Chymiſtry then lends its ready and ineſtimable aid to medicine, by affording ſubſtances capable of changing the nature of the poiſon by decompoſition; or of otherwiſe immediately ſtopping its pernicious effects. The work of M. Navier, a celebrated medical chymiſt of Chalons, points out the moſt efficacious means of preventing the deſtructive conſequences of the poiſons of arſenic, corroſive ſublimate, verdegriſe, and the preparations of lead; and notwithſtanding the declamations of certain phyſicians, who ſeem deſirous of excluding the ſciences from the practice of medicine, his work will receive the tribute of gratitude from poſterity.

Chymiſtry is not adequate to the counteracting the effects of all poiſons, but there is good reaſon to hope that reſearches into the nature of vegetable and animal poiſons, if made with ſkill and care, would be attended with the diſcovery of remedies of ſufficient power to counteract them. Opium, and all narcotic vegetables, the acid and cauſtic juices, ſuch as thoſe of ſpurge and euphorbium, the noxious plants, and more eſpecially the fungi, demand the particular attention of chymiſts, for the diſcovery of ſubſtances proper to obviate their dangerous effects. With no leſs utility, an inquiry might be made into the animal poiſons. We are already acquainted with the acid of ants, from the experiments of Margraaf and Fontana. Thouvenel has diſcovered ſeveral acrid matters in cantharides. Mead has made reſearches on the poiſon of the viper. Fontana has purſued the ſame ſubject, and has diſcovered that the lapis cauſticus immediately introduced into the wound made by this reptile, decompoſes or alters the poiſon, and prevents its deadly effects.

If it be poſſible, after what has been ſaid, to ſuppoſe that chymiſtry is not equal to the performance of the deſirable effects here pointed out, yet no one can deny that the ſcience of medicine is indebted to it for many uſeful remedies. It can never be forgotten that ſtibiated tartar, with all the mercurial, antimonial, and martial preparations which are poſſeſſed of ſuch power and efficacy, are the products of chymiſtry; and that the gratitude and encouragement of medical profeſſors, as well as the public in general, is due to ſuch as devote themſelves to its improvement.

To conclude our obſervations on the utility of chymiſtry to medicine, we ſhall only add, that a knowledge of the former is neceſſary, in order to draw up a preſcription for any compound medicine to be made up by the apothecary. It happens daily, that perſons unacquainted with chymiſtry, commit the groſſeſt errors in their extemporaneous formulæ, by mixing together ſubſtances that either become changed by mutual decompoſition, or elſe refuſe to unite at all. In the caſe of decompoſition, the medicine cannot produce the effect, which the phyſician from his acquaintance with the component matter, was led to expect. Such errors, ſo prejudicial to the health of the patient, are no otherwiſe to be avoided, but by a knowledge of chymiſtry, which is the only guide in the preparation of remedies. Without this guide, the phyſician is not only liable to the occaſional faults we have pointed out, but to numberleſs others, which though of leſs eſſential conſequence, muſt expoſe his ignorance to the apothecary; who, in the practice of his own art, cannot but be acquainted with a conſiderable number of chymical facts.

The uſefulneſs of chymiſtry in the arts, and the reſemblance between its proceſſes and the manipulations of artiſts, have often cauſed it to be confounded either with alchemy or pharmacy, by perſons ignorant enough to unite objects in their own nature ſo remote from each other. In the opinion of ſuch, the chymiſt is an artiſt inceſſantly employed in the vain ſearch of the philoſopher's ſtone. But thoſe who have acquired the leaſt knowledge of true chymiſtry and its purpoſes, will readily perceive the immenſe diſtance between the ridiculous and abſurd pretenſions of the alchymiſt, and the enlightened chymiſt; and more eſpecially the difference between the regular proceedings of the latter, compared with the inconſiſtent and uſeleſs proceſſes of the former. The error of the many, who regard chymiſtry as the art of preparing drugs, is much more pardonable; becauſe it does not confound chymiſts with the ignorant, and, at beſt, the uſeleſs operators of what is called the grand work, who, as Macquer ingeniouſly obſerves, are the workmen of an art that has no exiſtence; but aſſociates them with a reſpectable claſs of artiſts, whoſe labours are neceſſary to ſociety. But pharmacy being nothing more than a part of chymiſtry, or one of the many arts that are dependent on, or benefited by, its principles, the perſon who regards chymiſtry as the art of preparing remedies, will have but a very limited idea of this experimental ſcience: a ſcience of ſuch ſublimity and vaſt extent, that it not only contains within itſelf the much greater part of the numerous arts that diſtinguiſh civilized nations from ſavages, but extends its reſearches univerſally to the mutual actions of the component parts of bodies on each other; to the great improvement of natural philoſophy, which in many of its moſt important parts is purely chymical.

SECT. II.

PRINCIPLES OF BODIES.

Philoſophers in every age have admitted, that all the variety of natural bodies are formed of primary ſubſtances, more ſimple than themſelves, which they have diſtinguiſhed by the name of principles. Chymiſts, who have the ſtrongeſt conviction of this leading truth from their analyſes, have formed ideas, ſufficiently preciſe, of the nature and difference of theſe principles; and have even admitted of ſeveral kinds or claſſes. It muſt, however, be remarked, that they uſe the word principle in a different ſenſe from that adopted by the ancient philoſophers. For Ariſtotle and Plato did not regard any ſubſtances as principles, but ſuch as are too minute to be perceived by the ſenſes, and form, by their aſſemblage, bodies ſomewhat leſs ſimple, which are within the ſphere of perception, and were by them called elements; a name ſtill retained, and applied in the ſame ſenſe. Theſe are what other philoſophers have called atoms, or monades. But chymiſts, not chuſing to enter raſhly into ſpeculations of ſuch ſubtlety, apply the term principle in general to all bodies, whether ſimple, or more leſs compounded, which they obtain in their analyſes. Yet as principles, conſidered in this point of view, are very different from each other, they have divided them into proximate and remote principles. The firſt are ſuch as are ſeparated by a firſt analyſis, and may themſelves be compoſed of others; as for example, in decompoſing a vegetable ſubſtance, oils, mucilages, ſalts, and colouring matter, are ſeparated from each other, and are the proximate principles from which, by new operations, other principles may be had. Theſe other are the remote principles. Thus mucilage, which is a proximate principle of plants, affords by a new analyſis, acid, water, and earth, which are the remote principles of the plant. Other names have alſo been given to theſe two orders of principles, ſuch as principiated principles applied to thoſe before called proximate, and principiant principles to thoſe called remote. Theſe words imply, that the firſt are compoſed of other principles, and that the laſt are ſuch as ſerve to form or conſtitute others more compounded. Some chymiſts, for greater accuracy of diſtinction, admit ſeveral orders of principles. They call the moſt ſimple by the name of primitive, primary, or firſt principles. Principles compoſed of the moſt ſimple kind united are called ſecondary, or principles of the ſecond order. Principles of the third order are compoſed of this laſt, &c.

The number of elements has not been always the ſame among philoſophers. Some have regarded water as the principle of all things. According to Anaximines, air occupies this firſt place, and he did not ſcruple to deify this element, on account of its great importance. Others beſtowed the chief dignity upon the earth; the leader of whom was Anaximander, the diſciple of Thales, and maſter of Anaximenes. Every one found reaſons to ſupport his own opinion; but as the true method of conducting chymical and philoſophical inquiries was not then known, we can only eſteem theſe early notions as ſpeculations, void of all foundation. About three centuries after the time of theſe philoſophers, Empedocles, a phyſician of Agrigentum, thinking that the ſimplicity of the four ſubſtances contended for as the principle of all things to be equal, united their opinions, by admitting of four elements, fire, air, earth, and water. In the ſucceeding age, Ariſtotle and Zeno, adopted this opinion of Empedocles. When we reflect on the reaſons that may have engaged theſe philoſophers to regard fire, air, earth, and water, as elements, we are tempted to believe, that it was not ſo much in conſequence of the accurate knowledge they could have acquired concerning theſe bodies, as in conſideration of the magnitude or quality of them, and the conſtancy or invariability of their properties. Fire exiſts every where, and its effects are always the ſame. Our globe is ſurrounded by a maſs of air, whoſe eſſential properties do not ſeem ſubject to variation. Water is preſented to obſervation on the ſurface of the globe, in an immenſe maſs, that fills up or conceals its abyſſes or cavities. And laſtly, the globe itſelf, whoſe volume far exceeds that of all the creatures that inhabit it, ſeems to be formed of a ſolid matter, little ſubject to change, capable of fixing or ſerving as a baſe for the other elements. It appears, therefore, that it was from conſiderations, founded on the bulk and apparent immutability of theſe bodies, that the early ſages were induced to regard them as the materials uſed by nature in the formation of all other beings.

The peripatetic doctrine which prevailed in the ſchools, preſerved the Ariſtotelian diſtinction of elements, till the ſixteenth century. At that period, the ſect of chymiſts, which began to prevail againſt the others, admitted a new diviſion of primary ſubſtances. Paracelſus, who was more of the artiſt than of the philoſopher, drew immediate inferences from the reſults of his operations, and acknowledged five principles; ſpirit, or mercury; phlegm, or water; ſalt; ſulphur, or oil; and earth. By ſpirit, or mercury, he underſtood every volatile and odorous ſubſtance, though ſimplicity is far from being a conſtant attendant on theſe properties. Water, or phlegm, comprehended in his ſyſtem, all the aqueous and inſipid products, and is liable to the ſame objection with reſpect to its pretended ſimplicity. The word ſulphur, or oil, denoted all inflammable and liquid ſubſtances, and conſequently a great number of bodies more or leſs compounded, as the fat and eſſential oils, &c. By ſalt, he indicated every dry ſubſtance poſſeſſing taſte and ſolubility, qualities that belong to a great number of compounds. Laſtly, the word earth was applied in the doctrine of Paracelſus, to the dry, fixed, and inſipid reſidues of operations, all of which are now known to differ exceedingly from each other.

Beccher, a chymiſt, who has treated his ſubject in the moſt philoſophical manner, was aware of the objections that might be urged againſt the doctrine of Paracelſus, and from a conviction of its inſufficiency, he took another method of arriving at the elements of bodies. He firſt diſtinguiſhed two principles very different from each other, humidity and dryneſs, water and earth. He divided this laſt into three ſpecies; namely, the vitrifiable, inflammable, and mercurial. Vitrifiable earth, according to him, was that which alone poſſeſſed the greateſt immutability; but when mixed with ſome ſaline earth, was capable of forming the moſt perfect glaſs. He likewiſe attributed to it the property of rendering the combinations into which it entered ſolid, and little ſubject to change. The inflammable earth was known by the combuſtibility of the combinations it enters into. Beccher regarded it as the cauſe of ſmell, colour, and volatility. The mercurial earth he ſuppoſed to exiſt in mercury, arſenic, marine, acid, &c. &c.; and its peculiar character was that of giving a very conſiderable volatility and ſpecific gravity to the compounds in which it exiſted. Stahl adopted, and commented on the doctrine of Beccher. He regarded the inflammable earth as fire fixed in the bodies, and gave it the name of phlogiſton. He could not ſucceed in demonſtrating the exiſtence of mercurial earth, and there has nothing been done to this day, which at all eſtabliſhes it. Stahl paid the greateſt attention to combinations containing earth, water, and eſpecially phlogiſton; but he has ſaid nothing concerning air, which Hales, nearly at the ſame period, proved to be a principal agent in chymical phenomena.

From the time of Beccher and Stahl to the preſent, no change has been made by chymiſts in the doctrine of the elements laid down by the ancient philoſophers. Like Empedocles, they have acknowledged four elements, and have conſidered each in two different ſtates. 1. As free, or inſulated; in the large maſſes of air in the atmoſphere, fire taken in general, water, and the earth attended to at large. 2. Or as combined; in which kind of inquiry their buſineſs has been to obtain the component part by analyſis.

Such were nearly the opinions adopted reſpecting the principles of bodies, from the time of Beccher and Stahl, till the valuable diſcoveries of Prieſtley and Lavoiſier, on fixed air and combination, neceſſarily introduced new opinions. In fact, if immutability of properties, unity, and ſimplicity, be the true characters of elements; and if it be admitted that this ſimplicity no longer exiſts, when a body is found to be capable of decompoſition, it muſt be remarked: 1. That among the four elements there are at preſent two, namely, air and water, the principles of which, art has ſucceeded in decompoſing and ſeparating. 2. That the exiſtence of fire, in the ſenſe of the word, as uſed by philoſophers and chymiſts, taken to be a peculiar fluid always identical, is very far from being proved; and that many reaſons, and eſpecially the various modifications of fire, tend to weaken the probability of its being ſuch, as we ſhall ſhew hereafter. 3. That water itſelf, which ſeems to have the moſt ſtriking characters of ſimplicity and uniformity of ſtructure, has not reſiſted the late expedients uſed by the chymiſts; and that M. Lavoiſier has ſucceeded in decompoſing it into ſeveral aeriform fluids; a decompoſition which had already been in ſome degree exhibited by the differences of appearance ſhewn by this pretended element in a variety of circumſtances. 4. That elementary earth is a creature of the imagination; ſince it can be ſhewn, that there are many earthy ſubſtances equally ſimple and incapable of decompoſition, as will be ſhewn in the concluſion of this Syſtem.

From this general enumeration of facts hereafter to be more fully explained, it follows, that we are not acquainted with any ſimple or unchangeable ſubſtances; that the true principles or firſt elements of bodies elude our ſenſes and our inſtruments; that ſuch as are called elements are far from being ſimple, though they are ſo denominated on account of their influence in natural phenomena, and their exiſtence in a great number of products. Theſe aſſertions agree with the opinions of ſome of the ancient philoſophers, who did not regard the elements as the moſt ſimple bodies, but ſuppoſed them to be formed of principles of a far greater degree of tenuity and unchangeableneſs.

Theſe notions concerning thoſe bodies, which have for ſo many ages enjoyed the title of elements, and to which we deny that prerogative, do not prevent us from conſidering fire, air, earth, and water, as the moſt ſimple, or rather the leaſt compounded of the ſubſtances we know. And as we meet with theſe bodies in the analyſis of every natural product, of which they conſtitute the ſecondary principle, it will not be improper to conſider them as elements under that point of view.

PART II.

SOLUTION.

Solution is the art of ſeparating or diſſolving bodies, ſo as to know all their diſtinct parts. Before we proceed to give a general theory of the changes which happen upon the mixtures of different bodies together, or expoſing them ſingly to heat, we muſt obſerve, that all of them depend on certain qualities in bodies, by which ſome of them are apt to join and to remain united while they have an opportunity. The cauſe of thoſe qualities are totally unknown; and therefore, philoſophers have expreſſed the apparent effect of this unknown cauſe by the word attraction.

SALTS.

Salts are either fuſible, that is capable of abiding the fire, and melting in a ſtrong heat, without being diſſipated; or volatile, that is, being diſperſed in vapour with a ſmall heat. Their other properties are, that they are ſoluble in water; not inflammable, unleſs by certain additions; and give a ſenſation of taſte, when applied to the tongue.

The moſt general characteriſtic of ſalts is, that they are all ſoluble in water, though ſome of them much more difficultly than others. Moſt of them have likewiſe the property of forming themſelves, in certain circumſtances, into ſolid tranſparent maſſes of regular figures, different according to the different ſalt made uſe of, and which are termed cryſtals of that ſalt. In this ſtate they always contain a quantity of water; and therefore the utmoſt degree of purity in which a ſalt can be procured, is when it has been well cryſtallized, and the chryſtals are freed of their ſuperfluous moiſture by a gentle heat. They generally appear then in the form of a white powder.

In the ſolution of ſalts in water, the firſt thing obſervable is, that the water parts with the air contained in it; which immediately riſes to the top, in the form of bubbles. This, however, is moſt remarkable when the ſalt is in the dry form we have juſt now mentioned, becauſe there is always a quantity of air entangled among the interſtices of the powder, which riſes along with the reſt; and this diſcharge of air is ſometimes ſo great, as to be miſtaken for an efferveſcence. From this however, it is eſſentially different.

Another thing obſervable in the ſolution of ſalts is, that a conſiderable change happens in the temperature of the water in which they are diſſolved; the mixture becoming either a good deal warmer or colder than either the ſalt or the water were before. In general, however, there is an increaſe of cold, and ſcarce any ſalt produces heat, except when it has been made very dry, and deprived of that moiſture which it naturally requires; and thus the heating of ſalts by being mixed with water may be explained on the ſame principle with the heat produced by quick-lime.

After ſalt has been diſſolved in a certain quantity by water, no more of that ſalt will be taken up, unleſs the water is heated; and as long as the heat continues to increaſe, the ſalt will be diſſolved. When the water boils, at which time it has attained its greateſt heat, and will take up no more ſalt, it is then ſaid to be ſaturated with that ſalt. This, however, does not prevent it from taking up a certain quantity of another ſalt, and after that perhaps of a third, or fourth, without letting go any of the firſt which it had diſſolved. How far this property of water extends, has not yet been aſcertained by experiments.

To the above rule there is only one exception known as yet; namely, common ſea-ſalt: for water diſſolves it in the very ſame quantity when cold, as when boiling hot. It has been ſaid by ſome, that all deliqueſcent ſalts, or thoſe which grow moiſt on being expoſed to the air, had the ſame property: but this is found to be a miſtake.

This property of ſolubility, which all the ſalts poſſeſſes in common, renders them eaſily miſcible together; and the property by which moſt of them ſhoot into cryſtals renders thoſe eaſily ſeparable again which have no particular attraction for one another. This is likewiſe rendered ſtill more eaſy by their requiring different proportions of water, and different degrees of heat, to ſuſpend them; for by this they cryſtallize at different times, and we have not the trouble of picking the cryſtals of one out among thoſe of the other.

The manner in which the ſolution of ſalts in water is effected, is equally unaccountable with moſt of the other operations of nature. Sir Iſaac Newton ſuppoſed that the particles of water got between thoſe of the ſalt, and arranged them all at an equal diſtance from one another: and from this he alſo accounts for the regular figures they aſſume on paſſing into a cryſtalline form; becauſe, having been once arranged in an orderly manner, they could not come together in diſorder, unleſs ſomething was to diſturb the water in which they were ſuſpended; and if any ſuch diſturbance is given, we find the cryſtals are by no means ſo regular as otherwiſe they would have proved. Others have thought that theſe figures depend on a certain polarity in the very ſmall particles into which the ſalt is reſolved when in a ſtate of ſolution. Theſe things, however, are merely conjectural; neither is it a matter of any conſequence to a chymiſt whether they are right or wrong.

Though ſolution is that operation which ſalts undergo the moſt eaſily, and which ſhould ſeem to affect them the leaſt of any, a repetition of it proves nevertheleſs very injurious to them, eſpecially if it is followed by quick evaporation; and the ſalt, inſtead of being cryſtallized, is dried with a pretty ſtrong heat. Newman relates, that a pound of ſea-ſalt was reduced by 13 ſolutions, and exſiccations, to half an ounce; and even that was moſtly earth. Where ſolution is required, therefore, it ought always to be done in cloſe veſſels, in which alſo the ſubſequent evaporation ſhould be performed, and in all caſes where cryſtallization is practicable, it ought to be preferred to violent exſiccation.

The two great diviſions of ſalts are into acids and alkalies. The firſt of theſe are known by their peculiar taſte, which is called acid, or ſour. They are not found in a ſolid form; neither are any of them, except the acids of vitriol, of tartar, of phoſphorus, and of borax, capable of being reduced to ſolidity. The others, when highly concentrated, that is, brought to the utmoſt degree of ſtrength of which they are capable, always become an inviſible vapour, permanent elaſtic, until it comes in contact with water, or ſome other ſubſtance with which they are capable of uniting. For ſuch acids the name of ſalts ſeems leſs proper, as we can ſcarcely ſay that a vapour, which is already much more fluid than water, can be diſſolved in that element.

The acids are divided into the mineral, the vegetable, and the animal; expreſſing their different origin, or where they are moſt commonly to be found. The mineral acids are commonly reckoned three; the vitriolic, the nitrous, and the marine. To this the acid of borax ought to be added; but its weakneſs makes it much leſs taken notice of as an acid than the others. A Swediſh chymiſt, however, Mr. Scheele, hath lately added a new acid to the number of the mineral ones, under the name of the *fluor* acid.

The vegetable kingdom affords only two diſtinct ſpecies of acids. The one appears fluid, and when concentrated to the utmoſt degree becomes an inviſible vapour. This is produced from fermented liquor, under the name of vinegar. An acid ſimilar to this, and which is thought not to be eſſentially different from it, is found in the juices of certain fruits, as lemons, &c. and is extracted from moſt vegetables by diſtillation with a ſtrong fire. The other is likewiſe a conſequence of fermentation; and cruſts on the bottom and ſides of caſks in which wine is put to depurate itſelf. In its crude ſtate it is called tartar; and when afterwards purified, is called the cream, or cryſtals, of tartar.

The animal acid, which have hitherto been diſcovered, are only two; the acid of ants, and that of urine, which is alſo the acid of phoſphorus. The firſt of theſe is volatile; and conſequently muſt be ſuppoſed a vapour; when in its ſtrongeſt ſtate: the other is exceedingly fixed: and will rather melt into glaſs, than riſe in vapours. It is ſaid that an acid is contained in blood, in waſps, bees, &c. but no experiment have as yet been made on theſe to determine this matter with any degree of preciſion.

FILTRATION.

The beſt method for feltering water for families, is to have a wooden veſſel lined with lead three or four foot wide at top, but tapering ſo as to end in a ſmall orifice at the bottom. The under part of the veſſel is to be filled with very rough ſand or gravel well freed from earth by waſhing. Over this, pretty fine ſand may be laid to the depth of 12 or 14 inches, but which muſt alſo be freed from earthy particles. The veſſel may then be filled up to the top with water, pouring it gently at firſt leaſt the ſand ſhould be too much diſplaced. It will ſoon filter through the ſand, and run out at the lower orifice exceedingly tranſparent, and in a conſiderable quantity. When the upper part of the ſand begins to be ſtopped up, ſo as not to allow a free paſſage to the water, it may occaſionally be taken off, and the earthy matter waſhed from it, when it will be equally ſerviceable as before. It is needleſs here to point out the method of feltering ſmall quantities of liquors, as every body is acquainted with this part of filtration.

PRECIPITATION.

Precipitation, or coagulation, is the reverſe of ſolution, and is the bringing of a body ſuddenly from a fluid to a ſolid ſtate; it differs from cryſtallization, in that it generally requires leſs time; and in cryſtallization the ſubſtance aſſumes regular figures, whereas precipitates are always in the form of powders. Precipitation is uſed for ſeparating earths and metals from the acids which had kept them ſuſpended.

ÉVAPORATION.

Evaporation conſiſts in diſſipating the moſt fluid or volatile parts of any ſubſtance by means of heat, and is a preparatory for the operation of cryſtallization. No ſaline liquor muſt be evaporated in a veſſel which would be corroded by it, and hence iron veſſels are abſolutely improper for evaporations of any kind of ſaline liquor whatever.

CRYSTALLIZATION.

By Cryſtallization is meant the ſeparation of a ſalt from the water in which it has been diſſolved, in tranſparent maſſes regularly figured and differently formed, according to the different nature of the ſalts: the proceſs depends upon the conſtitution of the atmoſphere more than any other.

DISTILLATION.

Diſtillation is a kind of evaporation, only in ſuch a manner, that the part of the liquor evaporated is not diſſipated in the air but preſerved, by making the ſteam paſs through a ſpiral pipe, which goes through a large veſſel full of cold water, or into cold glaſs receivers.

SUBLIMATION.

Sublimation properly ſpeaking, is only the diſtillation of a dry ſubſtance; and therefore, when volatile matters, ſuch as ſalt of hartſhorn, are to be ſublimed, the operation is performed in a glaſs retort ſet in a ſand bath, and the ſalt paſſes over into a receiver.

DEFLAGRATION.

This operation is always performed by means of nitre, except in making the flowers of zinc. It requires open veſſels of earth, or iron; the latter are very apt to be corroded, and the former to imbibe part of the matter. To perform this proceſs with ſafety, and without loſs, the nitre ought to be mixed with whatever matter is to be deflagrated with it, and thrown by little and little into the veſſel previouſly made red hot. If much is put in at once, a great deal will be thrown out by the violent commotion; and to perform this operation in cloſe veſſels is in a manner impoſſible, from the prodigious quantity of elaſtic vapour generated by the nitre. Care muſt alſo be taken to remove the whole mixture to ſome diſtance from the fire, and not to bring back any ſpark from the quantity deflagrating, with the ſpoon which puts it in; otherwiſe the whole would irremediably be conſumed at once.

CALCINATION.

This is the ſubjecting any matter to a heat ſo violent, as to diſſipate ſome part of it, without melting what remains. It is often practiſed on metallic ſubſtances, particularly lead, for obtaining the calx of that metal called minium, or red lead.

This operation, as indeed all other chymical ones, is beſt performed in large quantities, where a particular furnace is conſtructed on purpoſe, a fire kept on day and night without interruption. The flame is made to play over the ſurface of the metal, and it is continually ſtirred ſo as to expoſe different parcels of it to the action of the heat.

FUSION.

This is when a ſolid body is expoſed to ſuch a degree of heat as makes it paſs from a ſolid to a fluid ſtate; and as different ſubſtances are poſſeſſed of very different degrees of fuſibility, the degrees of melting heat are very various.

Beſides the true fuſion, there are ſome kinds of ſalts which retain ſo large a proportion of water in their cryſtals, as to become entirely fluid upon being expoſed to a very ſmall degree of heat. This is commonly called the watery fuſion; but is really a ſolution of the ſalt in that quantity of water retained by it in its cryſtalline form: for ſuch ſalts afterwards become ſolid by the evaporation of the water they contained; and then require a ſtrong red heat to melt them thoroughly, or perhaps are abſolutely unfuſible.

Of all known ſubſtances, unctuous and inflammable ones become fluid with the leaſt heat; then come the more fuſible metals, lead, tin, and antimony; then ſome of the more fuſible ſalts; and then the harder metals, ſilver, gold, copper, and iron; then the mixtures for making glaſs; and laſt of all, the metal called platina, which has hitherto been incapable of fuſion, except by the violent action of the ſun-beams in the focus of a large burning glaſs. This ſubſtance ſeems to be the moſt refractory of all others, even the hardeſt flints melting into glaſs long before it.

Fuſion of ſmall quantities of matter is uſually performed in pots called crucibles; which, as they are required to ſtand a very violent heat, muſt be made of the moſt refractory materials poſſible.

The making of crucibles belongs properly to the potter; but as a chymyſt ought to be the judge of their compoſition, we ſhall here give ſome account of the different attempts to make theſe veſſels of he neceſſary ſtrength.

All earthen veſſels are compoſed, at leaſt partly, of that kind which is called the argillaſceous earth or clay, becauſe theſe only have the neceſſary ductility, and can be formed into veſſels of the proper form. Pure clay is, by itſelf, abſolutely unfuſible; but is exceedingly apt to crack when expoſed to ſudden changes of heat and cold. It is alſo very apt to melt when mixed with other ſubſtances, ſuch as calcareous earths, &c. When mixed in a certain proportion with other materials, they are changed by violent heat into a kind of half-melted ſubſtance, ſuch as our ſtone-bottles. They cannot be melted completely, however, by almoſt any fire; they are alſo very compact, and will contain the moſt ſenſible ſubſtances, even glaſs of lead itſelf; but as they are very apt to crack from ſudden changes of heat and cold, they are not ſo much uſed; yet, on particular occaſions, they are the only ones which can be made uſe of.

The more denſe any kind of veſſels are, the more apt they are, in general, to break, by a ſudden application of heat, or cold hence crucibles are not, in general, made of the greateſt denſity poſſible; which is not at all times required. Thoſe made at Heſſe, in Germany, have had the beſt reputation for a long time. Mr. Pott, member of the academy of ſciences at Berlin, hath determined the compoſition of theſe crucibles to be, one part of good refractory clay, mixed with two parts of ſand, of a middling fineneſs, from which the fineſt part has been fitted. By ſifting the finer particles from the ſand, too great compactneſs is avoided: but at the ſame time this mixture renders them apt to be corroded by vitrifying matters kept a long time in fuſion; for theſe do not fail to act upon the ſand contained in the compoſition of the crucible, and, forming a vitreous maſs, at laſt run through it.

This inconvenience is prevented, by mixing, inſtead of ſand, a good baked clay in groſs powder. Of a compoſition of this kind are made the glaſs-houſe pots, which ſometimes ſuſtain the violent heat employed in making glaſs, for ſeveral months. They are, however, gradually conſumed by the glaſs, and become conſtantly more and more thin.

As the containing veſſel, however, muſt always be expoſed to a more violent heat than what is contained in it, crucibles ought to be formed of ſuch materials as are not vitrifiable by any heat whatever. But, from the attempts made to melt platina, it appears, that of all known ſubſtances it would be the moſt deſirable for a melting veſſel. Heſſian crucibles, glaſs-houſe pots, Sturbridge-clay, in ſhort every ſubſtance which could be thought of to reſiſt the moſt violent heat, were melted in ſuch a manner as even to ſtop up the pipes of arge bellows, while platina was not altered in the leaſt; and Meſſrs. Macquer and Beaumé have ſhewn, that though platina cannot be melted ſo as to caſt veſſels of it, it may nevertheleſs be cupelled with led ſo as to become malleable, and thus veſſels might otherwiſe be made from that ſubſtance.

The extreme ſcarcity of this mineral, however, leaves no room to hope any thing from it; and Mr. Pott has made ſo many experiments upon clays mixed with different ſubſtances, that he has in a manner exhauſted the ſubject.

MINERALS.

A Mineral is a body dug out of the earth; though all metals are minerals, yet all minerals are not metals, ſome being ſemimetals, &c. &c.

METALLIC SUBSTANCES.

GOLD.

This metal is reckoned of all others the moſt perfect and indeſtructible. When in its greateſt purity, it has very little elaſticity, is not ſonorous, its colour is yellow, it is exceedingly ſoft and flexible, and is more ductile than any other metal whatever.

Of all bodies it is the moſt ponderous; its gravity being to that of water, according to Dr. Lewis, as 19,280, or 19,290, to 1. For its fuſion it requires a low degree of white heat, ſome what greater than that in which ſilver melts. Whilſt fluid, it appears of a bluiſh green colour; when cold, its ſurface looks ſmooth, bright, and conſiderably concave: it ſeems to expand more in the act of fuſion, and to ſhrink more in its return to ſolidity, than any of the other metals; whence the greater concavity of its ſurface. Before fuſion it expands the leaſt of all metals, except iron. By ſudden cooling it becomes, as well as other metals, brittle; which effect has been erroneouſly attributed to the contact of fuel during fuſion.

Gold amalgamates very readily with mercury, and mingles in fuſion with all the metals. It is remarkably diſpoſed to unite with iron; of which it diſſolves many times its own weight, in a heat not much greater than that in which gold itſelf melts; the mixture is of a ſilver colour, very brittle, and hard. All the metals, except copper, debaſe the colour of gold; and, if their quantity is nearly to that of the gold, almoſt entirely conceal it. All but copper and ſilver deſtroy its malleability; but none ſo remarkable as tin and lead: a moſt minute portion, even the vapour, of theſe metals, renders gold extremely brittle; though a ſmall portion of gold forms with them compounds ſufficiently ductile; more ſo than either the lead or tin by themſelves. When gold is ſtruck during a certain time by a hammer, or when violently compreſſed, as by the wire-drawers, it becomes more hard, elaſtic, and leſs ductile; ſo that it is apt to be cracked and torn. Its ductility is, however, reſtored by the ſame means uſed with other metals, namely, heating it red hot, and letting it cool ſlowly. This is called annealing metals; and gold ſeems to be more affected by this operation than any other metal. The tenacity of the parts of gold is alſo very ſurpriſing; for a wire of $\frac{1}{10}$ of an inch in diameter will ſupport a weight of 500 pounds.

SILVER.

This, next to gold, is the moſt perfect, fixed, and ductile of all the metals. Its ſpecific gravity is to that of water nearly as 11 to 1. A ſingle grain has been drawn into a wire three yards long, and flatted into a plate an inch broad. In common fires it ſuffers no diminution of its weight; and, kept in the vehement heat of a glaſs-houſe for a month, it looſes no more than one ſixty-fourth. In the focus of a large burning glaſs, it ſmokes for a long while, then contracts a greyiſh aſh on the ſurface, and at length is totally diſſipated.

Silver is ſomewhat harder and more ſonorous than gold, and is fuſible with a leſs degree of heat. The tenacity of its parts alſo is nearly one half leſs than that of gold; a ſilver wire of $\frac{1}{10}$ of an inch diameter being unable to bear more than 270 pounds.

Mercury unites very readily with ſilver-leaf, or with the calx of ſilver precipitated by copper; but does not touch the calces precipitated by alkaline ſalts. The vapours of ſulphureous ſolutions ſtain ſilver yellow or black. Sulphur, melted with ſilver, debaſe its colour to a leaden hue, renders it more eaſily fuſible than before, and makes it flow ſo thin as to be apt in a little time to penetrate the crucible: in a heat juſt below fuſion, a part of the ſilver ſhoots up, all over the ſurface, into capillary effloreſcences. Aqua fortis does not act upon ſilver in this compound; but fixed alkaline ſalts will abſorb the ſulphur, and form a hepar ſulphuris, which, however, is capable of again diſſolving the metal. If the ſulphurated ſilver is mixed with mercury ſublimate, and expoſed to the fire, the mercury of the ſublimate will unite with the ſulphur, and carry it up in the form of cinnabar, whilſt the marine acid of the ſublimate unites with the ſilver, into a luna cornea, which remains at the bottom of the glaſs. Fire alone is ſufficient, if continued for ſome time, to expel the ſulphur from ſilver.

COPPER.

This is one of thoſe metals, which, from their deſtructibility by fire, and contracting ruſt in the air, are called imperfect. Of theſe, however, it is the moſt perfect and indeſtructible. It is of a reddiſh colour when pure; eaſily tarniſhes in a moiſt air, and contracts a green ruſt. It is the moſt ſonorous of all the metals, and the hardeſt and moſt elaſtic of all but iron. In ſome of its ſtates, copper is as difficultly extended under the hammer as iron, but always proves ſofter to the file; and is never found hard enough to ſtrike a ſpark with flint or other ſtones; whence its uſe for chiſſels, hammers, hoops, &c. in the gunpowder works. When broke by often bending backwards and forwards, it appears internally of a dull red colour without any brightneſs, and of a fine granulated texture, reſembling ſome kinds of earthen ware. It is conſiderably ductile, though leſs ſo than either gold or ſilver; and may be drawn into wire as fine as hair, or beaten into leaves almoſt as thin as thoſe of ſilver. The tenacity of its parts is very conſiderable; for a copper wire of $\frac{1}{10}$ of an inch diameter will ſupport a weight of $299\frac{1}{4}$ pounds without breaking. The ſpecific gravity of this metal, according to Dr. Lewis, is to that of water as 8.830 to 1.

IRON.

Iron is a metal of a greyiſh colour, ſoon tarniſhing in the air into a duſky blackiſh hue; and in a ſhort time contracting a yellowiſh or reddiſh ruſt. It is the hardeſt of all metals; the moſt elaſtic; and, excepting platina, the moſt difficult to be fuſed. Next to gold, iron has the greateſt tenacity of parts; an iron wire, the diameter of which is the tenth part of an inch, being capable of ſuſtaining 450 pounds. Next to tin, it is the lighteſt of all the metals, loſing between a ſeventh and eighth part of its weight when immerſed in water. When very pure, it may be drawn into wire as fine as horſe-hair; but is much leſs capable of being beaten into thin leaves than the other metals, excepting only lead.

Iron grows red-hot much ſooner than any other metal; and this, not only from the application of actual fire, but likewiſe from ſtrong hammering, friction, or other mechanic violence. It nevertheleſs melts the moſt difficultly of all metals except platina; requiring, in its moſt fuſible ſtate, an intenſe, bright, white heat. When perfectly malleable, it is not fuſible at all by the heat of furnaces, without the additions or the immediate contact of burning fuel; and, when melted, loſes its malleability: all the common operations which communicate one of theſe qualities deprive it at the ſame time of the other; as if ſenſibility and malleability were in this metal incompatible. When expoſed to the focus of a large burning mirror, however, it quickly fuſed, boiled, and emitted an ardent fume, the lower part of which was a true flame. At length it was changed into a blackiſh, vitrified ſcoria.

LEAD.

Lead is a pale or livid white metal, ſoon loſing its brightneſs in the air, and contracting a blackiſh or greyiſh aſh-colour. It is the ſofteſt and moſt flexible of all metallic bodies; but not ductile to any great degree, either in the form of wire, or leaf; coming far ſhort, in this reſpect, of all other metals. It has alſo the leaſt tenacity of all metallic bodies; a leaden wire of $\frac{1}{12}$ of an inch diameter being capable of ſupporting only $29\frac{1}{4}$ pounds. Lead has, however, a conſiderable ſpecific gravity; loſing, when immerſed in water, between $\frac{1}{11}$ and $\frac{1}{12}$ of its weight. It is of all metals the moſt fuſible, excepting only tin and biſmuth. The plumbers caſt thin ſheets of lead upon a table or mould, covered with a woollen, and above this with a linen-cloth, without burning or ſcorching the cloths. The melted lead is received in a wooden caſe without a bottom; which being drawn down the ſloping table by a man on each ſide, leaves a ſheet of its own width, and more or leſs thin according to the greater or leſs celerity of its deſcent. For thick plates, the table is covered over with moiſtened ſand, and the liquid metal conducted evenly over it, by a wooden ſtrike, which bears on a ledge at each ſide.

TIN.

The colour of this metal reſembles ſilver, but ſomewhat darker. It is ſofter, leſs elaſtic, and ſonorous, than any other metal except lead. When bent backwards and forwards, it occaſions a crackling ſound, as if torn aſunder. It is the lighteſt of all malleable metals, being little more than ſeven times ſpecifically heavier than water. The tenacity of its parts alſo is not very conſiderable; a tin wire of $\frac{1}{10}$ of an inch diameter, being able to ſupport only $49\frac{1}{2}$ pounds.

Tin is commonly reckoned the leaſt ductile of all metals except lead; and certainly is ſo, in regard to ductility into wire, but not in regard to extenſibility into leaves. Theſe two properties ſeem not to be ſo much connected with one another as is generally imagined. Iron and ſteel may be drawn into very fine wire, but cannot be beat into leaves. Tin, on the other hand, may be beat into very thin leaves, but cannot be drawn into wire; gold and ſilver poſſeſs both properties in a very eminent degree; whilſt lead, notwithſtanding its flexibility and ſoftneſs, cannot be drawn into fine wire, or beat into thin leaves. It melts the moſt eaſily of all the metals; about the 430th degree of Fahrenheit's thermometer. Heated till almoſt ready to melt, it becomes ſo brittle that large blocks may be eaſily beat to pieces by a blow. The puror ſort, from its facility of breaking into long ſhining pieces, is called grain-tin. Melted, and nimbly agitated at the inſtant of its being to congeal, it is reduced into ſmall grains or powder.

With the heat neceſſary for fuſion, it may alſo be calcined; or at leaſt ſo far deprived of its phlogiſton as to appear in the form of a grey calx, which may be entirely reduced to tin by the addition of inflammable matter. The calcination of tin, like that of lead, begins by the melted metal loſing its brightneſs, and contracting a pellicle on its ſurface. If the fire is raiſed to a cherry-red, the pellicle ſwells and burſts, diſcharging a ſmall bright flame of an arſenical ſmell. By longer continuance in the fire, the metal is converted firſt into a greyiſh, and then into a perfectly white calx, called putty, which is uſed for poliſhing glaſs, and other hard bodies.

MERCURY, or QUICKSILVER.

Mercury is a fluid metallic ſubſtance, of a bright ſilver colour, reſembling lead or tin when melted; entirely void of taſte and ſmell; extremely diviſible; and congealable only in a degree of cold very difficultly produced, in this country, by art. It is the moſt ponderous of all fluids, and of all known bodies, gold and platina excepted; its ſpecific gravity being to that of water nearly as 14 to 1. It is found to be ſpecifically heavier in winter than in ſummer, by 25 grains in 11 ounces.

Neither air nor water, nor the united action of theſe two, ſeem to make any impreſſion upon mercury; nor is it more ſuſceptible of ruſt than the perfect metals. Its ſurface, nevertheleſs, is more quickly tarniſhed than gold or ſilver; becauſe the duſt which floats in the air, quickly ſeizes on its ſurface. The watery vapours alſo, which float in the air, ſeem to be attracted by mercury.

From theſe extraneous matters, which only ſlightly adhere to it, mercury may be eaſily cleanſed by paſſing it through a clean new cloth, and afterwards heating it: but if mixed with any other metal, no ſeparation can be effected without diſtillation. In this proceſs, a ſmall portion of ſome of the metals generally ariſes along with the mercury. Thus, quickſilver diſtilled from lead, biſmuth, or tin, appears leſs bright than before; ſtains paper black; ſometimes exhibits a ſkin upon the ſurface; and does not run freely, or into round globules. Mr. Boyle relates, that he has obſerved the weight of mercury ſenſibly increaſed by diſtillation from lead, and this when even a very moderate fire was made uſe of.

ZINC.

This is a ſemi-metal of a bluiſh white colour. It is the leaſt brittle of any of the ſemi-metals; and when amply ſupplied with phlogiſton, which may be done by treating it in cloſe veſſels with inflammable matters, it poſſeſſes a ſemi-ductility, by which it may be flattened into thin plates. When broken it appears of many flat ſhining plates or facets, which are larger when ſlowly than when haſtily cooled. When heated, it is very brittle; and crackles like tin, only louder, when bent. Expoſed to the air, it contracts in length of time a yellowiſh ruſt. Its ſpecific gravity, according to Dr. Lewis, is to that of water as $7\frac{1}{10}$ to 1. It begins to melt as ſoon as red hot; but does not flow thin till the fire is raiſed to a white heat. Then the zinc immediately begins to burn with an exceedingly bright and beautiful flame. Kept juſt in fuſion, it calcines ſlowly; not only on the upper ſurface, but likewiſe round the ſides, and at the bottom of the crucible. If ſeveral pieces are juſt melted together, the maſs, when grown cold, may be broke into the ſame number; their union being prevented by a yellowiſh calx, with which each piece is covered over. Mr. Malouin relates, in the French Memoirs for 1742, that a quantity of zinc being melted ſix times, and the fuſion continued fifteen hours each time, it proved, on every repetition, harder, more brittle, leſs fuſible, and leſs calcinable: that after the two firſt fuſions, its colour was grey; after the third, brown; and after the fourth, black: that the fifth rendered it of a ſlate blue; and the ſixth of a clear violet.

BISMUTH.

This ſemi-metal, called alſo tin-glaſs, and by ſome naturaliſts *marcaſita officinarum*, is ſomewhat ſimilar to the regulus of antimony. It appears to be compoſed of cubes formed by the application of plates upon each other. Its colour is leſs white than that of regulus of antimony; and has a reddiſh tinge, particularly when it is expoſed to the air. In ſpecific gravity it approaches to ſilver; being nearly ten times heavier than water. It has no degree of malleability; breaking under the hammer, and being reducible by trituration to fine powder. It melts a little later than tin, and ſeems to flow the thinneſt of all metalic ſubſtances. Biſmuth is ſemi-volatile, like all other ſemi-metals. When expoſed to the fire, flowers riſe from it; it is calcined; and converted into a litharge and glaſs nearly as lead is. It may even be employed like that metal, in the purification of gold and ſilver by cupellation. When in fuſion it occupies leſs volume than in its ſolid ſtate: a property peculiar to iron among the metals, and biſmuth among the ſemi-metals. It emits fumes in the fire as long as it preſerves its metallic form; when calcined or vitrified, it proves perfectly fixed.

Biſmuth mingles in fuſion with all the metalline ſubſtances, except regulus of cobalt and zinc. The addition of nickel, or regulus of antimony, renders it miſcible with the former, though not with the latter. It greatly promotes the tenuity as well as facility of the fuſion of all thoſe metals with which it unites. It whitens copper and gold, and improves the colour of ſome of the white metals: mixed in conſiderable quantity, it renders them all brittle, and of a flaky ſtructure like its own. If mixed with gold, or ſilver, a heat that is but juſt ſufficient to melt the mixture, will preſently vitrify a part of the biſmuth; which, having then no action on thoſe perfect metals, ſeparates, and glazes the crucible all round.

ANTIMONY.

This ſemi-metal, when pure, and well fuſed, is of a white ſhining colour, and conſiſts of laminæ applied to each other. When it has been well melted, and too haſtily cooled, and its ſurface is not touched by any hard body during the cooling, it exhibits the perfect figure of a ſtar, conſiſting of many radii iſſuing from a center. This proceeds from the diſpoſition that the parts of this ſemi-metal have to arrange themſelves in a regular manner, and is ſimilar to the cryſtallization of ſalts.

Regulus of antimony is moderately hard; but, like other ſemi-metals, it has no ductility, and breaks in ſmall pieces under a hammer. It loſes $\frac{1}{7}$ of its weight in water. The action of air and water deſtroys its luſtre, but does not ruſt it ſo effectually as iron or copper. It is fuſible with a heat ſufficient to make it red hot; but when heated to a certain degree, it fumes continually, and is diſſipated in vapours. Theſe fumes form what are called the argentine flowers of regulus of antimony, and are nothing but the earth of this ſemi-metal deprived of part of its inflammable principle, and capable of being reduced to its reguline ſtate by an union with this principle.

ARSENIC.

This mineral, when in its pure ſtate, has no appearance of a metallic ſubſtance. It is moderately heavy, compact, brittle, and of a cryſtalline and vitreous appearance. Expoſed to the air, it changes to a milky hue like that of porcelean; and at length to the opaque whiteneſs of white enamel. The larger maſſes preſerve their tranſparency longer than the ſmall, and longer in a dry than moiſt air. In the fire it totally exhales before melting, with a ſtrong ſmell of garlic. The fumes, caught in proper veſſels, condenſe either into a white powder, or into cryſtalline maſſes, as the receiver is more or leſs removed from the fire.

Arſenic eaſily unites with all metals and ſemi-metals, all of which it renders brittle. It renders gold of a greyiſh colour in its broken ſurface; ſilver, of a deep grey; and copper, white. Tin becomes, by mixture with arſenic, much harder, and more unfuſible; lead becomes hard and very brittle; and iron is changed into a blackiſh maſs. It volatilizes, vitrifies, and ſcorifies, all ſolid bodies; gold, ſilver, and platina, excepted.

Arſenic is capable of decompoſing nitre, and uniting with its baſis. It then forms a ſingular ſort of ſalt which cannot be decompoſed by any acid; becauſe the arſenic, when deprived of phlogiſton (which it perfectly is by the decompoſition of the nitre,) ſeems to have a greater attraction for alkalies than acids have. Was it poſſible therefore to deprive arſenic of all its phlogiſton, we ſhould no doubt find it capable of expelling the marine, or vitriolic, as well as the nitrous acid. It readily unites with alkaline ſalts, in the common way of fuſion: but is then eaſily ſeparable by an acid; becauſe, not being deprived of its phlogiſton, the union between it and the alkali is very weak. The neutral arſenical ſalt may itſelf be decompoſed, by melting it with inflammable matters, or adding a ſolution of it to any metallic ſolution. A double decompoſition and combination then take place; the acid unites with the alkali, and the arſenic with the metal.

CHYMISTRY.

INFLAMMABLE SUBSTANCES.

The nature of the work will not permit us to enter largely upon inflammable ſubſtances, we ſhall only obſerve that they may be divided into the following claſſes: Sulphurs, Ardent Spirits, Oils and Fats, Reſins, Bitumens, and Charcoal.

EARTH IN GENERAL.

The ancient philoſophers entertained an opinion that there exiſts one ſimple ſubſtance, the principle of hardneſs, dryneſs, weight and fixity in bodies, conſtituting the baſe of all ſolid bodies, to which they gave the name of earth. This opinion, founded purely on abſtract philoſophical notions, has been conſtantly taught in the ſchools, and is ſtill admitted by ſome of the learned. Paracelſus, as we have ſeen, denominated all the reſidues of analyſes, earth; but chymiſts, by the advice and example of Glauber, having examined thoſe reſidues, found they were far from being pure earth ſubſtances.

T. Boerhaave, who with ſome limitation had adopted the opinion of Paracelſus, obſerved, that after all analyſes, there remained a dry, inſipid, heavy, colourleſs matter, poſſeſſing all the properties of an earth. But when the proper methods of chemical examination are applied to theſe matters, it is found that they differ greatly from each other, and that one and the ſame denomination cannot with propriety be applied to them all.

Beccher admitted three kinds of earth, as has been mentioned, in ſpeaking of principles, namely, the vitrifiable, the inflammable, and the mercurial earth. Stahl regarded the firſt of theſe as the true earthy principle, and Macquer joins him in thinking, that the vitrifiable earth ought to be conſidered as the moſt pure and ſimple.

To arrive at a proper determination on this ſubject, let us conſider what are the properties which chymiſts univerſally admit, as diſtinguiſhing the element of earth. We find ſix, namely, weight, hardneſs, inſipidity, fixity, infuſibility, and immutability. But all theſe properties are found in the earth of quartz, rock cryſtal, and vitrifiable ſtones in general, as well as in that of clays. If therefore ſeveral matters, very different from each other, have all the properties attributed in general to the element called earth, ought we to regard them as ſo many ſimple and primitive earths, or ought we to adopt the opinion of Stahl and Macquer, who obſerving the properties of earth moſt evidently in the vitrifiable, have thought proper to eſteem it as the primitive earth, and the others as modifications produced by its entering into different compounds?

Seducing as this hypotheſis may be, and however great the confidence we might place in the opinion of ſuch eminent chymiſts, we cannot think it proper to reckon the vitrifiable earth the primitive baſe of the others. 1. Becauſe this earth is not entirely the ſame nature in all the ſtones wherein Stahl and Macquer admit its exiſtence. 2. Becauſe, without having paſſed the organs of animals, it may be altered by ſaline mineral matters, ſuch as alkalis; ſo that it cannot again, by any method whatever, be reſtored to its former ſtate of purity: a character, which certainly ought not to be found in an element, whoſe nature is unchangeable. 3. Becauſe we do not find this earth pure, and poſſeſſing all its properties in any organized bodies; in which, nevertheleſs, we find water eſſential to their compoſition. 4. Becauſe we find in ſeveral ſubſtances all the properties of earthy matters, in the ſame manner as in vitrifiable earth, though not ſo intenſe. 5. Becauſe it is not at all proved, that vitrifiable earth is the baſe of other earths and ſolid matters, as ſome chymiſts ſeem to think.

Nature preſents ſeveral ſubſtances to our obſervation, which have all the properties of earths. We cannot aſcertain which is the ſimpleſt among them, becauſe they all ſeem to be equally ſo, as far as experiments have determined; and even if it were diſcovered that one of them were ſimpler than the reſt, it could not be concluded to be the elementary earth, till it was ſhewn to be the baſis of other earths, and the cauſe of coheſion and ſolidity in various compounds. We ought therefore, without deciding which is properly ſpeaking the element, to admit of different kinds of earths, and endeavour to obtain ſuch a knowledge of their properties, as will ſerve to diſtinguiſh them whenever they are met with in chymical analyſes.

Chymiſts have long admitted ſeveral kinds of earthy matters: but their firſt diviſions were vicious in many reſpects, becauſe the characters they were founded on were neither ſufficiently certain, nor numerous. Such, for example, is the diſtinction of earths into mineral, vegetable, and animal earths. For though it is true, that the laſt fixed reſidues of vegetables, after lixiviation, are for the moſt part without ſmell, taſte, or ſolubility, theſe properties are not ſufficient to juſtify the claſſing them with earths, becauſe they are neither unalterable, infuſible, nor ſimple. The ſubſtance which forms the dry and infuſible baſe of the bones of animals, and is ſtill called by the name of earth, from its inſipidity and inſolubility, has been known for ſome years to be a true ſaline ſubſtance, as we ſhall ſhew in our hiſtory of the animal kingdom; and it may with great probability be conjectured, that the inſipid and inſoluble reſidues, after the laſt analyſis of other animal matters, are of the ſame nature as the reſidual matter of bones. The name of metallic earth given to the dry calces of the ſeveral matters from the inſipidity and inſolubility of ſome of them, does not agree with their other properties; for they are in general fuſible, and are all known to be compounded, as will hereafter be ſhewn.

Mineralogiſts, who have treated of the hiſtory of earths, have paid a greater attention to accuracy and preciſion in their claſſification than chymiſts; who have attended to them only in ſuch a general way as they thought might ſerve to advance the theory of the ſcience they cultivated. The greateſt number of modern naturaliſts, who have claſſed theſe matters, have adopted characters founded on theſe chymical properties, and by that means given much perſpicuity to the natural hiſtory of the mineral kingdom. Such are Meſſ. Wallerius, Cronſtedt, and Monnet, who have compoſed complete ſyſtems of mineralogy on this principle. No chymiſt has made a greater number of reſearches into the nature of ſtones and earths than Pott, who has given a methodical arrangement of theſe bodies, founded on the reſults of his own experiments. Much praiſe and gratitude is due from the public to M. Dietrich for his continued labours, and to Meſſ. Bergman and Bayen for their analyſes of many earthy ſubſtances. We ſhall not attempt to exhibit or compare the different ſyſtems of theſe authors, as it is not our preſent intention to write the natural hiſtory of earthy ſubſtances, but ſhall only avail ourſelves of their labours to determine how many different kinds of earths there are, chymically conſidered, and what are the diſtinctive characters of each.

Before we enter on this ſubject, we muſt obſerve, that it is proper to conſider ſtones and earths as conſtituting the ſame claſs, becauſe they are, in fact, nothing more than one and the ſame ſubſtance in a different ſtate of aggregation. Grit ſtone, for example, is nothing more than ſand united by the force of aggregation; and ſand conſiſts of gritſtone, whoſe integrant parts are diſunited: both ſubſtances having preciſely the ſame chymical properties.

M. Pott has divided earths and ſtones into four claſſes, the vitrifiable, the argillaceous, the calcareous, and the gypſeous. Subſequent diſcoveries have ſhewn, that the ſubſtances formerly diſtinguiſhed by the name of calcareous earth, are true neutral ſalts, and gypſeous ſtones are alſo known to be ſaline ſubſtances. Among the four claſſes of ſtones admitted by Pott, there are only two which belong really to this genus.

Doctor Black, whoſe name diſtinguiſhes one of the greateſt periods of the improvement of chymiſtry, having examined with much care, the baſe of the Epſom ſalt, has proved that it conſiſts of a peculiar ſubſtance, which he called magneſia, and placed among the earths. All the chymiſts have aſſented to his diſcovery.

M. Bergman has diſcovered in the marmor metallicum, or heavy ſpar, a peculiar earth, which he has called terra ponderoſa, or ponderous earth.

We think, we ought to diſtinguiſh theſe two ſubſtances, from earths properly ſo called, in conſequence of reaſons which we ſhall give in this Syſtem.

From various conſiderations we think, that no bodies ſhould be admitted as true earths, but ſuch as are perfectly inſipid, inſoluble, and infuſible; and that we ought to diſtinguiſh ſuch as poſſeſs theſe properties by the chymical phenomena they exhibit. We therefore admit of but two kinds of pure earths, which are equally ſimple and elementary.

The firſt is that which conſtitutes rock cryſtal, quartz, grit-ſtone, flints, and all hard ſtones that ſtrike fire with ſteel. Its chymical character is, that it is inalterable by the ſtrongeſt fire, neither loſing its hardneſs, tranſparency, nor other properties by any heat that art can produce. We call it vitrifiable earth, becauſe it is the only earth which forms a tranſparent glaſs by combination with alkalis.

The ſecond kind of earth, which we regard as ſimple and pure, is the argillaceous. In its ſtate of purity, it preſents the following characters. It is almoſt always opake, or at leaſt its tranſparency is never like of the vitrifiable ſtones. It is always diſpoſed in thin plates, or laminæ on each other. Though it has no more taſte than vitrifiable earth, it ſeems nevertheleſs to have a kind of action on our organs, as appears by its adheſion to the tongue. Its force of aggregation is never ſo conſiderable, as that of vitrifiable earth; whence it follows, that argillaceous ſtones are never very hard, but break by the blow of a ſteel inſtrument, without ſcratching it, or giving fire, as vitrifiable earths do. This ſmall force of aggregation renders this earth much more diſpoſed to combination, and therefore we meet with pure clay much more ſeldom than pure cryſtal or quartz. It may be readily conceived, after this obſervation, why clays are almoſt always coloured, and why there are few clays which poſſeſs the argillaceous character in an eminent degree. Clay expoſed to the action of heat, experiences an alteration which vitrifiable earths do not. Inſtead of remaining unchanged, it hardens, and obtains an aggregation ſtronger than in its natural ſtate. It even approaches the vitrifiable earth in hardneſs and want of diſpoſitions to combine, after ſuch treatment. Water has ſome action on clay, which it penetrates, and renders ſoft and ductile. That this is a kind of combination is evinced by the adheſion of theſe two ſubſtances, which is ſuch, that they cannot be ſeparated but by the action of a ſtrong heat continued for a long time. The property of clay to be ſoftened by water, and become hard by fire, is of great value in the arts. Laſtly, the property of entering into combination with a great a great number of ſubſtances, eſpecially diſtinguiſhes it from the vitrifiable earth. From this it is, that clay is found in a great number of compounds; and from the conſideration of this, we have ſpoken more largely of this earth; as a knowledge of its leading characters is neceſſary, in order to diſtinguiſh it in chymical operations.

Theſe two earths we have thought fit to diſtinguiſh, as they both poſſeſs the characters of elementary ſubſtances, and no chymiſt has yet ſucceeded in decompoſing them. We are not ſufficiently advanced in our knowledge concerning the origin, formation, or even the chymical properties of theſe earths, to pronounce with certain chymiſts, that the one is more ſimple than the other, and that the latter is only a modification of the former. We cannot admit, that the earth of rock cryſtal is the baſe of clay, which as far as is yet known is not the ſame ſubſtance, either attenuated, divided, or elaborated; for no chymiſt has ever converted the one into the other.

It rarely happens, that vitrifiable or argillaceous earth is found in nature in a ſtate of purity. The former alone enjoys this privilege in rock cryſtal; doubtleſs becauſe, as we have obſerved, of its great hardneſs and force of aggregation. Even this is often coloured by foreign matters. It is ſtill more frequently altered and combined with colouring matters in quartz. Argillaceous earth is yet leſs frequently found alone. The greateſt part of the earths and ſtones, to which naturaliſts have given different names, are compoſed of one or the other, or both theſe earths; or of ſaline ſubſtances, eſpecially lime, and magneſia, with metallic matters, moſt frequently iron. To obtain a conviction of this truth, nothing more is neceſſary than to caſt an eye over M. Monnet's work, in which that chymiſt ranges ſtones after their conſtituent parts. An attempt worthy of great praiſe, but which, while it ſhews the great advantages lithology may expect to receive from chymiſtry, affords at the ſame time a proſpect of the difficulties that ſtill attend the accurate claſſification of ſtones, from their chymical properties.

Earths and ſtones form the greateſt part of our globe, and are eaſily diſtinguiſhed from ſalts or inflammable bodies, by their inſolubility and unchangeableneſs in the fire. Their arrangement in beds, or ſucceſſive ſtrata, conſtitutes mountains or hills, and plains. In the former, they are either in ſhapeleſs maſſes, or in ſtrata inclined to the horizon. In the plains they are horizontally diſpoſed, and covered with a bed of mold fit for the vegetation of plants, which is produced by the decompoſition of the organized bodies that are formed and decay on the ſurface of the earth. The ſeveral kinds of earth are frequently diſtributed in a regular cryſtalline form in the clifts or ſubterraneous cavities. Water, which appears to have formed the greateſt part of theſe, continually attenuates them, tranſporting them from one place to another, and in general producing in them many changes.

The number of different forms of earths and ſtones being very great, and the knowledge of them of great importance to ſcience, as well as to the common applications of them to uſeful purpoſes, naturaliſts have in all ages been induced to endeavour to diſtinguiſh them by ſure and eaſy methods. The ancients had not the idea of claſſing them from their diſtinctive characters, but contented themſelves with deſcribing their general properties, and the hiſtory of the uſes they were applied to, together with their value, or the degree of eſtimation they were then held in. From this it is that the greateſt part of the ſtones deſcribed by Pliny, are not to be found or known. Modern naturaliſts, aware of the inconveniencies of this method of deſcribing ſtones, have taken another method of diſtinguiſhing them, with the intention that all future ages may underſtand their deſcriptions. It is from the external and ſenſible properties of theſe ſubſtances, that they have diſtinguiſhed them into orders, genera, and ſpecies.

WATERS.

Water has always been regarded as an element of great conſequence in moſt natural phenomena, capable of aſſuming a great number of forms, of entering into numerous combinations, unalterable in itſelf, and recovering its firſt ſtate. But the reſearches of M. Lavoiſier have ſhewn, that water, as well as air, is formed of principles of greater ſimplicity which may be obtained ſeparate from each other. This important diſcovery conſtitutes one of the moſt brilliant epochas of chymiſtry.

Natural philoſophers define water to be an inſipid, ponderous, tranſparent, colourleſs, and highly fluid body, ſuſceptible of the different ſtates of aggregation, from ſolidity to that of elaſtic vapour.

It is found in almoſt every natural body: there are, notwithſtanding, many ſubſtances with which art cannot unite it, though this is continually done in nature. It is obtained from wood, and the moſt ſolid bones. It exiſts in the hardeſt and moſt compact calcareous ſtones, and forms the greater part of the fluids, and a conſiderable proportion of the ſolid parts of animal bodies. Theſe are the facts that have occaſioned it to be reckoned among the number of elements.

To conclude; with regard to the other elements, we think that what has been already obſerved, and what muſt yet be ſaid in the courſe of the work will be quite ſufficient to clear up and explain every thing requiſite to be known in the art of chymiſtry.

Change cauſes it to become yellow or red, and to exhale fumes of the ſame colour in great abundace.

Its cauſticity is ſuch, that it immediately burns and deſtroys the organization of the ſkin and muſcles: it alſo reddens and entirely deſtroys the colour of ſyrup of violets. It is acted upon by light, and attracts the humidity of the air when it is ſtrongly concentrated. It unites with great violence to water, which becomes at firſt green, afterwards blue, and laſtly red. Much heat is given out in this combination. When united to a conſiderable quantity of water, it is called aqua fortis. The white and red nitrous acids were formerly conſidered as one and the ſame acid, differing only in the degree of concentration; and that which had the moſt colour, was conſidered as the moſt concentrated: but the nature of this ſaline ſubſtance being at preſent much better underſtood, it is admitted that it may exiſt in two different ſtates. In the one, the nitrous acid is colourneſs, more ponderous, leſs volatile, and does not emit fumes; in the other, it is tinged from yellow to a brown red, being lighter, more volatile, and continually emitting red vapours, more or leſs abundant, accordingly as its temperature is higher. Bergman diſtinguiſhes theſe two ſtates of the nitrous acid, by the names of dephlogiſticated and phlogiſticated nitrous acid; it will be ſufficient in this place to obſerve, that if the coloured and fuming nitrous acid be diſtilled in a glaſs retort, the red part comes over firſt in vapours, and the acid which remain in the retort becomes white and colourneſs. The deeper the colour of the nitrous acid, the larger will be the quantity of vapours, and the leſs the quantity of clear nitrous acid remaining in the retort; and on the contrary, if a nitrous acid, of a pale red, be ſubmitted to the ſame proceſs, the quantity of vapour is very inconſiderable, and the clear acid, which remains, is in much greater quantity than in the former caſe. This experiment proves, that the deep coloured nitrous acid is more volatile than the paler ſort; and that as all ſpirit of nitre is compoſed of theſe two acids, they may be obtained ſeparate, by diſtillation properly managed. In this operation, a certain quantity of vital air is always diſengaged, which may be collected by adapting a pneumatic apparatus to the receiver. It muſt be obſerved, that the ſame proceſs of diſtillation made with the paleſt nitrous acid, always diſengages ſome red vapours, and changes the colour of the acid, which becomes reddiſh. But this change produced by mere heat, diſappears when the acid grows cold; and the vapour, which had ariſen, is again diſſolved in the liquor.

Spirit of nitre has no action on the vitrifiable and quartzoſe earths; it unites with clay, ponderous earth, magneſia, lime, and the three alkalis, with which it forms nitre, with baſe of ponderous earth, and the ſeveral nitres diſtinguiſhed by the names, magneſian, calcareous, common, rhomboidal, ammoniacal; its affinities with theſe different baſes are the ſame as thoſe of the marine acid. Bergman arranges them in the following order: ponderous earth, fixed vegetable alkali, fixed mineral alkali, lime, magneſia, volatile alkali, clay.

The nitrous acid unites with the cretaceous acid, which it abſorbs in a conſiderable proportion: the mutual action of theſe two bodies is not well known.

The nitrous acid combines very readily with the marine acid: the alchymiſts gave the name of aqua regia to this compound, becauſe they uſed it to diſſolve gold, the king of the metals. It muſt always have appeared ſingular, that two acids, neither of which ſingly has any action on gold, ſhould become capable of diſſolving it when united. The alchymiſts happy in having diſcovered a ſolvent for this precious metal, did not trouble themſelves about the cauſe of the phenomenon. It is but a few years ſince two Swediſh chymiſts, Scheele and Bergman, attempted to diſcover the change which the admixture of theſe two acids produces in each. Scheele, as we have already obſerved, perceived, that the yellow vapour produced when the marine acid is diſtilled from the calx of manganeſe, has the ſame ſmell as aqua regia; that it deſtroys the blue colours of vegetables; and that its action on metals is very ſtrong, eſpecially on gold, which it perfectly diſſolves, like aqua regia. He thinks that theſe new properties ariſe, from its being deprived of phlogiſton by the calx of manganeſe, and that conſequently it has a ſtrong tendency to ſeize that principle from other bodies; and therefore acts powerfully on combuſtible bodies. From theſe facts and ſuppoſitions, he gave it the name of dephlogiſticated marine acid. We muſt here obſerve, this explanation is abſolutely contrary to the theory of Stahl, which Scheele appears to have adopted; ſince the marine acid, by the loſs of its phlogiſton, acquires new properties, which that great man attributed to the preſence of the inflammable principle, ſuch as volatility, a ſtrong odour, and a power of acting on combuſtible bodies. We apprehend, moreover, that all theſe phenomena are much more naturally explained by the new theory.

Bergman thinks, that the nitrous acid ſeizes the phlogiſton of the marine acid, and becomes partly diſſipated, in the form of vapour; and that the marine acid is converted into the ſame ſtate as it poſſeſſes, when diſtilled from the calx of manganeſe. Aqua regia, therefore, diſſolves gold by virtue of the dephlogiſticated marine acid it contains. Such is the opinion of the celebrated chymiſt of Upſal. The following theory, however, appears to agree better with the facts. When nitrous acid is poured upon ſpirit of ſalt, the two liquors grow hot, and deeper coloured; an effervescence is produced, attended with a mixed ſmell, leſs penetrating than that of pure ſpirit of ſalt, but perfectly reſembling marine acid, diſtilled from calx of manganeſe. Mr. Berthollet has diſcovered, that dephlogiſticated, or aerated marine acid, is diſengaged during this ſtrong action of the two acids. Spirit of ſalt, therefore, takes from the nitrous acid part of the pure air it contains, and is diſſipated in the form of aerated marine acid. A portion of this dephlogiſticated ſpirit of ſalt remains charged with nitrous gas, and this mixture conſtitutes aqua regia. Hence it may be eaſily conceived, why a very ſmall quantity of nitrous acid is required to give the marine acid the characters of aqua regia; and why the ſalt of gold affords, by diſtillation, nothing but the marine acid, as likewiſe happens with aqua regia diſtilled alone. But it muſt be obſerved, that as a much greater quantity of nitrous acid than is neceſſary is commonly uſed to ſaturate the marine acid with air, or to dephlogiſticate it, aqua regia contains theſe two acids, which act each according to its peculiar nature, and form various compounds with bodies expoſed to their action. It is, therefore, a deſideratum to aſcertain what quantity of nitrous acid is required to ſaturate a given quantity of marine acid, and to convert it into aqua regia, without its containing any portion of aqua fortis, which would only tend to alter its properties, and render its effects uncertain. Hence it is neceſſary, in the recording of nice chemical operations, to point out the reſpective quantities of the acids made uſe of in compounding the aqua regia employed.

The ſpecific gravity of this mixed acid, is leſs than that of either of the two which compoſe it; its ſmell is peculiar; its colour citron, verging towards orange: its action on various ſubſtances diſtinguiſhes it from every other acid: it is not ſenſibly changed by light; but heat ſeparates the two acids. Aqua regia combines with water in all proportions, at the ſame time producing heat; it diſſolves clay very ſlowly, and unites with ponderous earth, magneſia, lime, and the different alkalis, producing mixed ſaline combinations, which either cryſtallize ſeparately or together, according to their ſolubility. Aqua regia is much uſed in chymiſtry, eſpecially in the art of aſſaying.

The intimate nature and compoſition of the nitrous acid has been greatly attended to by chymiſts, ſince the earlier diſcoveries of Dr. Prieſtley. The opinion of ſuch as think the formation of this acid may be attributed to the vitriolic, and who regard it as a modification of this laſt, has been ſhewn to be founded on fallacious experiments; and it was ſoon found to be compoſed of peculiar principles, in conſequence of the following obſervations.

It has long ſince been obſerved, that the nitrous acid acts ſtrongly on combuſtible bodies, eſpecially metallic ſubſtances; a large quantity of red vapours exhaling at the ſame time into the atmoſphere, and the acid in ſome caſes being entirely diſſipated in that form. The combuſtible body is quickly converted into the ſtate of a body which has ſuffered calcination, or combuſtion. And this proceſs is in ſome caſes carried on ſo rapidly, as to cauſe ſudden inflammation of the combuſtible bodies, ſuch as oils, coal, phoſphorus and certain metals. Stahl attributed this effect to the rapidity with which he ſuppoſed nitrous acid to combine with phlogiſton; but this theory is inſufficient.

Dr. Prieſtley having received, under a glaſs veſſel filled with water, the vapour which is diſengaged during the action of the nitrous acid upon iron, obſerved, that inſtead of a red vaporous fluid, a tranſparent and colourleſs gas, reſembling air, is obtained, which he diſtinguiſhed by the name of nitrous air.

This gas has all the external characters of air, but differs in a great number of its chymical properties: its ſpecific gravity is ſomewhat leſs; it is incapable of maintaining either combuſtion or reſpiration; is ſtrongly antiſeptic; has no ſenſible taſte: and does not immediately produce any change in ſyrup of violets. Nitrous gas is not ſenſibly changed by the action of light; heat dilates it; vital air readily combines with it, and converts it into nitrous acid; atmoſpheric air produces the ſame effect, but with leſs intenſity. As ſoon as the air comes in contact with the nitrous gas, theſe two colourleſs fluids become red, like the fuming ſpirit of nitre; a conſiderable degree of heat is excited; the water riſes in the receiver, and abſorbs the red vapours, which convert it into a weak aqua fortis.

SECT. III.

VITRIOLIC ACID.

The vitriolic acid is a very cauſtic ſaline ſubſtance, which, when concentrated, burns and corrodes the ſkin, reddens the ſyrup of violets, and exhibits a rough ſtyptic taſte when much diluted with water. This acid has the form of a tranſparent, oleaginous fluid, twice as heavy as diſtilled water, and without ſmell; it contains the acid united with water, from which it cannot be entirely ſeparated by any known method. It is called vitriolic acid, becauſe it was formerly obtained from martial vitriol, by diſtillation. It is now obtained in France, and in England, by the complete combuſtion of ſulphur.

This acid takes the concrete form, either by expoſure to cold, or by combination with ſeveral elaſtic fluids.

The action of light on the vitriolic acid is not known. Some chymiſts have affirmed, that oil of vitriol, expoſed in well-cloſed veſſels to the rays of the ſun, becomes gradually more and more coloured, and even that ſulphur is formed: this phenomenon, which would afford a ſtrong confirmation of the doctrine of Stahl, is very far from being proved; and it is even probable that it does not take place: for we ſhall hereafter ſhew that the vitriolic acid cannot be converted into ſulphur, but by the loſs of its pure air, or oxyginous principle, and this ſeparation cannot be made in cloſed veſſels.

Stahl conſidered the vitriolic acid as the moſt univerſally diffuſed, and the principle of all other acids. The firſt of theſe aſſertions, founded on the conſideration that linen cloths, impregnated with fixed alkali, and expoſed to the air, become charged, in proceſs of time, with vitriolated tartar, or the ſalt formed by the union of the alkali with vitriolic acid, is now ſhewn to be falſe; becauſe theſe cloths are not found to contain an atom of vitriolated tartar, though they abound with cretaceous tartar, which has been improperly called aerated alkali. As to the ſecond, it is by no means proved that the other acids owe their origin to the vitriolic. Modern experiments have ſhewn, that each acid has its peculiar principles, different from every other, excepting the oxyginous principle, which is common to all.

Oil of vitriol, heated in a retort, becomes more concentrated by the loſs of a part of its water, and is not volatilized but by a ſtrong heat. Coloured vitriolic acid becomes clear and tranſparent by the action of heat. During this operation, which is called concentration and rectification of the vitriolic acid, a gas of a very penetrating ſmell, which we ſhall hereafter have occaſion to ſpeak of, under the name of ſulphureous gas, and was the cauſe of its colour, is ſeparated. Though this operation appears to render the vitriolic acid more clear and pure, it muſt be carried ſtill further, if the acid be deſired in a high ſtate of purity. The fact is, that the ordinary method of concentrating oil of vitriol, deprives it only of water and ſulphureous gas, without ſeparating the fixed matters by which it may be changed: its complete purification requires that it be diſtilled to dryneſs; changing the recipient as ſoon as the acid in the retort is ſufficiently concentrated by the firſt part of the proceſs; the dry white reſidue, which finally remains in the retort, conſiſts of vitriolated tartar, and ſome other ſubſtances taken up by the acid at the time of its original manufacture.

Oil of vitriol, expoſed to the air, attracts humidity, and loſes a part of its force and cauſticity; it likewiſe becomes coloured, by means of the combuſtible particles which float in the atmoſphere, and are ſtrongly acted on by this acid: the quantity of moiſture it abſorbs by this expoſure, is nearly double its own weight. The Duc D' Ayen, by a curious ſet of experiments, made during the violent froſt in the month of January, 1776, has ſhewn that highly-concentrated oil of vitriol, expoſed to cold between 13 and 15 degrees of Reaumur's thermometer, becomes congealed; that when it is diluted with two or three parts of water, it cannot be frozen; and that, if it be left continually expoſed to the air in its frozen ſtate, it becomes again fluid, though the temperature of the atmoſphere continues as cold, or even becomes colder than before. This laſt phenomenon is produced by the water contained in the atmoſphere, with which the acid unites, and produces an increaſe of temperature ſufficient to counteract and overcome the power of congelation.

Oil of vitriol unites to water with phenomena, that indicate a ſudden penetration, and intimate union. A ſtrong degree of heat, attended with a kind of hiſſing noiſe, is produced, a peculiar ſmell being at the ſame time emitted. The acid, thus diluted with water, loſes much of the intenſity of its taſte, and its fluidity is greater.

It is then called ſpirit of vitriol: by concentration it returns again to the ſtate of oil of vitriol.

This acid does not act on quartzoſe earths, not even when they have been previouſly diſſolved in alkalies: it combines with clay, ponderous earth, magneſia, lime, and alkalis, forming alum, ponderous ſpar, Epſom ſalt, ſelenite, vitriolated tartar, Glauber's ſalt, and vitriolic ammoniac; its elective attractions for theſe baſes have the ſame order as thoſe of the marine and nitrous acids, but they are ſtronger; this acid being capable of diſengaging either of the others from its baſe.

The action of oil of vitriol on other acids has not yet been well aſcertained; we only know, 1ſt, That it abſorbs a large quantity of the cretaceous acid. 2d, That it unites ſo eaſily with the marine acid, as to produce heat, and the diſengagement of a large quantity of marine acid gas in white vapours. Boerhaave affirms, in his chymiſtry, that the marine acid renders oil of vitriol concrete, which may perhaps be true of the aerated or dephlogiſticated marine acid. 3d, That the white and pure nitrous acid, added to oil of vitriol, coloured by a combuſtible body, renders it tranſparent, and is exhaled in the form of nitrous gas, on the application of heat to the mixture. 4th, That nitrous gas, added to oil of vitriol, cauſes it to take a concrete form.

The mode of action of the vitriolic acid on combuſtible bodies greatly elucidates the nature and principles of this acid; whenever a combuſtible body, as for example, a metal, or any animal or vegetable ſubſtance, is placed in contact with concentrated oil of vitriol, it paſſes with a greater or leſs degree of rapidity to the ſtate of bodies which have been burned and the acid is at the ſame time decompoſed.

Bodies containing oil, become black when plunged in cold vitriolic acid, the acid at the ſame time aſſuming firſt a brown, and afterwards a black colour; if an inflammable body in combuſtion, as for example, red hot charcoal, be plunged into this acid, it immediately aſſumes a degree of volatility, with a ſulphureous ſmell, emitting at the ſame time a white ſuffocating fume. If the acid be put in contact with a combuſtible body of a more ſimple nature than organic ſubſtances, the changes which follow may be more eaſily perceived and eſtimated, and the principles of the vitriolic acid may by that means be ſeparated and known. When oil of vitriol and mercury are heated together in a retort, whoſe neck is plunged beneath a glaſs veſſel filled with the ſame metallic fluid, a permanent gas, of a ſtrong and penetrating ſmell, ſimilar to that of burning ſulphur, is produced as ſoon as the acid boils.

This aeriform acid, known by the name of ſulphureous acid gas, is ſomewhat heavier than common air; it extinguiſhes flame, deſtroys animal life, reddens and diſcolours ſyrup of violets, unites to water with leſs rapidity than the marine acid gas, and accordingly to Prieſtley, diſſolves chalk, ſulphur, and iron; it is abſorbed by charcoal, and all very porous bodies; it is a peculiar modification of the vitriolic acid, capable of forming with alkalis ſalts, very different from thoſe produced by the combuſtions of that acid itſelf. Stahl, who paid particular attention to theſe important phenomena, imagined, that in this combination the phlogiſton of the metal united with the acid, and gave it ſmell, volatility, &c. but this great chymiſt, not having purſued the experiment to a ſufficient length, was doubtleſs unacquainted with the circumſtance, that the ſtrongeſt objections againſt his doctrine may be deduced from theſe facts. M. Lavoiſier, M. Bucquet, and others, have ſeverally examined the ſucceſſion of phenomena, which take place during the mutual action of mercury and the vitriolic acid. As ſoon as the mixture becomes white and dry, ſcarcely any ſulphureous gas paſſes over; if this vitriolic mercurial ſalt be then ſtrongly heated, a ſmall quantity of water is diſengaged, together with gas of a totally different nature from the former. It conſiſts of air, as pure and reſpirable as that which Dr. Prieſtley calls dephlogiſticated air. In proportion as this air paſſes over, the mercury is reduced to its fluid and metallic ſtate, abſolutely ſimilar to that which it originally poſſeſſed, and is entirely recovered, excepting certain portions, which, together, do not amount to the eighth part of the quantity made uſe of. Hence it appears, that the mercury not having been at all altered, the two gaſes, which come over, are produced by a decompoſition of the vitriolic acid itſelf. Sulphureous gas appears to have the ſame relation to this acid as the nitrous gas has to the acid of nitre. There is, however, ſome difference in the compoſition of theſe two acids; for it has not been found practicable immediately to reproduce the vitriolic acid by uniting the two gaſes it affords, though this may be done at pleaſure with the nitrous acid. It is probable, that the recompoſition of the vitriolic acid requires a conſiderable ſpace of time, ſince it really takes place when compounds of the ſulphureous acid, with different baſes, are expoſed to the air, and are found at length to contain mere vitriolic acid. Thus it is that the combination of the ſulphureous acid with the fixed vegetable alkali, commonly known by the name of ſulphureous ſalt of Stahl, being expoſed to the air, becomes converted into vitriolated tartar at the end of a certain ſpace of time.

From theſe experiments, Mr. Lavoiſier concludes, 1ſt, That the vitriolic acid is a compound of ſulphur and vital air, or the oxyginous principle. 2d, That when a combuſtible body is preſented to this acid, which has a ſtronger affinity than vital air to ſulphur, it ſeizes the pure air, and decompoſes the acid. 3d, That if the combuſtible matter do not ſeize the whole of the pure air, as is the caſe with moſt metallic ſolutions in oil of vitriol, the ſubſtance diſengaged is not pure ſulphur, but ſulphureous acid gas. 4th, That this gas occupies the middle place between ſulphur and vitriolic acid, and muſt be conſidered as vitriolic acid deprived of a certain quantity of its pure air, or as ſulphur rendered feebly acid by a portion of vital air; in order, therefore, to cauſe this gas to become true ſulphur, nothing more is required than to deprive it of this portion of air; an event which happens towards the end of metallic ſolutions by the vitriolic acid, when theſe ſolutions are evaporated and ſtrongly heated. It may likewiſe be readily underſtood in what manner the ſulphureous acid becomes gradually converted into vitriolic acid, by abſorbing the pure air, or oxyginous principle, contained in the atmoſphere.

Sulphureous gas is capable of uniting ſomewhat intimately with the vitriolic acid, to which it gives the property of emitting thick white vapours. Meyer, in his chymical eſſays on quick lime, ſpeaks of a ſmoaking oil of vitriol, prepared at Narthauſen in Saxony, by the diſtillation of common vitriol. This chymiſt, after Chriſtian Bernhard, a German chymiſt, mentions a concrete and fuming acid ſalt, obtained from the ſaid oil of vitriol by diſtillation. Having had an opportunity of procuring a few pounds of this Saxon acid, I obſerved the properties mentioned by Meyer; and by a gentle heat, I obtained a concrete fuming volatile ſalt, in deliqueſcent cryſtals, of two forms, according to the deſcription of Chriſtian Bernhard. A number of experiments which I have deſcribed, in a memoir to be inſerted among thoſe of the Royal Academy of Sciences, have convinced me, 1ſt, That the property of fuming and affording a concrete volatile ſalt, ariſes from the ſulphureous gas contained in a large proportion in the black oil of vitriol of Narthauſen. 2d, That in proportion as it loſes this gas by expoſure to air, it ceaſes to emit fumes, and affords no more concrete ſalt. 3d, That water diſengages this gas, and deprives the Saxon vitriolic acid of its fuming property, &c. 4th, and laſtly, That this concrete and very fuming acid ſalt, obtained by diſtillation is a ſaturated combination of oil of vitriol and ſulphureous gas, which gradually becomes converted into ordinary vitriolic acid, by expoſure to air. Two concrete vitriolic acids are therefore known; the one formed by the addition of nitrous, and the other of ſulphureous gas: I do not doubt but that other concrete modifications occaſioned by its combination with other gaſes, as the dephlogiſticated marine acid gas, &c. will hereafter be diſcovered.

The vitriolic acid is uſed in many arts, particularly in dying; it is one of the moſt common, and moſt neceſſary ſolvents made uſe of in chymiſtry; it is employed in medicine externally, as a powerful cauſtic, and internally, when diluted with water, ſo as to be ſcarce ſenſibly acid, as a refreſhing, cooling, and antiſeptic medicine.

The ſulphureous acid is employed in dying; it is uſed to whiten ſilks, to take out ſpots occaſioned by vegetable juices, &c.

SECT. IV.

ACID OF BORAX, OR SEDATIVE SALT.

The labours of a great number of chymiſts have ſhewn, that borax is a neutral ſalt, formed by the combination of a peculiar acid with mineral alkali; this acid was called ſedative ſalt by its diſcoverer, Homberg. Some moderns call it the acid of borax; the name of ſedative ſalt, by which it is generally known, is improper, and ought to be rejected.

Many chymiſts have ſuppoſed that this acid is an artificial product, formed by the combination of the ſalts made uſe of in its manufacture; but ſince Mr. Hoefer, apothecary to the Grand Duke of Tuſcany, has diſcovered that the waters of ſeveral lakes in that country contain it, in a ſtate of great purity, it cannot be doubted but that it is a peculiar acid. The chymiſts of the academy of Dijon have confirmed this diſcovery, by analyzing the waters of Monterotondo which were ſent to them, and in which they found ſedative ſalt, as diſcovered by Mr. Hoefer. It is probable that it may hereafter be found in other mineral waters; it ſeems to be produced by the putrefaction of fat ſubſtances.

Sedative ſalt, whether native, or obtained from borax, is a concrete ſubſtance, cryſtallized in ſmall white ſcales, exceedingly thin, irregularly cut at their edges, very light, and ſometimes brilliant in a certain degree. Its taſte is feebly, though ſenſibly, acid; it ſlightly reddens the tincture of violets, and alſo that of turnſole much more ſenſibly; it is not volatilized by fire, but melts at a conſiderable red heat into a tranſparent glaſs, which, upon expoſure to the air, becomes opake, and covered with a light white powder. This glaſs is the acid of borax unaltered, and recovers its cryſtalline form, by ſolution in water, and ſubſequent cryſtallization.

The acid of borax is not changed by the action of air, whether it be hot or cold, or in a ſtate of humidity or dryneſs.

It is difficultly ſoluble in water, a pound (9216 grains) of this fluid, boiling hot, diſſolving no more than 83 grains; according to the academicians of Dijon, it cryſtallizes by cooling, and by evaporation. This ſolution immediately reddens the tincture of turnſole, and changes the colour of ſyrup of violets, though ſlowly. If ſedative ſalt, moiſtened with a little water, be heated in a cucurbit with a head, a part of the acid ſublimes with the water which riſes, but the ſublimation ceaſes as ſoon as the water has all riſen; a circumſtance which proves, that this ſalt alone is fixed, as may be ſhewn by melting it in a crucible; by ſublimation in this manner with water, ſedative ſalt may be obtained in fine brilliant cryſtals, if the operation be well managed. This ſalt, called ſublimed ſedative ſalt, is very pure.

The ſedative acid is uſed to fuſe vitrifiable earths, with which it forms clear, and nearly colourleſs glaſſes; by the aſſiſtance of heat, it diſſolves the earth precipitated from the liquor of flints. It unites with ponderous earth, magneſia, lime, and alkalis, and forms with theſe different ſubſtances, ſalts, diſtinguiſhed by the general name of Borax, of which there is only one ſpecies which is yet well known.

All theſe properties, and more eſpecially its taſte, the red colour it communicates to vegetable alkalis, and its neutral combinations with alkalis, ſufficiently indicate its acid nature; but it is the moſt feeble of all the acids, and is diſengaged from its baſes, even by the cretaceous acid.

The action of acids on ſedative ſalt is not well known; it appears to be partly decompoſed by the vitriolic acid, the latter becoming ſulphureous when diſtilled from this ſalt. As to the nitrous and marine acids, it is known that they diſſolve it; but their mutual action has not been obſerved with ſufficient accuracy to determine whether any decompoſition takes plac.

There have been many different opinions reſpecting the nature and formation of ſedative ſalt; many chymiſts have thought it to be an intimate combination of vitriolic acid, and vitrifiable earth, with a fat ſubſtance. Meſſrs. Bourdelin and Cadet ſuppoſed it to be formed of marine acid; the latter imagined, that it contains a ſmall proportion of earth of copper, becauſe, like the calces of that metal, it gives a green colour to flame. Cartheuſer affirms, that ſedative ſalt, when dried by a gentle heat, emits vapours of ſpirit of ſalt; that this dry ſalt being diſſolved, a grey earth remained on the filter; laſtly, that by repeating the deſiccations and ſolutions, a great number of times, the ſalt is intirely decompoſed, ſo that it ſeemed to be a modification of marine acid, fixed by an earth. Meſſrs. Macquer and Poulletier de la Salle have repeated this experiment; they obſerved the diſengagement of a vapour during the calcination of the ſedative ſalt, but they were not ſatisfied that its ſmell was that of marine acid. By ſucceſſive deſiccations and ſolutions, they obtained a ſmall quantity of a grey earth, which when combined with marine acid, did not form ſedative ſalt, as Cartheuſer had affirmed; ſo that the opinion of this chymiſt is no more proved than the others. Model conſidering this ſalt as a combination of a peculiar alkali, with the vitriolic acid made uſe of in diſengaging it. But the ſedative acid being always the ſame ſubſtance, whatever may be the acid employed to diſengage it, this opinion cannot be admitted. Mr. Baumé affirms, that he has ſucceeded in forming ſedative ſalt, by leaving a mixture of clay and fat to digeſt together for 18 months. Hence he concludes, that this ſalt is a combination of the acid of fat with a ſubtle earth, of which it cannot afterwards be deprived. He adds, that vegetable oils afford the ſame ſalt, though more ſlowly. Mr. Wiegleb repeated this experiment of Baumé, but no ſedative ſalt was produced.

Chymiſts, at preſent, conſider ſedative ſalt as a peculiar acid, different from all others; and the order of its affinities with the alkaline baſes tend to ſupport this aſſertion. Bergman arranges them as follows: lime, ponderous earth, magneſia, vegetable alkali, mineral alkali, volatile alkali.

The acid of borax, or ſedative ſalt, was for ſome time employed in medicine on the authority of Homberg, who affirmed it to be ſedative, and even narcotic; but experince has ſhewn, that the virtues of this ſalt are not extraordinary; it is therefore rejected; and with ſo much the more juſtice, as it is certain that we poſſeſs remedies, whoſe action is much more powerful and certain.

SECT. V.

OF THE CHYMICAL CHARACTERS, AND TABLES OF ELECTIVE ATTRACTION.

The different marks or characters by which the ancient chemiſts uſed to denote many different ſubſtances, were invented rather from a ſuperſtitious and fantaſtical principle than from any real neceſſity; or, perhaps, like the ænigmatical language uſed by the alchymiſts, they have thereby ſought to conceal their myſteries from the vulgar. In contriving theſe marks, they affected a great deal of ingenuity; intending them as ſymbols of the qualities poſſeſſed by each of the different ſubſtances. A circle being ſuppoſed the moſt perfect figure, was therefore uſed to repreſent the moſt perfect metal in nature. that is, gold. Silver being likewiſe a perfect and indeſtructible metal, is placed next to gold; but, on account of its inferiority, is expreſſed only by a creſent, as if but half gold. A circle was likewiſe uſed to denote ſalt of any kind, as being ſomething elaborate and perfect. A croſs was uſed to denote acrimony of any kind, and conſequently employed for the acrimonious ſalts of vitriol, alkali, &c. Hence, all the inferior metals have the croſs ſomehow or other combined with the marks deſigned to repreſent them. Thus, the mark for quickſilver denotes, that it hath the ſplendor of ſilver, the weight of gold, but its perfection is hindered by an acrimony repreſented by the croſs at bottom, &c. Fire is repreſented by an equilateral triangle, having one of its angles uppermoſt. This may be conſidered as a rude repreſentation of flame, which is always pointed at top. Water, again, is repreſented by a triangle, with an angle dowuwards, ſhewing the way in which that element exerts its ſtrength, &c. All theſe marks, however, as they were of no real uſe at firſt, ſo they are now becoming every day more and more neglected.

Tables of affinities, or elective attractions, are but of late invention. They are conſequences of an improved ſtate of chymiſtry, when the different ſubſtances were found to act upon one another in moſt caſes according to a fixed and ſettled rule. The moſt approved table of this kind for a long time was that compoſed by Mr. Geoffrey. It was however found to be very incomplete, not only as to its extent, but likewiſe as heat and ſome other circumſtances were found to vary the attractions conſiderably, and ſometimes even to reverſe them. Other tables have been conſtructed by Mr. Gellert, &c. but none hath yet appeared ſo complete but that many additions may be made to it. The following is that at preſent exhibited by Dr. Black in his courſe of chymiſtry:

1. VITRIOLIC ACID.

Phlogiſton
Fixed alkali
Calcareous earth
Zinc
Iron
Tin
Copper
Quickſilver
Silver
Volatile alkali
Magneſia
Earth of alum.

2. NITROUS ACID.

Phlogiſton
Fixed alkali
Calcareous earth
Zinc
Iron
Lead
Tin
Copper
Quickſilver
Silver
Volatile alkali.

3. MARINE ACID

Fixed Alkali
Calcareous earth
Zinc
Iron
Lead
Tin
Copper
Regulus of antimony
Quickſilver
Silver
Spirit of wine
Volatile oils
Gold.

4. SULPHUR.

Fixed alkali
Calcareous earth
Iron
Nickel
Copper
Lead
Tin
Silver
Regulus of antimony
Quickſilver
Arſenic.

5. HEPAR SULPHURIS is partially decompounded by
Quickſilver
Solution of fixed alkali
Lime-water
Volatile alkali

6. FIXED AIR.

Calcareous earth
Fixed alkali
Magneſia
Volatile alkali.

7. ALKALINE SALTS.

Vitriolic acid
Nitrous acid
Marine acid
Acetous acid
Volatile vitriolic acid
Sedative ſalt
Fixed air
Sulphur
Expreſſed oils.

8. CALCAREOUS EARTH.

Vitriolic acid
Nitrous acid
Marine acid
Acid of tartar
Acetous acid
Sulphureous acid and ſedative ſalt
Sulphur

9. METALLIC SUBSTANCES. Lead and Regulus of Antimony excepted.

Marine acid
Vitriolic acid
Nitrous acid
Sulphur and acetous acid.

10. LEAD.

Vitriolic acid
Marine acid
Nitrous acid
Acetous acid
Expreſſed oils

11. REGULUS of ANTIMONY.

Vitriolic acid
Nitrous acid
Marine acid
Acetous acid

12. ARSENIC.

Zinc
Iron
Copper
Tin
Lead
Silver
Gold

13. REGULUS of ANTIMONY with Metals.

Iron
Copper
Tin
Lead
Silver
Gold.

14. QUICKSILVER.

Gold
Lead and tin
Copper
Zinc, biſmuth, and regulus of antimony.

15. SILVER.

Lead
Copper
Iron

16. WATER.

Fixed alkali
Spirit of wine
Mild alkaline ſalts, and ſome neutrals.

17. SPIRIT of WINE.

Water
Oils and reſins.

In conſequence of heat, ſedative ſalts decompounds vitriolated tartar and ſea-ſalt. Phoſphorine acid decompounds vitriolated tartar, nitre, and ſea-ſalt.

Double Elective Attractions; which, in ſome caſes, may be conſidered as exceptions to the foregoing table.

I. Thoſe which happen in mixtures of watery ſubſtances.

1.	Acids Calc. earths, or metallic ſubſtances	Volatile alkali Fixed air.
2.	Vitriolic or marine acids Alkalies or Earths	Mercury, ſilver, or lead Nitrous or acetous acids.
3.	Lead Nitrous, marine, or acetous acids	Vitriol acid Alkalies, earths, or M. S.
4.	Silver Vitriolic, nitrous, or acetous acids	Marine acid Alkaline ſalts, earths, or M. S.
5.	Volatile alkali Acids	Fixed air Fixed alkali.
6.	Nitrous, marine, or acetous acids Calcareous earths	Volatile alkali, magneſia, or earth of alum Vitriolic acid.

II.

Chymical &c. Characters.

To Abstract	Ā.
Acid	✛ > ↶.
—— Marine	-⊖ ⊖‡ >⊖ >⊖
—— Nitrous	-⦶ >⦶ ⦶‡ >⦶
—— Phosphoric	⍋
—— Vegetable	☩
—— Vitriolic	-⊕ >⊕‡ ⊕‡ >⊕.
Volatile Sulphureous	🜍
Æther	Æ △.
Air	A 🜁 △.
—— Fixed	🜁 f△.
—— Mephitic	m.△.
Alcahest or Alcohol of Wine	$V^{s}A$
An Alembic	∀ XX XX XX.
Alkali	⏉ 8.
—— Caustic Fixed	c.⊖v.
—— Volatile	c.⊖△.
—— Fixed	⊖v ⊖v ⊖v ⊖⊥
—— Milder Fixed	m.⊖v.
—— Vol	⊖△ ⊖△ ⊖△ ⊖⊤
Amalgam	a̅a̅a̅ ⟁.
Antimony	◇ ⟐ ♁.
—— Flowers of	♁
Aqua Fortis	Æ AF 🜅 VF VF.
—— Regia	AR Æ VR 🜆.
—— Vitae	AV ∇^{v} ∾.
Arsenic	X∘∘ 🜺 Ʊ.
—— Regulus of	8
Ash or Ashes	EA Ɇ E ⊏C
—— Pot or Pearl	♆ ♆
Auripigment	🜺 O-O O-O =O=
Bath	B.
—— Sand	AB BA.
—— Vapour	VB.
—— Water	BM MB.
Bismuth	B W.
Blood Stone	⁝
Bole Armenian	AB ⊕:
Borax	Ẇ A ⊔ ♄ ⌂ ⌂ ⌂
Bottle	≋.
Brandy	AV ∇^{v} ∾.
Braſs	◊ ♀.
Calamine Stone	LC Lc.
To Calcine	A Ç ⌒c⌒.
Camphor	≈≈ yr.
Caput Mortuum	☠ ☠ ☠ ⊙
To Cement	Z Z̿.
Ceruſs	Ɨ ╪ ♄
Cinnabar	🜓 ⊖ ⊖ ꝫ.
Clay	▽.
Copper	♀.
Crab	♋
A Crucible	X ✚ $✚^{ble}$ △ ▽.
Curcubit	△ ⟁.
Day	♁ σ.
Dige	♉ 8 8̄.
To Diſsolve	≈
To Distill	d ẟ ϑ δ $\tilde{D}^{s}$ ∾
Dram Drachma	⌐.. ʒ.
Drop	G gt. gut. ⋞
Each	A ā āā
Earth	🜃
—— absorbent	▽.
—— of Allum	A▽ ⊜.
—— Calcareous	c.▽ - ▽̧
—— Fluor or Fusible	⌐▽⊖
—— Sealed	$\overset{s}{\nabla}$.
—— Siliceous or Vitrescible	▽⊖
Eſsence	Eſs ‡.
Fire	△
—— Circular	⊖.
—— Reverberating	△R.
Fluors	⌐▽⊖
Glaſs	XX O-)O
Gold	☉
—— Filings of	☉ꜰ
—— Leaf	⊡
—— Potable	☉P
A Grain	gr. o
Gum	⌒
Gypsum	▽̧
Half	ſſ ſs.
Harts Horn	CC.
Honey	⤚.
An Hour	⧗.
Iron	♂.
—— Filings	O‡ O↘ ♂.
Layer upon Layer	SSS.
Lead	♄ ♄
Lime	C Є
Litharge	⅁ ⊸
Magnesia	M▽ M.
Mercury	☿.
—— Precipitated	☿≂.
—— of Saturn	☿♄.
—— Sublimed	♀≏.
Metallic Bodies	CM.
—— Substances	SM MS.
Mix	m.
Modius	M.
A Month	V̲ ⊠.
Nickel	N
Night	ϙ ♀.
Nitre	⦶.
Oil	○ ◎ ◎ ∴ ⌖ ⊳.
—— Eſsential	E∴ ⟁.
—— Fixed	▽.
—— Olive	)(
An Ounce	⌐.. ℥ ℥.
A Part	p. ꝑ.
Phlegm	↗ ϙ
Phlogiston	🜍 🜍.
Phosphorus	△.
A Pound	P ℔ p ⌒.
Precipitate	⌣ ≂.
Prepare	PP. pp.
A Pugil	P p.
Quick Lime	CV ♆ ♆ ⊕ ♆ ▽.
Quicksilver	☿.
Quinteſsence	QE
A Receiver	®
Regulus	♉ ♉.
—— of Antimony Stellated	♉ ✹
—— Stellated	✹
Retort	∂ 9 ⌓ ⌓.
Saffron	⊕.
—— of Copper	⦶Є.
—— of Iron	▽̈.
Salt	⊖.
—— Alkaline	Ω ẟ.
—— Ammoniac	Ӿ Ӿ ✱ ⊕· ⊖✱
—— Common	⊖ 8̇
—— Gem	♉· ♉ ⊸
—— Sea	⊖ ⊖ $\overset{M}{⊖}$
—— Sedative	SS
Sand	∴ ⁘
A Scruple	℈
Seal Hermetically	SH.
	☽ ⟁
—— Filings of	☽ꜰ
Spirit	⌒ ⊖- ≏
—— of Wine	SV √ V^{s} ⊸
—— Proof	V^{s} See Brandy
—— Rectified	V^{s} $V^{s}R$
Sublimate Sublime	≏.
Sulphur	🜍 🜍
—— Liver of	⊖🜍
—— Mineral call'd Sulphur Vivum	🜍
Talc	X X.
Tartar	🜿.
Tin	♃
Tutty	⊗ ⊠
Urine	⊡ ⊡
Verdigrise	⊕
—— Distilled	⊕dd.
Vinegar	✛ ✢
Distilled	✳ ✳.
Vitriol	⦶ ⊕ ⊖‡ ⊕‡.
Volatile	∽ ∿
Water	🜄
—— Lime	▽.
Wax	⌖ ⊸
Wine	V.
—— Lees	⚹.
A Year	♀.
Zine	♃ ♃ Zc.

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II. Thoſe which happen in diſtillations or ſublimations, and require heat

1.	Vol. alkali Acids	Fixed air Calcareous earths.
2.	Vol. Alkali Vitriol. acid	Nitrous, marine, or acetous acids Fixed alkali.
3.	Vol. alkali Nitrous, marine, or vitriolic acids	Acetuous acid Fixed alkali, or abſorbent earths.
4.	Reg. of antimon. Sulphur	Marine acid Quickſilver.

III. Thoſe which happen in mixtures by fuſion.

1.	Tin Silver	Iron Lead.
2.	Copper Gold	Sulphur Lead.
3.	M. S. Gold	Sulphur Reg. of ant.

The firſt of theſe tables requires very little explanation. The names printed in ſmall capitals, are thoſe of the ſubſtances which have the affinity with or attract thoſe below them. Thus, vitriolic acid attracts moſt powerfully the phlogiſton, or inflammable principle; next, fixed alkali; then, calcareous earth; and ſo on, in the order in which they are marked. The tables of double elective attractions cannot be made quite ſo diſtinct; though an explanation of one example will make this likewiſe eaſy to be underſtood. Thus in Table I. the firſt caſe is, "If a combination of acids with calcareous earths or metallic ſubſtances is mixed with a combination of volatile alkali and fixed air, the acids will unite themſelves to the volatile alkali, and the fixed air to the calcareous earth or metallic ſubſtance.

MINERAL WATERS, AND THE METHODS OF ANALYZING THEM.

Waters, which contain minerals in ſolution, are diſtinguiſhed by the appellation of mineral waters. But, as there is no water found in nature, even among thoſe uſually reckoned the pureſt, which is not impregnated by ſome of theſe ſubſtances, the name of mineral waters ought to be confined to ſuch as are ſufficiently impregnated to produce a ſenſible effect on the animal œconomy, ſo as to cure or prevent the diſorders to which we are liable. For this reaſon, the name of medicinal waters ſeems to be much more applicable to theſe fluids than that by which they are commonly known, and which is too ſtrongly eſtabliſhed to be changed.

The firſt knowledge of mineral waters, like every other branch of knowledge we poſſeſs, was accidentally diſcovered. The good effects they produced on ſuch as uſed them, have doubtleſs been the cauſe of diſtinguiſhing them from common waters. The firſt philoſophers who conſidered their properties, attended only to their ſenſible qualities, ſuch as colour, weight, or lightneſs, ſmell, and taſte. Pliny, however, diſtinguiſhed a great number of waters, either by their phyſical properties, or their uſes; but the inquiry after methods of aſcertaining, by medical proceſſes, the quantity and quality of the principles held in ſolution by mineral waters, was not attempted till the ſeventeenth century. Boyle is one of the firſt who, in the valuable experiments on colours, publiſhed by him at Oxford in 1663, mentioned ſeveral re-agents capable of indicating the ſubſtances diſſolved in water by the alteration produced in their colours.

Many celebrated chymiſts have ſince made ſucceſsful experiments on mineral waters, and almoſt every one made valuable diſcoveries reſpecting the different principles contained in theſe fluids. Boulduc diſcovered natrum, and determined its properties; Le Roi, phyſician of Montpellier, diſcovered calcareous muriate; Margraaf the muriate of magneſia; Prieſtley cretaceous acid; and Monnet and Bergman the hepatic gas. The two laſt mentioned chymiſts, beſides the diſcoveries with which they have enriched the art of analyzing waters, have publiſhed complete treatiſes on the method of proceeding in this analyſis; and have carried this part of chymiſtry to a degree of perfection and accuracy, far exceeding that which it poſſeſſed before the time of their labours.

PRINCIPLES OF MINERAL WATERS.

It is but a few years ſince the ſubſtances capable of remaining in ſolution in water have been accurately known. This appears to have ariſen from the want of accurate chymical methods of aſcertaining the nature of theſe ſubſtances; and the certainty of their exiſtence has naturally followed the diſcovery of methods of aſcertaining them. Another cauſe which has retarded the progreſs of ſcience in this reſpect, is, that mineral matters, diſſolved in waters, are almoſt always in very ſmall doſes, and are alſo mixed together in conſiderable numbers, ſo that they mutually tend to conceal or alter thoſe properties in which their diſtinctive characters conſiſt. Nevertheleſs, the numerous experiments of the chymiſts we have quoted, and a great number of others, which we ſhall occaſionally mention, have ſhewn, that ſome mineral ſubſtances are often found in waters, others ſcarcely ever met with; and laſtly, many which are never held in ſolution by that fluid. We ſhall here conſider each claſs of theſe ſubſtances in order.

Quartzoſe earth is ſometimes ſuſpended in waters; and as it is in a ſtate of extreme diviſion, it remains ſuſpended without precipitating; but its quantity is extremely minute.

Clay likewiſe appears to exiſt in water: the extreme ſubtlety of this earth, by which it is diſperſed through the whole maſs of water, cauſes it to render them turbid. Argillaceous waters are whitiſh, and have a pearl, or opal colour; they are likewiſe ſmooth, or greaſy to the touch, and have been called ſaponaceous waters.

Lime, magneſia, and ponderous earth, are never found pure in waters; they are always combined with acids.

Fixed alkalies are never met with in a ſtate of purity in waters, but frequently combined with acids, in the form of neutral ſalts; the ſame obſervation applies to the volatile alkali, and moſt acids, except the cretaceous acid, which is often free, and in poſſeſſion of all its properties in waters. It conſtitutes a peculiar claſs of mineral waters, known by the name of gaſeous, ſpirituous, or acidulous waters.

Among the perfect neutral ſalts, ſcarcely any are met with but vitriol of ſoda or Glauber's ſalt, the muriates of ſoda, and of pot aſh, and cretaceous ſoda, which are frequently diſſolved in mineral waters; nitre, and cretaceous tartar, are rarely found.

Selenite, calcareous muriate, chalk, Epſom ſalt, or vitriol of magneſia, muriate of magneſia, and cretaceous magneſia, are the earthy ſalts which are moſt commonly found in waters. As to the calcareous nitre, and nitre of magneſia, which ſome chymiſts have aſſerted they have met with, theſe ſalts are ſcarcely ever found in mineral waters, properly ſo called, though they exiſt in ſalt waters.

The argillaceous neutral ſalts, and ſalts with baſe of ponderous earth, are ſcarcely ever diſſolved in waters. Alum appears to exiſt in ſome waters.

Pure inflammable gas has not yet been found diſſolved in mineral waters.

Pure ſulphur has not been found in theſe fluids, though it may exiſt very rarely, in ſmall quantities, in the ſtate of liver of ſulphur. Sulphureous waters are moſt commonly mineralized by the hepatic gas, or vapour of liver of ſulphur.

Laſtly, among metals, iron is moſt commonly diſſolved in waters, and may be found in two ſtates; either combined with the cretaceous acid, or with the vitriolic acid. Some chymiſts have ſuppoſed that it was likewiſe diſſolved in its metallic ſtate, without an acid intermedium; but as this metal ſcarcely ever exiſts in nature, without being either in the ſtate of ruſt, or of that of vitriol, the opinion of theſe philoſophers could only be maintained at the time when the cretaceous acid was not yet diſcovered; and the ſolubility of iron in water, without the aſſiſtance of the vitriolic acid, could not otherwiſe be accounted for. Bergman affirms, that iron as well as manganeſe, is found in certain waters, combined with the muriatic acid.

Arſenic, and the vitriols of copper and zinc, which exiſt in many waters, communicate poiſonous properties to them, and ſhew, when diſcovered by analyſis, that the uſe of ſuch waters muſt be carefully avoided.

Moſt chymiſts, at preſent, deny the exiſtence of bitumen in waters: in fact, the bitter taſte was the cauſe why waters were formerly ſuppoſed to contain theſe oily ſubſtances; but it is now known that this taſte, which does not exiſt in bitumen, is produced by the calcareous muriate.

There is no difficulty in conceiving how water, which percolates through the interior parts of the globe, and eſpecially through the mountains, may become charged with the different ſubſtances we have enumerated. It is likewiſe clear, that, according to the nature and extent of the ſtrata of earth, through which they paſs, mineral waters will be more or leſs charged with theſe principles, and that the quantity and nature of theſe principles muſt be ſubject to great variations.

DIFFERENT CLASSES OF MINERAL WATERS.

It appears from what we have already obſerved reſpecting mineral waters, that theſe fluids may be claſſed according to the earthy, ſaline, and metallic ſubſtances they hold in ſolution; and that the number of claſſes, on this principle, would be very conſiderable: but it muſt be obſerved, that none of theſe ſubſtances are found ſingle and alone in waters; but on the contrary they are often diſſolved, in the number of three, four, five, or even more. This circumſtance creates a difficulty in the methodical claſſification of waters, relative to the principles that they contain. However, if we attend to thoſe ſubſtances which are the moſt abundantly contained in waters, or whoſe properties are the moſt prevalent, we ſhall be able to make a diſtinction, which, though not very accurate, will be ſufficient to arrange theſe fluids, and to form a judgment of their virtues. Chymiſts, who have atttended to mineral waters in general, have availed themſelves of this method. M. Monnet has eſtabliſhed three claſſes of mineral waters; the alkaline, the ſulphureous, and the ferruginous: and ſubſequent diſcoveries have enlarged the number of claſſes. M. Duchanoy, who has publiſhed a valuable treatiſe on the art of imitating mineral waters, diſtinguiſhes ten, viz. the gaſeous, the alkaline, the earthy, the ferruginous, the ſimple hot, the gaſeous thermal, the ſaponaceous, the ſulphureous, the bituminous, and the ſaline waters. Although it may be urged as a reproach, that this author has made his claſſes too numerous, ſince the pure gaſeous and bituminous waters are unknown; yet his diviſion is doubtleſs the moſt complete, and gives the moſt accurate idea of the nature of the different mineral waters, and conſequently is the beſt ſuited to his ſubject. We ſhall here propoſe a diviſion leſs extenſive, and in our opinion more methodical, than that of M. Duchanoy; at the ſame time obſerving, that we do not conſider ſimple thermal waters as mineral waters, becauſe they conſiſt merely of heated water, according to the beſt chymiſts; and that we ſhall not ſpeak of bituminous waters, becauſe none ſuch have been yet found.

All mineral waters may be arranged in four claſſes, viz. acidulous, ſaline, ſulphureous, and ferruginous waters.

Gaſeous waters, which may with more propriety be called acidulous waters, are thoſe in which the cretaceous acid predominates; they are known by their ſharp taſte, and the facility with which they boil, and afford bubbles by ſimple agitation: they redden the tincture of turnſole, precipitate lime-water and liver of ſulphur. As no waters have yet been diſcovered which contain this acid pure and alone, we think this claſs may be divided into ſeveral orders, according to the other principles contained in them, or the modifications they exhibit. They all appear to contain more or leſs alkali and calcareous earth; but their different degrees of heat afford a good criterion for dividing them into two orders; the firſt might comprehend cold, acidulous, and alkaline waters, ſuch as thoſe of Seltzer, Saint Myon, Bard, Langeac, Chateldon, Vals, &c.; in the ſecond might be placed, hot, or thermal, acidulous, and alkaline waters, as thoſe of Mount D'Or, Vichy, Chatelgyon, &c.

SALINE.

By the name of ſaline waters, we underſtand with M. Duchanoy, ſuch as contain a ſufficient quantity of neutral ſalt to act ſtrongly on the animal œconomy, ſo as moſt commonly to purge. The theory and nature of theſe ſalts are eaſily diſcovered; they perfectly reſemble the ſolutions of ſalts made in our laboratories; but they almoſt always contain two or three different ſpecies of ſalts. The vitriol of ſoda, or Glauber's ſalt, is very rare; vitriol of magneſia, or Epſom ſalt, marine ſalt, or muriate of ſoda, calcareous and magneſian muriates, are the ſaline principles which mineralize them, either together or ſeparate. The waters of Sedlitz, of Seydſchutz, and of Egra, abound with Epſom ſalt, frequently mixed with muriate of magneſia. Thoſe of Balaruc contain marine ſalt, chalk, and the calcareous and magneſian muriates; thoſe of Bourbonne marine ſalt, ſelenite, chalk; and thoſe of la Mothe contain marine ſalt, ſelenite, chalk, Epſom ſalt, muriate of magneſia, and an extractive matter. It muſt be here obſerved, that ſalts with baſe of magneſia, are much more common in waters than has hitherto been ſuppoſed; and that few analyſes have yet been made, in which they have been well diſtinguiſhed from calcareous muriate.

SULPHUREOUS WATERS.

The name of ſulphureous waters has been given to ſuch mineral waters as appear to poſſeſs ſome of the properties of ſulphur; ſuch as the ſmell, and the property of diſcolouring ſilver. Chymiſts have long been ignorant of the true mineralizer of theſe waters; moſt have ſuppoſed it to be ſulphur, but they never ſucceeded in exhibiting it, or at leaſt have found it in quantities ſcarcely perceptible. Thoſe who have made experiments on ſome of theſe waters, have allowed them to contain either ſulphureous ſpirit or liver of ſulphur. Meſſ. Venel and Monnet, are the firſt who oppoſed this opinion; the latter in particular, nearly diſcovered the truth, when he conſidered ſulphureous waters as impregnated merely by the vapour of liver of ſulphur. Rouelle the younger likewiſe affirmed, that theſe fluids might be imitated by agitating water in contact with air, diſengaged from liver of ſulphur by an acid. Bergman carried this doctrine much farther, by examining the properties of hepatic gas, he has proved that this gas mineralizes ſulphureous waters, which he calls hepatic waters, and has directed methods of aſcertaining the preſence of ſulphur. Notwithſtanding theſe diſcoveries, M. Duchanoy, ſpeaking of ſulphureous waters admits liver of ſulphur, ſometimes alkaline, ſometimes calcareous, or argillaceous. He follows the opinion of Le Roy, who propoſed a liver of ſulphur with baſe of magneſia in imitating theſe waters. It appears in fact to be true, that there are waters which contain a ſmall quantity of liver of ſulphur; while there are others, which are mineralized only by hepatic gas; In this caſe it will be neceſſary to diſtinguiſh ſulphureous waters into two orders; the name of hepatic might, perhaps, be given with propriety to ſuch as hold a ſmall quantity of liver of ſulphur in ſolution, and hepatized to ſuch as are impregnated only with the hepatic gas. The waters of Bareges and Cauterets appear to belong to this firſt order, and thoſe of St. Amant, Aix la Chapelle, and Montmorency, appear to belong to the ſecond. Moſt of theſe waters are thermal; but that of Enghien, near Montmorency, is cold.

FERRUGINOUS WATERS.

Iron being the moſt abundant of metals, and the moſt ſuſceptible of alteration, it is not to be wondered at that water eaſily becomes charged with it, and conſequently that the ferruginous waters are the moſt abundant and moſt common of all mineral waters. Modern chymiſtry has thrown great light on this claſs of waters; they were formerly ſuppoſed to be all vitriolic. M. Monnet has aſcertained that moſt of them do not contain vitriol, and he ſuppoſed that the iron is diſſolved without the intermedium of an acid. It is at preſent known, that the iron is not in the ſtate of vitriol, but is diſſolved by means of the cretaceous acid, and forms the ſalt which we have called chalk of iron. Meſſrs. Lane, Rouelle, Bergman, and many other chymiſts, have put this out of doubt. The greater or leſs quantity of cretaceous acid, and the ſtate of the iron in waters of this kind, render it neceſſary to diſtinguiſh the preſent claſs into three orders.

The firſt order comprehends martial acidulous waters, in which the iron is held in ſolution by the cretaceous acid, whoſe ſuperabundance renders them briſk and ſubacid. The waters of Buſſang, Spa, Pyrmont, Pouhon, and la Dominique de Vals, are of this firſt order.

The ſecond contains ſimple martial waters, in which the iron is diſſolved by the cretaceous acid, without exceſs of the latter. Theſe waters conſequently are not acidulous. The water of Forges, Aumale and Conde, as well as the greater number of ferruginous waters, are of this order; this diſtinction of ferruginous waters was made by M. Duchanoy.

PHYSICAL PROPERTIES OF MINERAL WATERS.

After having ſhewn the different matters which may be found in waters, and exhibited a ſlight ſketch of the method in which they may be divided into claſſes and orders, according to their principles, it will be neceſſary to mention the methods of analyſing them, and diſcovering with the greateſt poſſible degree of accuracy, the ſubſtances they hold in ſolution. This analyſis has been juſtly conſidered as the moſt difficult part of chymiſtry, ſince it requires a perfect knowledge of all chymical phænomena, joined to the habit of making experiments. To obtain an accurate knowledge of the nature of any water propoſed to be examined. 1. The ſituation of the ſpring, and the nature of the ſoil, more eſpecially with reſpect to mineral ſtrata, muſt be carefully obſerved; for this purpoſe cavities may be dug to different depths, in order to diſcover, by inſpection, the ſubſtances with which the water may be charged. 2. The phyſical properties of the water itſelf, ſuch as its taſte, ſmell, colour, tranſparence, weight, and temperature, muſt next be examined; for this purpoſe, two thermometors which perfectly agree, and a good hydrometer, muſt be provided. Theſe preliminary experiments require likewiſe to be made in the different ſeaſons, different times of the day, and eſpecially in different ſtates of the atmoſphere; for a continuance of dry weather, or of abundant rain, has a ſingular influence on waters. Theſe firſt trials uſually ſhew the claſs to which the water under examination may be referred, and direct the method of analyſis. 3. The depoſitions formed at the bottom of the baſons, the ſubſtances which float on the water, and the matters which riſe by ſublimation, form likewiſe an object of important reſearch, which muſt not be neglected. After this preliminary examination, the proper analyſis may be proceeded on, which is made after three methods; by re-agents, by diſtillation, and by evaporation.

EXAMINATION OF MINERAL WATERS BY RE-AGENTS.

Theſe ſubſtances, which are mixed with waters, in order to diſcover the nature of the bodies held in ſolution by ſuch waters, from the phenomena they preſent, are called re-agents.

The beſt chymiſts have always conſidered the uſe of re-agents as a very uncertain method of diſcovering the principles of mineral waters. This opinion is founded on the conſiderations that their effects do not determine in an accurate manner, the nature of the ſubſtances held in ſolution in waters; that the cauſe of the changes which happen in fluids by their addition is often unknown: and that in fact, the ſaline matters uſually applied in this analyſis, are capable of producing a great number of phenomena reſpecting which it is often difficult to form any deciſion. For theſe reaſons, moſt chymiſts who have undertaken this analyſis, have placed little dependence on the application of re-agents. They have concluded, that evaporation affords a much ſurer method of aſcertaining the nature and quantity of the principles of mineral waters; and it is taken for granted, in the beſt works on the analyſis of theſe fluids, that re-agents are only to be uſed as ſecondary means, which at moſt ſerve to indicate or afford a probable gueſs of the nature of the principles contained in waters; and for this reaſon modern analyſts have admitted no more than a certain number of re-agents, and have greatly diminiſhed the liſt of thoſe uſed by the earlier chymiſts.

But it cannot be doubted at preſent, that the heat required to evaporate the water, however weak it may be, muſt produce ſenſible alterations in its principles, and change them in ſuch a manner, as that their reſidues, examined by the different methods of chymiſtry, ſhall afford compounds differing from thoſe which were originally held in ſolution in the water. The loſs of the gaſeous ſubſtances, which frequently are the principal agents in mineral waters, ſingularly changes their nature, and beſides cauſes a precipitation of many ſubſtances, which owe their ſolubility to the preſence of theſe volatile matters, and likewiſe produces a re-action among the other fixed matters, whoſe properties are accordingly changed. The phenomena of double decompoſitions, which heat is capable of producing between compounds that remain unchanged in cold water, cannot be eſtimated and allowed for, but in conſequence of a long ſeries of experiments not yet made. Without entering, therefore, more fully into theſe conſiderations, it will be enough to obſerve, that this aſſertion, whoſe truth is admitted by every chymiſt, ſufficiently ſhews, that evaporation is not intirely to be depended on. Hence it becomes a queſtion, whether there be any method of aſcertaining the peculiar nature of ſubſtances diſſolved in water without having recourſe to heat; and whether the accurate reſults of the numerous experiments of modern writers afford any proceſs for correcting the error which might ariſe from evaporation.

Among the conſiderable number of re-agents propoſed for the analyſis of mineral waters, thoſe which promiſe the moſt uſeful reſults are tincture of turnſole, ſyrup of violets, lime-water, pure and cauſtic vegetable alkali, cauſtic volatile alkali, oil of vitriol, nitrous acid, lime-water ſaturated with the colouring matter of Pruſſian blue, ſpiritous tincture of nut-galls, and the nitrous ſolutions of mercury and of ſilver. Bergman adds to theſe, paper coloured by the aqueous tincture of Fernambouc, which becomes blue by alkalis, the aqueous tincture of terra merita, which the ſame ſalts convert to a brown red, the acid of ſugar to exhibit the ſmalleſt poſſible quantity of lime, and the muriatic ſalt of ponderous earth to aſcertain the ſmalleſt quantity of vitriolic acid.

The effect and uſe of theſe principal re-agents have been explained by all chymiſts, but they have not inſiſted on the neceſſity of their ſtate of purity. Before they are employed, it is of the utmoſt importance perfectly to aſcertain their nature, in order to avoid fallacious effects. Bergman has treated very amply of the alterations they are capable of producing. This celebrated chymiſt affirms, that paper coloured with the tincture of turnſole becomes of a deeper blue by alkalis; but that it is not altered by the cretaceous acid, which he calls aerial acid. But as this colouring matter is uſeful chiefly to aſcertain the preſence of this acid, he directs its tincture in water to be uſed ſufficiently diluted till it has a blue colour. He abſolutely rejects ſyrup of violets, becauſe it is ſubject to ferment, and becauſe it is ſcarcely ever obtained without adulteration in Sweden. M. de Morveau adds in a note, that it is eaſy to diſtinguiſh a ſyrup coloured by turnſole, by the application of corroſive ſublimate, which gives it a red colour, while it converts the true ſyrup of violets to a green.

Lime-water is one of the moſt uſeful re-agents in the analyſis of mineral waters, though few chymiſts have expreſsly mentioned it in their works. This fluid decompoſes metallic ſalts, eſpecially martial vitriol, whoſe iron it precipitates; it ſeparates clay and magneſia from the vitriolic and muriatic acids, to which theſe ſubſtances are frequently united in waters. It likewiſe indicates the preſence of the cretaceous acid, by its precipitation. M. Gioanetti, a phyſician of Turin, has very ingeniouſly applied it to aſcertain the quantity of cretaceous acid contained in the water of St. Vincent. This chymiſt, after having obſerved that the volume or bulk of this acid, from which its quantity has always been eſtimated, muſt vary, according to the temperature of the atmoſphere, mixed nine parts of lime-water with two parts of the water of St. Vincent; he weighed the calcareous earth formed by the combination of the cretaceous acid of the mineral water with the lime, and found, according to the calculation of Jacquin, who proves the exiſtence of thirteen ounces of this acid in thirty-two ounces of chalk, that the water of St. Vincent contained ſomewhat more than fifteen grains. But as lime-water may ſeize the cretacious acid united with fixed alkali, as well as that which is at liberty, M. Gioanetti, to aſcertain more exactly the quantity of this laſt, made the ſame experiment with water deprived of its diſengaged acid by ebullition. This proceſs may therefore be employed to determine, in an eaſy and accurate manner, the weight of diſengaged cretaceous acid, contained in a gaſeous mineral water.

One of the principal reaſons which have induced chymiſts to conſider the action of re-agents in the analyſis of mineral waters as very fallacious, is, that they are capable of indicating ſeveral different ſubſtances held in ſolution in waters, and that it is then very difficult to know exactly the effects they will produce. This obſervation relates more eſpecially to vegetable alkali, conſidered as a re-agent, becauſe it decompoſes all the ſalts which are formed by the union of acids with clay, magneſia, lime, and metals. When this alkali precipitates a mineral water, it cannot, therefore, be known by ſimple inſpection of the precipitate, of what nature the earthy ſalt, decompoſed in the experiment, may be. Its effect is ſtill more uncertain when the alkali made uſe of is ſaturated witth cretaceous acid, as is moſt commonly the caſe; ſince the acid to which it is united augments the confuſion of effects: for this reaſon, I propoſe the uſe of very pure cauſtic vegetable alkali, which likewiſe poſſeſſes an advantage over the effervescent alkali, viz. that of indicating the preſence of chalk diſſolved in a gaſeous water, by virtue of the ſuperabundant cretaceous acid; for it ſeizes this acid, and the chalk falls down of courſe. I have eſtabliſhed this fact, by pouring ſoap lees newly made, into an artificial gaſeous water, which held chalk in ſolution. The latter ſubſtance is precipitated in proportion as the cauſtic fixed alkali ſeizes the cretaceous acid which held it in ſolution. By evaporating the filtrated water to dryneſs, I have obtained ſalt of ſoda, ſtrongly effervescent with ſpirit of vitriol. The cauſtic fixed alkali likewiſe occaſions a precipitate in mineral waters, though they may not contain earthy ſalts; for if they contain an alkaline neutral ſalt, of a leſs ſoluble nature, the additional alkali will precipitate it by uniting with the water, nearly in the ſame manner as ſpirit of wine does. M. Gioanetti has obſerved this phenomenon in the waters of St. Vincent; and it may eaſily be ſeen by pouring cauſtic alkali into a ſolution of vitriolated tartar, or muriate of ſoda; theſe two ſalts being quickly precipitated.

The cauſtic volatile alkali is in general leſs productive of error, when mixed with mineral waters; becauſe it decompoſes only earthy ſalts, with baſe of clay or magneſia, and does not precipitate the calcareous ſalts. It is neceſſary, however, to make two obſervations reſpecting this ſalt: the firſt is, that it muſt be exceedingly cauſtic, or totally deprived of cretaceous acid; without this precaution, it decompoſes calcareous ſalts by double affinity: the ſecond is, that the mixture muſt not be left expoſed to air, when the effect of its action is required to be inſpected ſeveral hours after it is added; becauſe, as M. Gioanetti has well obſerved, this ſalt in a very ſhort time ſeizes the cretaceous acid of the atmoſphere, and becomes capable of decompoſing calcareous ſalts. To put this important fact out of doubt, I made three deciſive experiments; ſome grains of ſelentine, formed of tranſparent calcareous ſpar, and ſpirit of vitriol, were diſſolved in diſtilled water. It is neceſſary to make the ſelentine with tranſparent ſpar, becauſe chalk, or Spaniſh white, contain magneſia and river water. I divided this ſolution into two parts; into the firſt I poured a few drops of volatile alkaline ſpirit, recently made, and very cauſtic; this I put into a well-cloſed bottle: at the end of twenty-four and forty-eight hours it was clear and tranſparent, without any precipitate, and therefore no decompoſition had taken place. The ſecond portion was treated in the ſame manner with the volatile alkaline ſpirit, but placed in a veſſel which communicated with the air by a large aperture: at the end of a few hours a cloud was formed near the upper ſurface, which continually increaſed, and was at laſt precipitated to the bottom. This depoſition effervesced ſtrongly with ſpirit of vitriol, and formed ſelentine. The cretaceous acid contained in this precipitate was therefore afforded by the volatile alkali which had attracted it from the atmoſphere. This combination of cretaceous acid and alkaline gas, forms ammoniacal chalk, capable of decompoſing calcareous ſalts by double affinity, as Black, Jacquin, and many other chymiſts have ſhewn, and as may be eaſily proved, by pouring a ſolution of concrete volatile alkali, or ammoniacal chalk, into a ſolution of ſelenite, which is not rendered turbid by the cauſtic volatile alkali. Laſtly, to render the theory of this ſecond experiment clearer, I took the firſt portion to which the cauſtic volatile alkali had been added, and which having been kept in a cloſe veſſel, had loſt no part of its tranſparency. I reverſed the bottle which contained it, over the funnel of a very ſmall pneumato-chymical apparatus, and by the aſſiſtance of a ſyphon, I paſſed into it cretaceous acid gas diſengaged from the effervescent fixed alkali by ſpirit of vitriol. In proportion as the bubbles of this acid paſſed through the mixtures, it became turbid in the ſame manner as limewater: by filtration a precipitate was ſeparated, which was found to be chalk, and the water by evaporation, afforded ammoniacal vitriol: gaſeous water, or the acid ſpirit of chalk, produced the ſame decompoſition in another mixture of pure ſelenite and cauſtic volatile alkali. This deciſive experiment clearly ſhews, that the volatile alkali decompoſes ſelenite by double affinity, and by means of the cretaceous acid. Hence we ſee, that when it is required to preſerve a mixture of the mineral water with volatile alkali for ſeveral hours, (which is ſometimes neceſſary, becauſe it does not decompoſe certain earthy ſalts but very ſlowly) the experiment muſt be made in a veſſel which can be accurately cloſed, in order to prevent the contact of air, which would falſify the reſult. This precaution, which is of great importance in the uſe of all re-agents, is likewiſe mentioned by Bergman and Gioanetti. To theſe I ſhall add another obſervation concerning the uſe of volatile alkali. As it a matter of conſiderable difficulty to preſerve the volatile alkali in the ſtate of perfect cauſticity, though it is neceſſary to be had in ſuch a ſtate, for the analyſis of mineral waters, a very ſimple expedient, which I have often uſed with ſucceſs, may be applied in this caſe. It is to pour a ſmall quantity of volatile alkaline ſpirit into a retort, whoſe neck is plunged in the mineral water: when the retort is ſlightly heated, the alkaline gas becomes diſengaged, and paſſes highly cauſtic into the water. If it occaſions a precipitate, it may be concluded that the mineral water contains martial vitriol, which may be known by the colour of the precipitate, or otherwiſe that it contains ſalts, with baſe of aluminous or magneſian earth. It is difficult to determine from the phyſical properties of the earthy precipitate formed in waters by the cauſtic volatile alkali, to which of the two laſt baſes it is to be attributed; yet the manner in which it is formed may ſerve to decide. Six grains of Epſom ſalt were diſſolved in four ounces of diſtilled water, and ſix grains of alum in an equal quantity of the ſame fluid: through each of theſe ſolutions a ſmall quantity of alkaline gas was paſſed: the ſolution of Epſom ſalt immediately became turbid, while that of alum did not begin to exhibit a precipitate till twenty minutes after. Theſe mixtures were carefully included in well cloſed bottles. The ſame phenomenon took place with the nitres and muriates of magneſia and aluminous earth, diſſolved in equal quantities of diſtilled water, and treated in the ſame manner. The quickneſs or ſlowneſs of the precipitation of a mineral water, by the addition of alkaline gas, therefore affords the means of aſcertaining the nature of the earthy ſalt decompoſed by this gas. In general, ſalts with baſe of magneſia, are much more uſually met with than thoſe with baſe of aluminous earth. Bergman has obſerved, that the volatile alkali is capable of forming with vitriol of magneſia or Epſom ſalt, a compound, in which a portion of this neutral ſalt is combined, without decompoſition, with a portion of ammonical vitriol. This non-decompoſed portion of Epſom ſalt, may probably form with the ammoniacal vitriol a mixed neutral ſalt, ſimilar to ſal alembroth. The volatile alkali does not, therefore, precipitate the whole of the magneſia, and conſequently does not accurately exhibit the quantity of Epſom ſalt, of which that earth is the baſe. For this reaſon lime water, in my opinion, is preferable for aſcertaining the nature and quantity of ſalts with baſe of magneſia contained in mineral waters. It has likewiſe the property of precipitating the ſalts with argillaceous baſe much more abundantly, and readily than alkaline gas.

The concentrated vitriolic acid precipitates a white powder from water which contains ponderous earth, according to Bergman; but, as the ſame chymiſt obſerves, that this earth is ſeldom found in mineral waters, it will not be neceſſary to enlarge on the effects of this re-agent. When it produces an efferveſcence or bubbles in water, it indicates the preſence of chalk, cretaceous fixed alkali or pure cretaceous acid: each of theſe ſubſtances may be diſtinguiſhed by certain peculiar phenomena. If water containing chalk be heated after the addition of the vitriolic acid, a pellicle and depoſition of ſelenite are ſoon formed, which does not happen with waters which are ſimply alkaline. At firſt conſideration, it may ſeem that the ſelenite ought to be precipitated as ſoon as vitriolic acid is poured into water containing chalk; this, however, very ſeldom happens without the aſſiſtance of heat, becauſe theſe waters moſt commonly contain a ſuperabundance of cretaceous acid which favours the ſolution of the ſelenite, and of which it is neceſſary to deprive them before the ſalt can be precipitated. This fact may be ſhewn, in the cleareſt manner, by pouring a few drops of concentrated vitriolic acid into a certain quantity of lime-water which has been precipitated, and afterwards rendered clear by the addition of cretaceous acid; if the lime-water be highly charged with regenerated chalk, a precipitate of ſelenite is thrown down in a few minutes, or more ſlowly in proportion as the cretaceous acid is ſet at liberty. If no precipitate be afforded by ſtanding, as will be the caſe when the quantity of ſelenite is very ſmall, and the ſuperabundant cretaceous acid conſiderable, the application of a ſlight degree of heat will cauſe a pellicle of ſelenite, and a precipitate of the ſame nature to be formed.

The ſmoking ſpirit of nitre is recommended by Bergman to precipitate ſulphur from hepatized waters. The experiment may be made by pouring a few drops of the ſmoking ſpirit on diſtilled water, in which the gas diſengaged from cauſtic liver of ſul phur, heated in a retort, has been received. This artificial hepatic water, which does not conſiderably differ from natural ſulphureous waters, except in the circumſtance of its being more difficult to filter, and its always appearing ſomewhat turbid, affords a precipitate in a few ſeconds, by the addition of nitrous acid; the precipitate is of a yellowiſh white; when collected on a filter and dried, it burns with the flame and ſmell of ſulphur, and in other reſpects has every character of that inflammable body. The ſpirit of nitre ſeems to alter hepatic gas in the ſame manner as it does all other inflammable ſubſtances, by virtue of the great quantity of pure air it contains. Scheele has recommended the deplogiſticated muriatic acid to precipitate the ſulphur, from waters of this nature, but it did not produce this effect on the waters of Enghien; and I have diſcovered that the ſulphureous acid precipitates ſulphur with great facility.

There are few re-agents, whoſe mode of action is leſs known than that of the phlogiſticated alkali; it has been long ſince aſcertained, that this liquor prepared with bullock's blood, contains Pruſſian blue ready formed; it has been thought that this blue might be ſeparated by the addition of an acid; and in this ſtate it has been propoſed as a ſubſtance capable of exhibiting iron exiſting in mineral waters. Whether it be true or not, that the colouring matter of Pruſſian blue is contained in phlogiſticated lixivium, as Bucquet ſuppoſed, and Mr. Baunach has ſince aſcertained; it ſeems clear that this lixivium ought to be excluded from the claſs of re-agents. Macquer having diſcovered that Pruſſian blue is decompoſed by alkalies, propoſed the ſaturated liquor of the colouring matter of this blue, as a teſt to aſcertain the preſence of iron in mineral waters. But as the liquor itſelf likewiſe contains a ſmall quantity of Pruſſian blue, which may be ſeparated by means of an acid, as Macquer has ſhewn, M. Baumé adviſes that two or three ounces of diſtilled vinegar be added to each pound of this Pruſſian alkali, and digeſted in a gentle heat, till the whole of the Pruſſian blue is precipitated; after which pure fixed alkali is to be added to ſaturate the acid of vinegar. Notwithſtanding this ingenious proceſs, I have obſerved, that the Pruſſian alkali purified by vinegar depoſits Pruſſian blue, in proceſs of time, more eſpecially by evaporation. M. Gioanetti made the ſame obſervation by evaporating the Pruſſian alkali, purified by the method of Baumé to dryneſs: he has propoſed two proceſſes for obtaining this liquor in a ſtate of purity, and totally exempt from iron; the one conſiſts in ſuperſaturating the Pruſſian alkali with diſtilled vinegar, evaporating it to dryneſs by a gentle heat, diſſolving the remaining maſs in diſtilled water, and filtrating the ſolution; all the Pruſſian blue remains on the filter, and the liquor, which paſſes through, contains none at all. The other proceſs conſiſts in neutralizing this alkali with a ſolution of alum, from which, after filtrating, the vitriolated tartar is ſeparated by evaporating. Theſe two liquors do not afford a particle of Pruſſian blue with the pure acids, nor by evaporating to dryneſs. The lime-water, ſaturated with the colouring matter of Pruſſian blue, mentioned by us, in treating on iron, does not require theſe preliminary operations: when poured on a ſolution of martial vitriol, it immediately forms pure Pruſſian blue without any mixture of green. Acids do not precipitate any Pruſſian blue from this re-agent; it therefore does not contain iron, and conſequently is preferable to the Pruſſian alkalies, in the eſſay of mineral waters.

This phenomenon doubtleſs depends on the action of the lime, which, when diſſolved in water, is far from having the ſame efficacy on iron as alkalies have. This Pruſſian lime water ſeems to be exceedingly well adapted to diſtinguiſh martial waters, whether they be gaſeous or vitriolic. In fact, the cretaceous gas, which holds iron in ſolution in waters, being of an acid nature, decompoſes Pruſſian lixiviums by the way of double affinity, as well as martial vitriol. I have tried Pruſſian lime-water on Spa waters, and thoſe of Paſſy, and I immediately obtained a very perceptible blue in the former, and very abundant in the latter. This, therefore, is a liquor very eaſily prepared, which does not contain the ſmalleſt portion of Pruſſian blue, and is exceedingly well calculated to exhibit the preſence of ſmall quantities of iron in waters. It is a kind of neutral ſalt, formed by the colouring part of the blue and lime. I have obſerved, in the foregoing part of this work, in treating of iron, that M. Scheele made the ſame inferences as myſelf concerning the utility of this proof liquor, which was mentioned by me as early as the year 1780.

Nut-galls, as well as all other rough and aſtringent vegetables, ſuch as oak-bark, the fruit of the cypreſs tree, the huſks of nuts, &c. have the property of precipitating ſolutions of iron, and exhibiting that metal of different colours, according to its quantity, its ſtate, and that of the water in which it is diſſolved. This colour in general is of all ſhades, from a pale roſe to the deepeſt black. It is well known that the purple colour, aſſumed by waters, with the tincture of nut-galls, is not a proof that they contain iron in its metallic ſtate, ſince martial vitriol and iron united to the cretaceous acid, which is called martial chalk, likewiſe aſſume a purple colour by the infuſion of nut-galls. The differences of colour obſerved in theſe precipitations, as M. Duchanoy has well obſerved in his Eſſays on the Art of Imitating Mineral Waters, depend rather on the quantity of iron, its greater or leſs degree of adheſion to the water, and the more or leſs advanced ſtate of decompoſition of the ſolution. We may here take notice, that though this re-agent has been known and employed with ſucceſs in the analyſis of mineral waters ſince the time that Duclos recommended it in 1667, and though Macquer, Monnet, and the chymiſts of the academy of Dijon have made a great number of experiments on nut-galls; the nature of the aſtringent principle is not yet known. We can only conjecture that it is a peculiar acid, ſince it unites with alkalies, converts blue vegetable colours to a red, decompoſes liver of ſulphur, and combines with metallic calces. Nut-galls in powder, the infuſion of this ſubſtance in water, made without heat, and the tincture of ſpirit of wine, are uſed to aſcertain the preſence of iron in mineral waters. The tincture is preferred, becauſe it is not ſubject to become mouldy as the aqueous ſolution is. It is a ſingular circumſtance, that the diſtilled products of nut-galls likewiſe colour martial ſolutions. The infuſions in acids, alkalies, oils, and ether, exhibit the ſame phenomenon. The iron precipitated by this matter from acids, is in a ſtate little known, and forms a kind of neutral ſalt, which though very black, is not attracted by the magnet. It diſſolves ſlowly, and without ſenſible efferveſcence in acids, but loſes theſe properties by the action of fire, and is then attracted by the magnet. The nut-gall is ſo efficacious a re-agent, that a ſingle drop of its tincture colours in the ſpace of five minutes, with a purple tinge, three pints of water, which contains only the twenty-fifth part of a grain of martial vitriol.

The two laſt re-agents we ſhall propoſe for the examination of waters, are ſolutions of ſilver and of mercury in the nitrous acid. Theſe have uſually been employed to exhibit the preſence of the vitriolic or muriatic acids in mineral waters; but many other ſubſtances, which do not contain the ſmalleſt portion of thoſe, are likewiſe precipitated by theſe ſolutions. The white and heavy ſtriæ which the ſolution of ſilver exhibits in water, that contains no more than half a grain of marine ſalt in the pint, aſcertains the preſence of the marine acid with great certainty and facility; but they do not in the ſame manner indicate the preſence of the vitriolic acid, ſince, according to Bergman's eſtimate, at leaſt thirty grains of vitriol of ſoda muſt exiſt in the pint of water, in order to produce an immediate ſenſible effect. To this we may add, that fixed alkali, chalſt, and magneſia, precipitate the nitrous ſolution of ſilver in a much more evident manner, and conſequently that the precipitation formed in a mineral water by this ſolution is inſufficient to determine with preciſion, the ſaline or earthy ſubſtances from which it aroſe.

The ſolution of mercury by the nitrous acid, is ſtill more productive of error: it not only indicates the preſence of vitriolic and muriatic acids in waters, but it is likewiſe precipitated by the cretaceous fixed alkali, in a yellowiſh powder, which might be miſtaken for an effect of the vitriolic acid. Lime and magneſia produce a precipitate nearly of the ſame appearance. It has been commonly ſuppoſed, that the very abundant white precipitate which it forms in water, is owing to the preſence of marine ſalt; yet mucilaginous and extractive ſubſtances exhibit the ſame phenomenon, as is now well known to all chymiſts. Beſides, theſe ſources of error and uncertainty, dependant on the property which ſeveral ſubſtances have, of producing ſimilar precipitates with the nitrous ſolution of mercury, there are likewiſe others which depend on the ſtate of this ſolution itſelf, and of which it is of the utmoſt conſequence to know, in order to avoid very conſiderable errors in the analyſis of waters. Bergman has mentioned ſome of the remarkable differences obſerved in this ſolution, according to the manner in which it is made, either with or without heat, more particularly with reſpect to the colour the precipitates it affords by different intermediums; but he does not ſay a word concerning the property this ſolution poſſeſſes, of being precipitated by diſtilled water, when it is highly charged with calx of mercury; though M. Monnet mentioned this fact in his treatiſe on the diſſolution of metals. The importance of this ſubject renders it neceſſary to enter more fully into the circumſtances which attend it. I have made a great number of ſolutions of mercury, in very pure nitrous acid, with different doſes of theſe two ſubſtances, with heat and in the cold, and with acids of very different ſtrengths. Theſe experiments have afforded the following reſults.

1. Solutions made in the cold, became charged more or leſs readily with different quantities of mercury, according to the degree of concentration of the nitrous acid; but whatever the quantity of mercury diſſolved in the cold by the concentrated acid may be, no part of it will be precipitated by mere water. I have diſſolved in the cold two drachms and a half of mercury, in two drachms of ſmoaking ſpirit of nitre, weighing one ounce, four drachms, and five grains, in a bottle, which contained an ounce of diſtilled water: the combination took place with the utmoſt rapidity; very denſe nitrous gas eſcaped, together with aqueous vapours, diſſipated by the heat of the mixture, amounting to more than one fourth of the acid. This ſolution was of a deep green, and very tranſparent. I poured a few drops into half an ounce of diſtilled water: ſome white ſtriæ were formed, which were diſſolved by agitation, and afforded no precipitate, though it was the moſt ſaturated ſolution I could make in the cold, and preſented the greateſt degree of commotion, efferveſcence, and red vapours, during the combination of the mercury and acids. As it had depoſited cryſtals, I added two drachms of diſtilled water, which diſſolved the whole without any appearance of precipitation. With much greater ſafety therefore may ſuch ſolutions, as have been made in the cold with common nitrous acid, and half their weight of mercury, be uſed in the analyſis of mineral waters, for they will never afford a precipitate by the addition of mere water.

2. The weakeſt nitrous acid ſtrongly heated on mercury, will diſſolve a larger quantity than the ſtrongeſt acid in the cold: the ſolution, which is of a light yellow colour, will appear thick and oily, and will afford by ſtanding, an irregular yellowiſh maſs, which may be changed into a beautiful turbith by the addition of boiling water; this ſolution poured into diſtilled water, forms a very abundant precipitate of a yellow colour, ſimilar to turbith. A ſolution made in the cold, exhibits the ſame reſult, if it be ſtrongly heated, ſo as to diſengage a large quantity of nitrous gas. Theſe ſolutions made with heat, ought therefore to be excluded from the analyſis of mineral waters, becauſe they are decompoſable by diſtilled water.

3. The two ſolutions appear to differ from each other in the quantity of calx of mercury, which is much greater in that which is precipitated by the water, than in that which is not decompoſable by that fluid. I have proved this, by evaporating equal quantities of both theſe ſolutions in an apothecary's phial, to reduce them into red precipitate, and I obtained one fourth more of this precipitate from the ſolution, which is decompoſed by water, than from that which is not rendered turbid. The ſpecific gravity likewiſe appeared to me to be a good method of aſcertaining the relative quantities of calx of mercury contained in theſe different fluids. I compared weights of equal maſſes of three mercurial nitrous ſolutions; the one, which was not at all precipitated by diſtilled water, and was the reſult of the firſt mentioned experiment, weighed one ounce, one drachm, and ſixty ſeven grains in a bottle, which contained exactly an ounce of diſtilled water. The ſecond ſolution was made by a very gentle heat, and produced a ſlight opal colour with diſtilled water, and ſcarcely any ſenſible quantity of precipitate. The ſame bottle contained one ounce ſix drachms twenty four grains. Laſtly, a third mercurial ſolution conſiderably heated, and which precipitated a true turbith mineral of a dirty yellow, by diſtilled water, weighed in the ſame bottle, one ounce, ſeven drachms, twenty five grains. A deciſive experiment remained to be made to confirm this opinion ſtill more perfectly: if the ſolution precipitated by water, owed this property to a quantity of mercurial calx, too large with reſpect to the acid, it would of courſe loſe that property by the addition of acid; this accordingly happened. Aqua fortis was poured on a ſolution which was decompoſed by water, and it ſoon acquired the property of no longer being precipitated, and was abſolutely in the ſame ſtate as that which had been made ſlowly at firſt, by the mere heat of the atmoſphere. M. Monnet has mentioned this proceſs, as a means of preventing cryſtals of mercurial nitre from becoming converted into turbith by the contact of the air. It is by a contrary proceſs, and by evaporating a portion of the acid of a good ſolution, which is not precipitated by water, that it is converted into a ſolution much more ſtrongly charged with mercurial calx, and conſequently capable of being decompoſed by water; its original property may be reſtored by the addition of a quantity of acid, equal to that which it loſt by evaporation.

Such are the different conſiderations which I have thought it neceſſary to exhibit, that the effects of re-agents on waters may be better aſcertained; but whatever may be the degree of preciſion to which reſearches of this nature may be carried; however extenſive the knowledge we may have acquired concerning the degrees of purity, and the different ſtates of ſuch ſubſtances as are combined with mineral waters, for the purpoſe of diſcovering their principles, if it ſtill remains a fact that each of theſe re-agents is capable of indicating two or three different ſubſtances diſſolved in theſe waters, the reſult of their action will always be ſubject to uncertainty. Lime, for example, ſeizes the cretaceous acid, and precipitates ſalts with the baſe of clay, and of magneſia, as well as the metallic ſalts. Volatile alkali produces the ſame effect. Fixed alkalies, beſides the above-mentioned ſalts, precipitate thoſe with baſe of lime. Lime water charged with the colouring matter of Pruſſian blue, Pruſſian alkali, and the ſpirituous tincture of nut-galls, precipitate martial vitriol and martial chalk. The nitrous ſolutions of ſilver and of mercury, decompoſe all the vitriolic and muriatic ſalts, which may be various both in quantity and in kind, in the ſame water, and are themſelves decompoſable by alkalies, chalk, and magneſia. Among this great number of complicated effects, how ſhall we diſtinguiſh that which takes place in the water under examination, or by what means ſhall we aſcertain whether it is ſimple or compounded?

Theſe queſtions, though very difficult, for the time when the expedients of chymiſtry were little known, are nevertheleſs capable of being diſcuſſed in the preſent ſtate of our knowledge. I muſt firſt obſerve, that the nature of re-agents being much better known at preſent than it was ſome years ago, and their re-action on the principles of water better aſcertained, it may, therefore be ſtrongly preſumed that their application may be much more advantageouſly made than has hitherto been ſuppoſed: nevertheleſs, among the great number of excellent chymiſts who have attended to the analyſis of waters, Meſſrs. Baumé, Bergman, and Gioanetti, are almoſt the only perſons who have been aware of this great advantage. We have been long in the habit of examining mineral waters by re-agents, in very ſmall doſes, and often in glaſſes: the phenomena of the precipitations obſerved have been noted down, and the experiment carried no farther. M. Baumé adviſes, in his chymiſtry, that a conſiderable quantity of the mineral water, under examination, ſhould be ſaturated with fixed alkalies and with acids, that the precipitates be collected, and their nature examined. Bergman apprehended that the quantity of the principles contained in waters might be judged of from the weight of the precipitates obtained in theſe mixtures. Several other chymiſts have likewiſe employed this method, but always with a view to certain particular circumſtances; and no one has hitherto propoſed to make a connected analyſis of mineral waters by this means. To ſucceed in this analyſis, I think it would be proper to mix ſeveral pounds of the mineral water with each reagent, till the latter ceaſes to produce any precipitate; the precipitate ſhould then be ſuffered to ſubſide during the time of twenty four hours, in a veſſel accurately cloſed; after which the mixture being filtered, and the precipitate dried and weighed, the operator may proceed to examine it by the known methods. In this manner the nature of the ſubſtance will be clearly aſcertained, on which the re-agent has acted, and the cauſe of the decompoſition may conſequently be inferred. A certain order may be followed in theſe operations, by mixing the waters firſt with ſuch ſubſtances as are leaſt capable of altering them, and afterwards paſſing to other ſubſtances capable of producing changes more varied and difficult to explain. The following method is that which I commonly uſe in this kind of analyſis. After having examined the taſte, the colour, the weight, and all the other phyſical properties of a mineral water, I pour four pounds of lime water on an equal quantity of the fluid; if no precipitate is made in twenty four hours, I am ſure that the water contains neither the cretaceous acid at liberty, nor the cretaceous fixed alkali, nor earthy ſalts with the baſe of aluminous earth or magneſia, nor metallic ſalts. But if a precipitate be formed, I filter the mixture, and examine the chymical properties of the depoſited ſubſtance; if it has no taſte, if it be inſoluble in water, or effervеſces with acids, or forms an inſipid and almoſt inſoluble ſalt by the addition of vitriolic acid, I conclude that it is chalk, and that the lime water has acted only on the cretaceous acid diſſolved in the water. If, on the contrary, it is ſmall in quantity, and ſubſides very ſlowly; if it do not effervеſce, and affords with the vitriolic acid a ſtyptic ſalt, or a bitter and very ſoluble ſalt, it is formed by magneſia or aluminous earth, and often by both.

After the examination by lime-water, I pour on four other pounds of the ſame mineral water, a drachm or two of volatile alkaline ſpirit, perfectly cauſtic, or I cauſe alkaline gas, diſengaged by heat from the ſpirit, to paſs into the water. When the water is ſaturated, I leave it at reſt in a cloſe veſſel for twenty-four hours; if a precipitate be afforded, it can only conſiſt of martial or magneſian, or aluminous ſalts, whoſe nature I examine by the different methods mentioned in the foregoing paragraph. But the action of alkaline gas being more fallacious than that of lime-water, which produces the ſame decompoſitions, it muſt be obſerved that this laſt ſhould only be uſed as an aſſiſtant means, which does not afford reſults equally accurate with thoſe produced by the former re-agent.

When ſalts with baſe of aluminous earth, for magneſia, hav been diſcovered by lime-water, or by alkaline gas, the cauſtic mineral alkali may be uſed, to diſtinguiſh thoſe with baſe of lime, ſuch as ſelenite and calcareous marine ſalt: for this purpoſe I precipitate ſome pounds of the water, which I examine by this alkaline liquor, till it no longer produces any turbidneſs. As this alkali decompoſes ſalts with baſe of aluminous earth, as well as thoſe compoſed of lime: if the precipitate reſembles in its form, colour, and quantity, that which lime-water has afforded, it may be preſumed that the water does not contain calcareous ſalt, and the chymical examination of the precipitate uſually confirms this ſuſpicion; but if the mixture is much more turbid than that made with lime-water; if the depoſition be much heavier, more abundant, and more readily afforded, the lime is mixed with magneſia or aluminous earth.

It were uſeleſs to explain at large, the effects of oil of vitriol, ſpirit of nitre, nutgalls, alkali, or lime ſaturated with the colouring matter of Pruſſian blue, employed in re-agent or mineral waters. I ſhall therefore only add, that when they are mixed in large doſes with theſe waters, and the precipitates collected, the nature and quantity of their principles may be accurately aſcertained, as has been done by Meſſrs. Bergman and Gioanetti.

Neither ſhall I dwell on the products which the nitrous ſolutions of ſilver or mercury afford when mixed with mineral waters. It is more particularly neceſſary to operate with large quantities of water, when theſe re-agents are uſed, in order to determine the nature of the acids contained in the waters. The analyſis of theſe fluids will be complete when their acids are known, becauſe theſe are often combined with the baſes exhibited by the re-agents before-mentioned. The colour, the form, and the abundance of the precipitates afforded by the nitrous ſolutions of mercury and ſilver, have hitherto exhibited to chymiſts the nature of the acids which cauſed them. A thick and ponderous depoſition immediately formed by theſe ſolutions, denotes the muriatic acid: if it is ſmall in quantity, white, and cryſtallized with the nitre of ſilver, or yellowiſh, and yellow and irregular when formed with that of mercury, and if it ſubſide but ſlowly, it is attributed to the vitriolic acid. But, as theſe two acids are often met with in the ſame water, and as alkali and chalk likewiſe decompoſe the ſolutions, the reſults or deductions made from the phyſical properties of the precipitates muſt be uncertain. It is therefore neceſſary to examine them more effectually; for this purpoſe, lunar, or mercurial ſolutions may be mixed with five or ſix pounds of the water intended to be analyzed. The mixtures being filtered, twenty-four hours after, the precipitates muſt be dried, and treated according to the methods of chymiſtry. If the precipitate afforded by the nitrous ſolution of mercury be heated in a retort, the portion of metal united with the muriatic acid of the waters will be volatilized into mercurius dulcis, and that which is combined with the vitriolic acid will remain at the bottom of the veſſel, and exhibit a reddiſh colour. Theſe two ſalts may likewiſe be diſtinguiſhed by putting them on a hot coal: the vitriol of mercury, if preſent, emits a ſulphureous acid, and aſſumes a red colour; the mercurial muriate remains white, and is volatilized without exhibiting any ſmell of ſulphur. Theſe phenomena likewiſe ſerve to diſtinguiſh the precipitates which may be formed by the alkaline ſubſtances contained in water, ſince the latter do not emit the ſulphureous ſmell, and are not volatile without decompoſition.

The precipitates produced by the combination of mineral waters with the nitrous ſolution of ſilver, may be as eaſily examined as the foregoing. Vitriol of ſilver being more ſoluble than lunar cornea, diſtilled water may be ſucceſsfully uſed to ſeparate theſe two ſalts. Luna cornea is known by its fixity, its fuſibility, and eſpecially in its being leſs eaſily decompoſable than vitriol of ſilver. This laſt, placed on hot coals, emits a ſulphureous ſmell, and leaves a calx of ſilver, which may be fuſed without addition. I do not here ſpeak of all the proceſſes chymiſtry affords for ſeparating or diſtinguiſhing the two lunar ſalts here mentioned: it is ſufficient that I have pointed out ſome of them.

EXAMINATION OF THE MINERAL WATERS BY DISTILLATION.

Diſtillation is uſed in the analyſis of waters, to aſcertain the gaſeous ſubſtances they may be united to. Theſe ſubſtances are either air, more or leſs pure, or cretaceous acid, or hepatic gas. To aſcertain their nature and quantity, ſome pounds of the mineral water muſt be poured into a retort, ſufficiently large to contain it, without being filled more than half or two-thirds of its capacity; to this veſſel a recurved tube is to be adapted, which paſſes beneath an inverted veſſel filled with mercury. In this diſpoſition of the apparatus, the retort muſt be heated till the water perfectly boils, or till no more elaſtic fluid paſſes over. When the operation is finiſhed, the quantity of air contained in the empty ſpace of the retort muſt be ſubtracted from the bulk of the gas obtained; the reſt conſiſts of aeriform fluid, which was contained in the mineral water, whoſe properties may quickly be known by the proofs of a lighted taper, tincture of turnſole, and lime water; if it catches fire, and has a fetid ſmell, it is hepatic gas; if it extinguiſhes the taper, reddens turnſole, and precipitates lime water, it is the cretaceous acid; laſtly, if it maintains combuſtion without taking fire, is without ſmell, and alters neither turnſole nor lime water, it is atmoſpheric air. It may happen that the elaſtic fluid may be purer than the air of the atmoſphere: in this caſe its degree of purity may be judged by the manner in which it maintains combuſtion, or by mixing it with nitrous or inflammable gas, in the eudiometers of Fontana and Volta. The proceſs uſed in obtaining gaſeous matters, contained in lime water, is intirely modern. A moiſtened bladder was formerly uſed, which was adapted to the neck of a bottle filled with mineral water; the fluid was agitated, and by the ſwelling of the bladder, an eſtimate was made of the quantity of gas contained in the water. This method is now known to be fallacious, becauſe water cannot give out all its gas but by ebullition, and becauſe the ſides of the moiſtened bladder alter and decompoſe the elaſtic fluid obtained. It is ſcarcely neceſſary to remark, that the phenomena exhibited by the water, during the eſcape of the gas, muſt be carefully examined, and that a leſs quantity of water may be expoſed to diſtillation, in proportion as its taſte and ſparkling indicate that it contains a larger quantity of gas.

Such is the method recommended by modern chymiſts to obtain the elaſtic fluids combined with waters: I muſt obſerve, 1. That this proceſs cannot be depended on, with regard to acidulous waters, unleſs the preſſure of the atmoſphere, and the ſtate of compreſſion of the elaſtic fluid under the glaſs veſſels, be very accurately accounted for; and as this is not eaſily done, the abſorption of cretaceous acid by lime water, propoſed by M. Gioanetti, appears to be preferable. 2. Though it has been recommended by Bergman to obtain hepatic gas from ſulphureous waters, it does not anſwer, becauſe the heat of ebullition decompoſes the gas, and it is likewiſe decompoſed by the mercury, which is converted into ethiops, as ſoon as it comes in contact with elaſtic fluid.

EXAMINATION OF MINERAL WATERS BY EVAPORATION.

Evaporation is generally conſidered as the moſt certain method of obtaining all the principles of mineral waters. We have before obſerved, and here repeat, that the experiments of Meſſrs. Venel and Cornette ſhew that long continued ebullition may decompoſe ſaline matters diſſolved in water, and for that reaſon we have adviſed the examination of them by re-agents, employed in greater proportions: yet evaporation may afford much information, when uſed, together with the analyſis by re-agents, which ought always to be conſidered as one of the principal methods of examining waters.

The intention of evaporation being to collect the fixed principles contained in a mineral water, it is obvious, that in order to know the nature and proportion of theſe principles, a conſiderable quantity of the water muſt be evaporated, and ſo much the more, in proportion as the principles appear to exiſt in ſmaller quantities. When the water is thought to contain a large quantity of ſaline matter, about twenty pounds muſt be evaporated; if, on the contrary, it appears to hold but a very ſmall quantity in ſolution, it will be neceſſary to evaporate a much larger quantity. It is ſometimes requiſite to perform this operation with ſeveral hundred pounds. The nature and form of the veſſels, in which waters are expoſed for evaporation, is not a matter of indifference. Thoſe of metal, excepting ſilver, are altered by water; veſſels of glaſs, of a certain magnitude, are very ſubject to be broken; but thoſe of glazed, ſmooth pottery, are the moſt convenient, though the cracks in the glaze ſometimes cauſe an abſorption of ſaline matter; veſſels of unglazed porcelain, called biſcuit, would doubtleſs be the moſt convenient, but their price is a conſiderable obſtacle. Chymiſts have propoſed different methods of evaporating mineral waters; ſome have directed diſtillation to dryneſs, cloſe veſſels, in order to prevent foreign ſubſtance, which float in the atmoſphere, from mixing with the reſidue; but this method is exceſſively tedious: others have adviſed evaporation by a gentle heat, never carried to ebullition, becauſe they ſuppoſed that this laſt heat alters the fixed principles, and carries up a portion of them. This was the opinion of Venell and Bergman. M. Monnet, on the contrary, directs the water to be boiled, becauſe this motion prevents the reception of foreign matters contained in the atmoſphere. Bergman avoids this inconvenience, by directing the veſſel to be covered, and a hole left in the middle of the cover for the vapours to paſs out: this laſt method greatly retards the evaporation, becauſe it diminiſhes the ſurface of the fluid. At the commencement, the heat uſed muſt be ſufficient to repel the duſt; but the greateſt difference in the manipulation of this experiment, conſiſts in ſome writers directing, that the ſubſtances depoſited ſhould be ſeparated, as the evaporation proceeds, in order to obtain each pure and by itſelf; others, on the contrary direct the operation to be carried on to dryneſs. We are of the opinion of Bergman, that this laſt method is the moſt expeditious and certain; becauſe, notwithſtanding the care which may be taken, in the firſt method, to ſeparate the different ſubſtances, which are depoſited or cryſtallized, they are never obtained pure, and muſt always be examined by a ſubſequent analyſis; and the method is beſides inaccurate, on account of the frequent filtrations, and the loſs it occaſions. Laſtly, it is very embarraſſing, and renders the evaporation much longer. Mineral waters may therefore be evaporated to dryneſs, in open glaſs veſſels, on the water-bath, or ſtill more advantageouſly in glaſs retorts, on a ſand-bath.

Various phenomena are obſerved during this evaporation; if the water be acidulous, it emits bubbles, as ſoon as the heat firſt begins to act; in proportion as the cretaceous acid is diſengaged, a pellicle is formed, with a depoſition of calcareous earth, or martial chalk. Theſe firſt pellicles are ſucceeded by the cryſtallization of ſelenite; and laſtly, the muriatic ſalts of pot-aſh and ſoda cryſtallize in cubes at the ſurface, but the deliqueſcent are not obtained but by evaporation to dryneſs.

The reſidue muſt then be weighed, and put into a ſmall phial, with three or four times its weight of ſpirit of wine: the whole being agitated, and ſuffered to ſubſide for ſome hours, muſt be filtered, and the ſpirit of wine preſerved ſeparate. The reſidue, on which the ſpirit has not acted, muſt be dried in a gentle heat, or in the open air; when perfectly dry, it muſt be weighed, and the loſs of weight will ſhew what quantity of calcareous or magneſian muriate was contained, becauſe theſe ſalts are very ſoluble in ſpirit of wine. We ſhall preſently ſpeak of the method of aſcertaining the preſence of theſe two ſalts in the ſpirituous fluid.

The reſidue, after treatment with ſpirit of wine, and drying, muſt be agitated with eight times its weight of cold diſtilled water, and filtered. After ſome hours ſtanding, the reſidue is to be dried a ſecond time, and boiled half an hour in four or five hundred times its weight of diſtilled water: this laſt reſidue, after filtration, conſiſts of that which cold and boiling water is inſufficient to diſſolve. The firſt water contains neutral ſalts, ſuch as vitriol of ſoda, or the vegetable alkali, united with cretaceous acid: the large quantity of boiling water ſcarcely contains any ſubſtance but ſelenite. There are therefore four ſubſtances to be examined, after theſe different operations on the matter obtained by evaporation. 1. The reſidue inſoluble in ſpirit of wine, and in water of different temperatures. 2. The ſalts diſſolved in ſpirit of wine. 3. The ſalts diſſolved in cold water. We ſhall now proceed to the experiments neceſſary to aſcertain the nature of theſe different ſubſtances.

1. The reſidue which has reſiſted the action of ſpirit of wine and water, may be compoſed of calcareous earth, of magneſian and martial chalk, of clay and of quartz. Theſe two laſt ſubſtances are ſeldom found in waters, but the three firſt are very common; the brown, or more or leſs deep yellow colour, indicates the preſence of iron. If the reſidue be of a white grey, it does not contain this metal. When iron is preſent, Bergman directs it to be moiſtened, and expoſed to the air till it ruſts; in which ſtate vinegar does not act on it. In order to explain the methods of ſeparating theſe different ſubſtances, we will ſuppoſe an inſoluble reſidue to conſiſt of the five ſubſtances here mentioned; it muſt firſt be moiſtened, and expoſed to the rays of the ſun; and when the iron is perfectly ruſted, the reſidue muſt be digeſted in diſtilled vinegar. This acid diſſolves the lime and magneſia, and by evaporation affords the calcareous acetous ſalt, diſtinguiſhable from the acetous ſalt of magneſia, by its not attracting the humidity of the air. They may conſequently be ſeparated by deliqueſcence, or by pouring vitriolic acid into their ſolution. The latter forms ſelenite, which precipitates; but if the magneſian acetous ſalt be preſent, the Epſom ſalt, compoſed of magneſia united with the vitriolic acid, will remain in ſolution, and may be obtained by a well-conducted evaporation. To aſcertain the quantity of magneſian and calcareous earths contained in this reſidue, the ſelenite is firſt to be precipitated; and the Epſom ſalt, formed by the vitriolic acid poured into the acetous ſolution, muſt then be precipitated by cretaceous vegetable alkali. The quantities of theſe preciditates are known by weighing. When the chalk and magneſia of the reſidue are thus ſeparated, the iron, the clay, and the quartz remain. The iron and clay are diſſolved by pure muriatic acid, from which the former is precipitated from Pruſſian lime, and the latter by cretaceous vegetable alkali. Theſe precipitates muſt likewiſe be weighed. The matter which remains after the ſeparation of the clay and iron is uſually quartzoſe: its quantity may be known by weighing, and its habitudes by fuſion with the blow-pipe with cretaceous mineral alkali. Such are the moſt accurate proceſſes, recommended by Bergman, for examining the inſoluble reſidue of waters.

2. The ſpirit of wine uſed in waſhing the ſolid reſidue of mineral waters, muſt be evaporated to dryneſs. Bergman adviſes treating it with ſpirit of vitriol, in the ſame manner as the acetous ſolution before ſpoken of; but it muſt be obſerved, that this proceſs ſerves only to exhibit the baſes of theſe ſalts. To determine the acid, which is ordinarily united with magneſia or lime, and ſometimes with both, a few drops of oil of vitriol muſt be poured on, which excites an efferveſcence, and diſengages the muriatic acid, known by its ſmell and white vapour when the ſalt under examination contains that acid. This may likewiſe be known by diſſolving the whole reſidue in water, and adding a few drops of the ſolution of ſilver. The nature of the baſe, which, as we have obſerved, is either lime, magneſia, or both together, is known by the ſame vitriolic acid, by a ſimilar proceſs with that already explained reſpecting the acetous ſolution.

3. The water uſed in waſhing the firſt reſidue of the mineral water, performed as before directed, with eight times its weight of cold diſtilled water, contains neutral alkaline ſalts, ſuch as vitriol of ſoda, or Glauber's ſalt, or muriates or marine ſalts, chalk of pot-aſh, and of ſoda, and vitriol of magneſia: a ſmall quantity of martial vitriol is ſometimes found. Theſe ſalts never exiſt all together in waters: the vitriol of ſoda, and the chalk of pot-aſh, are very ſeldom found; but marine ſalt is frequently met with, together with cretaceous ſoda. The vitriol of magneſia is frequently met with and ſome waters even contain it in conſiderable quantities. When the firſt waſhing of the reſidue of a mineral water contains only one kind of neutral ſalt, it may eaſily be obtained by cryſtallization; and its nature aſcertained from its form, taſte, and the action of fire as well as that of the re-agents: but this caſe is very rare, for it is much more uſual to find many ſalts united in this lixivium. They muſt therefore be ſeparated, if practicable, by ſlow evaporation; but as this method does not always perfectly ſucceed, however carefully the evaporation be conducted, it will be neceſſary to re-examine the ſalts obtained at the different periods of the evaporation. Cretaceous ſoda is uſually depoſited confuſedly with the muriatic ſalts, but they may be ſeparated by a proceſs, pointed out by M. Gioanetti. It conſiſts in waſhing this mixed ſalt with diſtilled vinegar; for this acid diſſolves cretacious ſoda. The mixture muſt then be dried and waſhed a ſecond time with ſpirit of wine, which takes up acetous ſoda, without acting on marine ſalt. The ſpirituous ſolution being evaporated to dryneſs, and the reſidue calcined, the vinegar becomes decompoſed and burns. Soda alone remains, whoſe quantity may be then accurately determined.

4. The water uſed in the quantity of four or five hundred times the weight of the reſiduum of the mineral water contains only vitriol of lime, or ſelentine. This may be aſcertained by pure cauſttic volatile alkali which occaſions no change, while the cauſtic vegetable alkali precipitates it abundantly. By evaporation to dryneſs, the quantity of earthy ſalt contained in the water may be accurately aſcertained.

ARTIFICIAL MINERAL WATERS.

The numerous proceſſes we have deſcribed for examining the reſidues of mineral waters by evaporation, ſerve to aſcertain with the greateſt preciſion all the ſeveral matters held in ſolution in theſe fluids. Another proceſs remains to be made to prove the ſucceſs of the analyſis, viz. That of imitating nature in the way of ſyntheſis, by diſſolving pure water the different ſubſtances, obtained by the analyſis of a mineral water which has been examined. If the artificial mineral water has the ſame taſte, the ſame weight, and exhibits the ſame phenomena, with re-agents as the natural mineral water, it is the moſt complete, and the moſt certain proof that the analyſis has been well made. This artifical combination has likewiſe the advantage of being procured in all places at pleaſure, and at a trifling expence; and is even in ſome caſes ſuperior to the natural mineral waters, whoſe properties may be changed by carriage and other circumſtances. The moſt celebrated chymiſts are of opinion, that it is poſſible to imitate mineral waters. Macquer has obſerved, that ſince the diſcovery of the cretaceous acid, and the property it is found to poſſeſs of rendering many ſubſtances ſoluble in water, it is much more eaſy to prepare artificial mineral waters. Bergman has deſcribed the method of compoſing waters, which perfectly imitate thoſe of Spa, Seltzer, Pyrmont, &c. He likewiſe informs us, that they are uſed with great ſucceſs in Sweden, and that he himſelf has experienced their good effects. M. Duchanoy has publiſhed a work, in which he has given a number of proceſſes for imitating all the mineral waters uſually employed in medicine. We may therefore hope, that chymiſtry may render the moſt eſſential ſervice to the art of healing, by affording valuable medicines, whoſe activity may be increaſed or diminiſhed at pleaſure.

CHYMICAL ANALYSIS OF BLOOD.

The blood is the moſt important, the moſt compounded, and the moſt impenetrable of the recrementitious humours. According to the doctrine of the greateſt phyſicians, it is the ſource and focus of all the other animal fluids.

Blood, by diſtillation of the water bath, affords phlegm of a faint ſmell, which is neither acid nor alkaline, but readily putrefies by virtue of an animal ſubſtance it holds in ſolution.

Blood united to alkalis becomes more fluid by ſtanding. Acids immediately coagulate it, and change its colour. By filtration, and evaporating of the filtrated liquor to dryneſs by a gentle fire, and ſubſequent lixiviation of this reſidual matter, ſuch neutral ſalts are obtained, as ſalt of ſoda forms with each acid, any of which may be indiſcriminately uſed. Spirit of wine coagulates blood.

Experiments made on blood in its original ſtate, do not ſhew the nature of the ſubſtances which compoſe this fluid; but the ſpontaneous decompoſition of blood, and the ſeparation of its two parts, the clot and the ſerum, afford a method of performing this by examining each ſubſtance in particular.

When expoſed to heat, it coagulates and hardens long before it boils. It converts ſyrup of violets to a green. When diſtilled on the water-bath, it affords a mild and inſipid phlegm, neither acid nor alkaline, but ſubject to putrefaction: the matter in the retort is then dry, hard, and tranſparent like horn, and no longer ſoluble in water; but by a ſtrong heat it affords an alkaline phlegm, much concrete volatile alkali, and a very fetid oil.

Serum does not decompoſe the calcareous and argillaceous neutral ſalts: but it decompoſes metallic ſalts very readily. It is coagulable by ſpirit of wine, and this coagulation differs greatly from that which is formed by acids, more particularly in its ſolubility in water, as Bucquet has diſcovered. This liquid therefore appears, from theſe experiments, to be an animal mucilage compoſed of water, acidifiable oily baſes, marine ſalt, chalk of ſoda, and calcareous phoſphate; this laſt appears to produce the roſe-coloured precipitate, which I have obtained by pouring the nitrous ſolution of mercury into ſerum. Though the liquid be ſcarcely coloured, the addition of nitrous acid, and more eſpecially of mercurial nitre, produces a roſe or light fleſh colour, which I have frequently obſerved in many other animal liquors. The moſt ſingular property of this mucilage, which deſerves the attention of phyſicians is, its becoming concrete by the action of fire, and of acids.

The clot of blood expoſed to the heat of a water-bath, affords an inſipid water, and becomes dry and brittle. By diſtillation it affords an alkaline phlegm, a thick oil of a fetid and empyreumatic ſmell, and much volatile alkali. Its reſidue is a ſpungy coal of a brilliant and metallic aſpect, difficult to incinerate, and which when heated with the vitriolic acid affords vitriols of ſoda and of iron. After theſe operations, a mixture of calcareous phoſphate and coaly matter remains.

The ſolution, when heated with different menſtrua, exhibits all the characters of ſerum; but it contains a much greater quantity of iron, which may be obtained by incineration of the coal, and ſubſequent waſhing, to ſeparate the ſaline matters. The reſidue of this waſhing is ſaffron of Mars, of a beautiful colour, and uſually attracted by the magnet. The colour of blood is attributed to this metal. Iron has been obtained from blood in conſiderable quantities, by ſeveral chymiſts.

The clot, after having been waſhed, and deprived of all its red ſerum, appears to conſiſt of a white fibrous matter, which remains to be examined.

By diſtillation on the water bath, it affords a taſteleſs phlegm of a faint ſmell, and capable of putrefaction. The moſt gentle heat ſingularly hardens the fibrous matter: when ſuddenly expoſed to a ſtrong heat, it ſhrinks up like parchment. By diſtillation in a retort, it affords an alkaline phlegm, a ponderous, thick, and very fetid oil, with much ammoniacal chalk, contaminated by a portion of oil.

The neutral ſalts, and other mineral ſubſtances, do not act upon it. It unites to the lymph, eſpecially that which is coloured, to form the clot. This laſt, like the fibrous part, is totally ſoluble in acids; doubtleſs, on account of the combination of this matter with the red ſerum. Hence we ſee, that the fibrous part differs greatly from the albuminous matter. It cannot be doubted, but that this matter, which has not hitherto been diſtinctly obſerved by phyſiological and pathological phyſicians, is of the greateſt conſequence in the animal œconomy. I have obſerved, that it is depoſited in the muſcles, conſtituting the fibrous baſe of theſe organs, and that it forms the ſubſtance which is moſt eminently irritable. Whence I have inferred, that it is of conſequence to pay a greater attention to this ſubſtance than has hitherto been done; and to conſider it as capable by its abundance or deviation of cauſing peculiar diſorders.

Notwithſtanding theſe reſearches into the nature of blood, much remains to be done before its chymical properties will be perfectly known. The intimate difference between the ſerum and the fibrous part is yet unknown: neither has blood been yet examined in all its ſtates; eſpecially in the different diſorders which conſiderably alter this fluid; as for example, in ſtrong inflammations, in the chloroſis, ſcorbutic diſorders, &c. Phyſicians judge of theſe alterations merely by the external appearance, and it is much to be wiſhed that their nature were better aſcertained by accurate analyſis.

CHYMICAL APPARATUS.

In this Syſtem I have adopted the plan which I perceive to have been invariably followed by the ſeveral profeſſors hitherto concerned in compoſing the various Syſtems in this work; that of introducing every new improvement in the Arts and Sciences. To this end I have examined other dictionaries, but finding them all abound with old and uſeleſs apparatus, I have wholly rejected them, and adopted thoſe of later invention, which from the ſimplicity and utility of their construction bear a decided preference; nor have I omitted to point out the particular conſtruction, uſe, and improvements of the reſpective employments repreſented in the plate, as without ſuch deſcription no idea could be formed of the ſuperiority of theſe new inventions. I have paid particular attention to one of the moſt uſeful furnaces yet known, invented by the learned and ingenious Dr. Black, of Edinburgh, which entirely obviates the inconveniences attending former ones, and beſides its durability, has been found, though but one inſtrument, to anſwer all the purpoſes of the practical or ſpeculative Chymiſt. This furnace is deſcribed under Fig. 7. *and* 8.

The moſt eſſential part of chymical apparatus is the furnace, of which there are various kinds conſtructed for the purpoſe of containing fire, and applying, directing and adjuſting its ſeveral degrees of heat.

The moſt ſimple furnace is uſually made of an iron hoop, five or ſix inches deep; with a grate or ſome iron bars acroſs the bottom, for ſupporting the fuel. It either ſtands upon feet, ſo as to be moveable from place to place, as repreſented in *Fig.* 1: or may be fixed in brickwork: if ſo a vacancy ſhould be left under the grate, for receiving the aſhes that drop; and an aperture, in the forepart of this aſh-pit, ſerves both for allowing the aſhes to be occaſionally raked out, and to admit air to paſs up through the fuel. This furnace is deſigned for ſuch operations as require only a moderate heat; as infuſion, decoction, and the evaporation of liquids. The veſſel, containing the ſubject matter, is ſupported over the fire by a trevet. *Fig.* 1. C.

FIGURE I.

A COMMON STOVE WHICH STANDS ON FEET AND IS MOVEABLE FROM PLACE TO PLACE.

A, the body of the ſtove. B, Its feet. C, The grate conſiſts of a ring with bars which go acroſs on the inſide. On the outer part are fixed four pieces of iron, D, for the purpoſe of ſcrewing the ring on to the bottom of the furnace, by which means it is kept out of the cavity, preſerved from the extremity of heat, and laſts much longer. It is applied to a hole made for that purpoſe at the bottom of the machine.

FIGURE II.

A WIND FURNACE.

A, its dome; B, the door for ſupplying fuel and placing the matter to be wrought on; C, the chimney; D, the door of the aſh pit; E, the regiſter or damping plate.

This furnace is of a deeper hoop or body, cylindrical, parallelopipedal, widening upwards, elliptical or of other figures, formed of, or lined with ſuch materials as are capable of bearing an intenſe heat, with an aſh and pit grate. It communicates at the top with a perpendicular chimney, which conſtitutes it a wind furnace. The area of the aperture of the chimney ſhould be nearly equal to the area of the interſtices of the grate, ſo that the chimney may be ſufficiently wide to admit a free paſſage to all the air that the furnace can receive through the grate, in which caſe, the greater the height of the chimney, the more powerful will be the draught of air through the furnace, and the more intenſely will the fire burn. Conſequently the chimney or tube ſhould conſiſt of various detached parts, that may be lengthened or ſhortened at pleaſure, in order to increaſe or diminiſh the rapidity of the flame.

The vehemence of the fire may alſo be reſtrained at pleaſure, by cloſing or opening the aſh pit door, which admits the air on the chimney by which it eſcapes, as the intenſity of the fire depends wholly upon the quantity of air ſucceſſively paſſing through, and animating the burning fuel.

Other properties of this implement are a regiſter in the chimney, which enlarges or contracts the paſſage for the air, and a damping plate with ſix holes, bearing a certain proportion to each other, as repreſented in E.

The holes may be ſtopped at pleaſure ſo as to admit any quantity of air, from 1 degree to 128. When fuſions are to be performed in this furnace, the crucible or melting pot muſt be placed among the fuel, on a brick, to keep the air from ſtriking the bottom of the crucible.

FIGURE III.

A FURNACE COMMONLY USED FOR FUSION IN A CRUCIBLE.

A, the beginning of its chimney from the back part. B the mouth of the furnace ſerving as the door. C. the regiſter.

Wind furnaces are of two kinds; one with the chimney on the the top, or at the middle of the furnace, as in *Fig.* 2. the other with the chimney on one ſide as in this figure.

This kind of wind furnace communicates by an aperture in its back A near the top B, either with an oblique pipe prepared for the purpoſe, or with the chimney of the room, in which caſe all paſſages to the chimney muſt be ſtopped up, in order to increaſe the draught of air through the furnace.

In this implement the aperture B at the top, ſerves for the door, which may be covered with a plate, as occaſion requires. This is the kind of furnace moſt commonly uſed for fuſion in a crucible.

Many conveniences attend this furnace, as by leaving the aperture B clear, you may introduce a boiling or evaporating pan, a copper ſtill, an iron pot for diſtilling hartſhorn, an iron ſand pot, or any veſſel whoſe ſize will admit of being ſupported on the furnace by the rims. The aperture of the top being thus filled up by veſſels, a door muſt be made in the ſide C for ſtirring, and ſupplying the fuel.

FIGURE IV.

PLAN OF A WIND FURNACE, WHEN DESIGNED FOR A REVERBERATORY.

A, The iron bars which ſupport the retort.

B, The retort laying on the bars.

C, The neck of the retort coming out of air aperture of the furnace, in the oppoſite ſide of the door, B.

When this furnace is uſed as a reverberatory, that is, for diſtillation in long necks or coated glaſs retorts, two iron bars ſhould be placed acroſs above the fire, in order to ſupport the veſſel. An aperture ſhould be made for the neck to come out at in the ſide oppoſite to that in which is the door, or at leaſt ſo remote from it as to prevent the receivers obſtructing the operator in ſtirring the fire and throwing in freſh fuel.

FIGURE V.

PLAN OF A WIND FURNACE, WHEN DESIGNED FOR A SAND BATH.

A, a long iron plate, one end of which cloſely ſhuts the mouth of the furnace.

B, a ridge of free ſtone or brick work.

C, the mouth of the canal.

D, the door for admitting fuel, regiſters, &c. as in other furnaces.

When a furnace of this conſtruction is deſigned to be converted to the purpoſe of a ſand-bath, it will be proper to have the ſand placed in a long iron plate, with a ridge of freeſtone or brick work on each ſide. One end of this plate ſhould cover the mouth of the furnace, and the canal by which the furnace communicates with its chimney ſhould be lengthened and carried under the plate, which ſhould form the upper ſide of the canal. This kind of ſand-bath is of ſingular utility, as in its digeſtions, &c. requiring different degrees of heat, may be carried on at one and the ſame time, becauſe the heat gradually decreaſes from the end A, over the furnace to the other extremity C. If ſtills or iron pots for diſtilling hartſhorn and aqua fortis are placed in furnaces, a conſiderable part of the bottom of thoſe veſſels ſhould reſt upon ſolid brick work; becauſe ſuch veſſels whoſe bottoms are narrow in proportion to their height, when charged with liquor require great ſupport. To make up for the diſadvantage ariſing from a ſmall ſurface only being expoſed to the action of the fire, there is a ſpiral canal which communicates at top with a common chimney, and conveys the heat all round the ſides of the veſſel.

FIGURE VI.

AN ATHANOR.

A, the tower on which a cover may be applied at the top B when uſed; C, the fire place; D, the aſh-pit; E E, an oblong frame of metal or ſtone connected with the tower A. F F, a chamber connected with the fire place C, and continued up to the chimney G. Above this chamber the reſt of the frame is lined with iron. H H, which being covered with ſand and heated by the long range of fire in the chamber F below, form the ſand heat. I, the regiſter.

This furnace, though in ſome inſtances reſembling the ſand furnace *Fig.* 5, is of ſingular utility, as by means of it a conſtant heat may be kept up a conſiderable time without attendance. The deſign of this furnace is to heat exterior bodies. The canal, or flue G, ſhould paſs under a ſand, or water bath K, as in *Fig.* 5, and riſe perpendicularly to a heighth ſufficient to occaſion a proper draught of air through the fire. The cauſe of this furnace not requiring conſtant attendance is, that the furnace being carried conſiderably above the part where the bottom of the canal G enters it may be filled with fuel to the top and cloſely covered, ſo that the fuel will burn no higher than up to the upper ſide of the canal through which the air paſſes off; therefore as the lower part of the fuel conſumes, it will of courſe be ſupplied by that above.

The tower A, which contains the fuel, ſhould be made to widen downwards, that the coals may fall the more freely, but not ſo much as to preſs the fire at the bottom too ſtrongly. A ſmall aperture ſhould be made oppoſite to the canal or pipe of the chimney G, or a number of holes proportioned to the dimenſions of the furnace, or the degree of heat required for ſupplying the air, which is admitted more freely by this means than through the grate, as its bars muſt in courſe of time be choaked up by the aſhes.

By placing a regiſter or ſliding plate between the flue and the furnace, the height of the fire place, and conſequently the quantity of fire, may be increaſed or diminiſhed at pleaſure. By incloſing the ſpace beneath the flue to the ground, the cavity may be applied to ſeveral uſeful purpoſes.

FIGURE VII.

DR. BLACK's FURNACE.

As this furnace may be converted to many uſes, and ſo infinitely ſurpaſſes any thing of the kind I have ever met with before, I deem it neceſſary to give a more copious deſcription of it than I have done of the reſt.

A, a hole frequently uſed as the mouth of the furnace; B, the vent; C, the aſh pit; D, the rim of the aſh pit, that receives the bottom of the furnace; E, the holes of the damping plate.

FIGURE VIII. A SECTION of FIG. VII.

I ſhall combine the two figures 7 and 8 together, in order to deſcribe with as much preciſion as poſſible this furnace in its entire ſtate; but to prevent confuſion, it ſhould be underſtood, that *Fig.* 7. repreſents the body of the furnace with its bottom received within the aſh pit. As in this figure then I could not exhibit the bottom of the furnace, I have, in *Fig.* 8, ſuppoſed the body of the furnace to be cut down through its middle, whereby one half of the undermoſt hole, with a proportional part of the grate G, applied to it, is exhibited along with, and nearly oppoſed to one half of the upper hole F. The ſame hole which in *Fig.* 7, is repreſented in its entire ſtate by A, in *Fig.* 7, by the ſection, *Fig.* 8, the relation of the upper and under holes to one another is explained.

The aſh pit of *Fig.* 8, is not divided in the middle, but brought down a little diſtance from the body of the furnace, in order to repreſent more clearly the border D, which receives the bottom of the furnace.

The body of this furnace is nearly of the ſame form at that of the common ſtove, *Fig.* 1. and cloſed at each end with a thick iron plate. In the upper plate ſhould be two holes. One of theſe A, ſerves for the mouth of the furnace. The other, B, for the purpoſe of ſcrewing down the vent opon. The aſh pit C, *Fig.* 7. and 8, ſhould be made in the ſame oval form as the body of the furnace, but rather wider, ſo that the bottom of the furnace H may go within the brim. A little below there ſhould be a border, D, *Fig.* 8, to receive the bottom of the furnace H. All the parts except the holes of the damping plate E, *Fig.* 7 and 8, ſhould be cloſed by a quantity of ſoft lute, upon which the body of the furnace preſſing down, the joining is rendered firm and compact; for the body, aſh pit, vent, and grate of this furnace, as it comes from the hands of the workmen, are all in ſeparate figures.

I ſhall here ſubjoin ſome accounts reſpecting the different operations in chymiſtry to which this furnace may be adapted. For a melting furnace, the upper hole, A, ſhould be covered, and may be uſed as a door to the furnace, which is convenient for introducing and examining from time to time the ſubſtances that are to be acted upon; this hole ſhould be nearly over the grate.

The covering for this aperture may be a flat and ſquare tile; but I am informed that Dr. Black uſually employs a kind of lid made of plate iron, with a rim that contains a quantity of luting. In order to increaſe the degree of heat, the vent B ſhould be heightened and the holes in the damping plate E kept open, by which means the furnace may be employed in moſt operations in the line of aſſaying.

Though this furnace does not admit of the introduction of a muffle, yet if a brick be placed upon its end in the middle of the grate, and if large pieces of fuel are uſed, ſo that the air may have free paſſage through it, metals may be aſſayed in this furnace without coming into contact with the fuel. It may therefore be employed in thoſe operations for which a muffle is uſed, and in this manner lead and other metals may be brought to their proper calces.

This furnace may alſo be employed in diſtillations even when they require an intenſe heat. The earthen retort muſt then be ſuſpended by means of an iron ring ſtanding up from it.

FIGURE IX.

This ring hangs down from the hole A, in *Fig.* 7, above half a foot, ſo that the bottom of the retort reſts upon the ring, and is immediately hung over the fuel. The opening between the mouth of the furnace A, ſhould be filled up with broken crucibles or potſherds, which being covered over with aſhes, tranſmit the heat very ſlowly, ſo that the furnace anſwers for diſtillations perfumed with the naked fire.

I am informed Dr. Black has had ſome of theſe furnaces provided with a hole, from which the neck of the retort iſſued, and in this manner he has diſtilled the phoſphorus of urine which requires a very ſtrong heat.

FIGURE X.

An iron pot fitted to the opening of the furnace A, which may be employed as a ſand pot for diſtillations, with retorts performed in the ſand bath. The vent B in theſe diſtillations is uſed as the door of the furnace, and is kept tight with more eaſe than when on the ſide. The vent in this caſe may be covered with a lid of charcoal or clay.

This furnace alſo ſubſerves the purpoſes of the common ſtill, part of which may be made to enter the opening A, and thus hang over the fire. In this caſe too the vent B is made the door of the furnace, by which freſh fuel is to be introduced. But in common diſtillations, freſh fuel need never be added; and even in the diſtillations of mercury, phoſphorus of urine, and indeed any proceſs whatever, the furnace generally contains fuel ſufficient to finiſh the operation; the fuel being ſo effectually preſerved from diſſipation, and the conſumption of the fuel ſo very ſlow.

I have in theſe two Figures 7 *and* 8, *comprized the account of Dr. Black's furnace, and hope it will contribute to the ſatisfaction of our readers, and the benefit of practitioners in Chymiſtry.*

With regard to the materials of furnaces, the fixed ones ſhould be built of bricks, cemented together by ſome good loam or clay. Any kind of loam or clayey compoſition, that is of a proper degree of tenacity, which when made into a paſte with water, and well worked, does not ſtick to the fingers, and which, when thoroughly dried, neither cracks nor melts in a vehement fire, is fit for this uſe. The pure and more tenacious clays require to have their tenacity leſſened by an admixture of ſand, or rather of the ſame kind of clay burnt and groſly powdered.

Smaller portable furnaces may be made of ſtrong iron or copper plates, lined to the thickneſs of an inch or more with the ſame kind of clayey compoſition; which for this uſe may be beaten with ſome horſe dung, chopped ſtraw, or cut hair or tow.

Very commodious portable furnaces, for a buſineſs of moderate extent, may be formed alſo of the larger kind of the common black lead melting pots, by cutting a door at the bottom of the pot for the aſh-pit, another above this for the fire place, and introducing a circular iron grate of ſuch a ſize that it may reſt between the two doors. For a particular account of the method of preparing theſe furnaces for different uſes, I ſhall refer the reader to the firſt part of the Commercium Philoſophico-technicum of Dr. Lewis: they are however liable, by the repetition of violent heats, to a kind of calcination like inflammable ſubſtances; and the heat is not regulated with ſufficient exactneſs.

FIGURE XI.

An evaporating pan, being a ſection of a globe of glaſs beſt fitted for expoſing a broad ſurface.

FIGURE XII.

The chymical phial or mattraſs with a long neck, for admitting the vapours raiſed by heat or mixture, to circulate and be condenſed, whereby their eſcape is prevented.

FIGURE XIII.

A retort and receiver together, to ſhew their connection during the operations of diſtillation or ſublimation.

The receiver is of a conical figure, whereby the ſteam has more room to circulate and condenſe. Dr. Black has found this figure more convenient in getting out ſublimed matter. This figure repreſents an example of the *diſtillatio per latus*, or the diſtillation by the retort and receiver, and is uſed in all caſes where nice operations are required; or where metallic veſſels would be corroded by the contained matter. The *diſtillatio per aſcenſum* is performed by a copper ſtill, the ſame as the following figure.

FIGURE XIV.

A COPPER STILL.

A, the body of the ſtill containing the matter. B, the head of the ſtill into which the vapour ariſes. This is made to fit very cloſely to the body, ſo as to require little or no luting. C, a pipe iſſuing from the middle of the top of the head, and deſcending to C, is received into the pipe D. D, the pipe or worm deſcending into a large veſſel E, containing a quantity of cold water to keep the pipe cool, and thereby facilitate the condenſation of the vapours. F, the further extremity of this pipe, coming out at an opening in the under part of the veſſel E, from this extremity the condenſed matter diſtills. This inſtrument is on the conſtruction uſed and recommended by Dr. Black, and varies a little from the common form. I am informed, he thinks it unneceſſary for the pipe D to be made ſerpentine, which renders the cleaning of it very difficult and uncertain.

FIGURE XV.

A SEPARATORY FOR SEPARATING OIL FROM WATER.

This inſtrument is provided with two tubes, A, B, projecting from near its neck; and it is thus managed: if the oil to be ſeparated is ſpecifically lighter than the water, the veſſel is gently inclined to one ſide, in order to pour out the oil, which from its lightneſs has aſcended into the tube: if, on the contrary, the oil is ſpecifically heavier than the water, the veſſel, with its mouth ſhut, is to be inverted, that the oil at its bottom may be brought to ſink into one of the tubes: from which it is to be poured till the water begins to come off along with it, when the mouth of the tube is to be inſtantly ſhut by the top of a finger. It is obvious, that to manage this inſtrument properly, requires conſiderable addreſs and dexterity.

FIGURE XVI.

An oblong glaſs veſſel, the under part of which is kept hot, when intended to ſublime ſolid matters, and the upper part is kept cool, whereby the vapour is condenſed in the form of a cake at the top. The mouth of the veſſel is to be ſtopt by a cotton ſtopple. This method is not ſo well fitted for large operations as the retort and receiver.

FIGURE XVII.

An adopter, which is a receiver that has a pipe iſſuing from its farther extremity, and which is received into another receiver or adopter; the number of receivers at pleaſure may increaſe or diminiſh. It may be uſeful for the condenſation of very elaſtic vapours, as thoſe of the cauſtic volatile alkali, vitriolic ether, &c. The receivers in this inſtrument are of the uſual form, and may ſhow wherein that recommended by Dr. Black differs.

FIGURE XVIII.

A retort funnel for pouring in liquors, ſo as to prevent touching the neck of the retort. It is neceſſary in drawing out the funnel, the operator ſhould keep it applied to the upper part of the retort, whereby the drop hangs from the under edge of the funnel, and therefore cannot touch the inſide of the retort.

FIGURE XIX.

A crucible, which is angled at the top for the conveniency of pouring out the contained matter. It is narrow below for receiving ſmall quantities, which in a large compaſs might be leſs eaſily brought out. The black lead and clay crucibles are often acted on by ſaline matters, and ſometimes deſtroyed by the inflammable matter of the black lead: they, however, anſwer much better for fuſing metals than thoſe of clay and ſand. Theſe laſt anſwer beſt for ſaline ſubſtances; but being more liable to break than the other, they may be made ſecurer by incloſing the crucible containing the matter within another crucible, and filling up the interſtices with ſand.

The crucible in this figure ſtands upon a pedeſtal, which is a piece of clay or brick betwixt the crucible and the grate, to prevent the cold air ſtriking the bottom whilſt the ſtop is hot; in which caſe the crucible generally breaks to pieces. To prevent the fuel from falling in, covers made of clay ſhould be applied, or another cricible inverted upon that containing the matter; and the joining ſhould be ſecured by a proper lute.

FIGURE XX.

A pair of crucible tongs for putting in or taking out the matter to be wrought on.

The preceding Syſtem of Chymiſtry, I flatter myſelf, will be found not only entertaining but uſeful. Other Dictionaries have treated Chymiſtry as a ſcience ſcarcely worth notice, but it certainly is a ſubject of the utmoſt importance, as it conveys ſuch eſſential information by furniſhing us with the nature and properties of bodies, without which the phyſician would find himſelf frequently baffled, and the naturaliſt would be loſt in the depths of error.

I have conſulted the beſt chymiſts both antient and modern, and I have borrowed from them whatever I conceived proper for my purpoſe, to which I have added my own obſervations; and I truſt the whole will meet with the approbation of the public. I acknowledge myſelf greatly indebted to the works of the ingenious and learned Dr. D'Fourcroy, of Paris, and the celebrated Dr. Black, of Edinburgh. As I have been ſolicitous to avoid errer, ſo have I been cautious not to incur the cenſure of having affected novelty; and, therefore, have receded no farther from the common ſyſtems than I think they have receded from truth.

I ſhall think myſelf ever happy to convey any kind of information to ſociety, whoſe well wiſher I have the honour to be,

ELIZABETH PLACE,
No. 4, LAMBETH.

A. G. SINCLAIR, M. D. M. A.

Chymical Apparatus — See System of Chymistry.

Fig. 1.

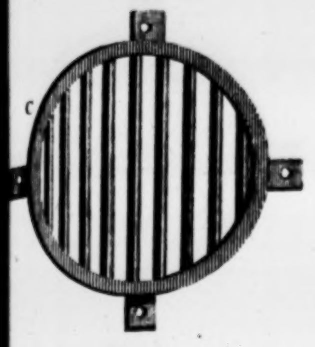
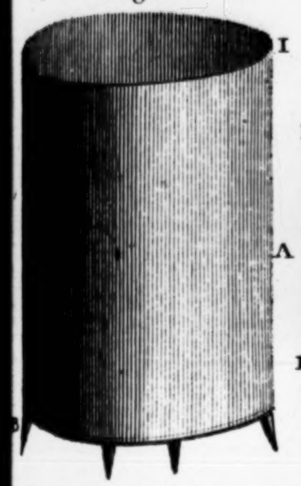


Fig. 1.



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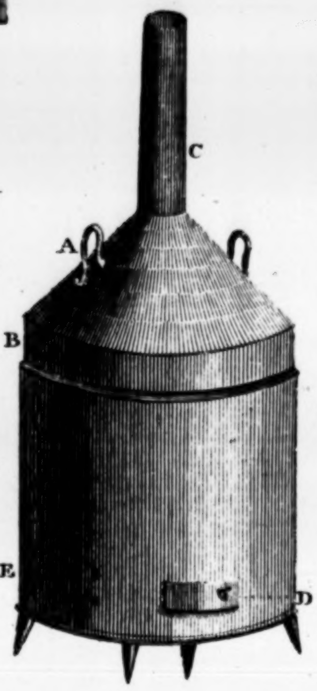

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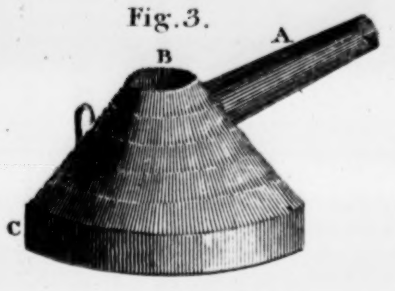

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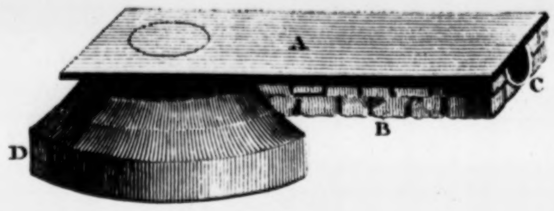

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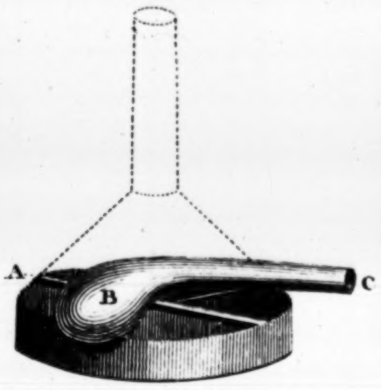

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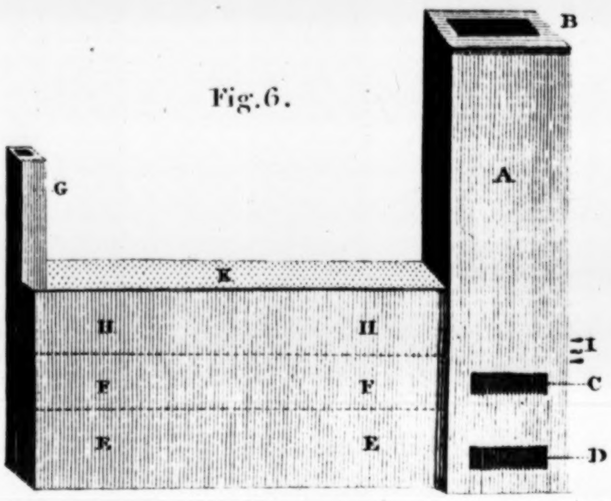
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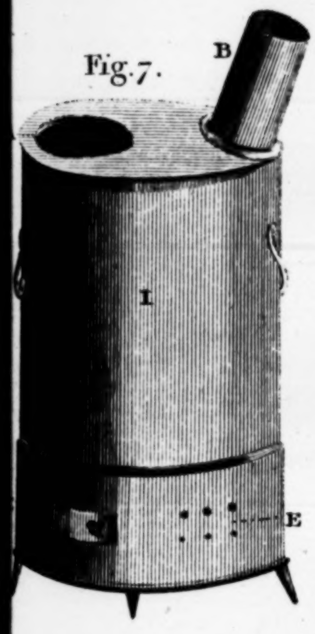

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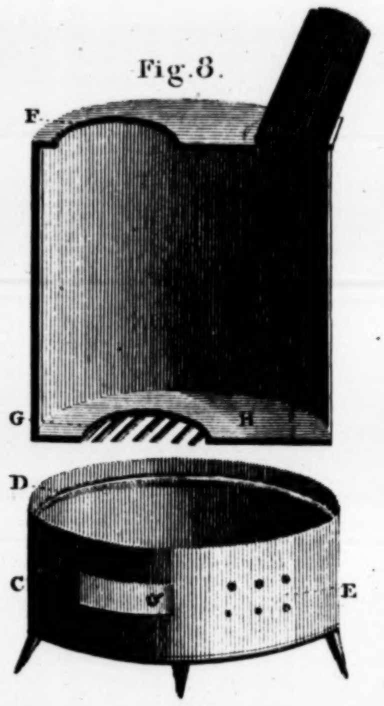

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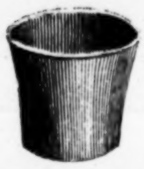

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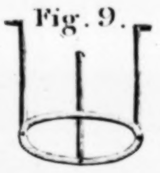

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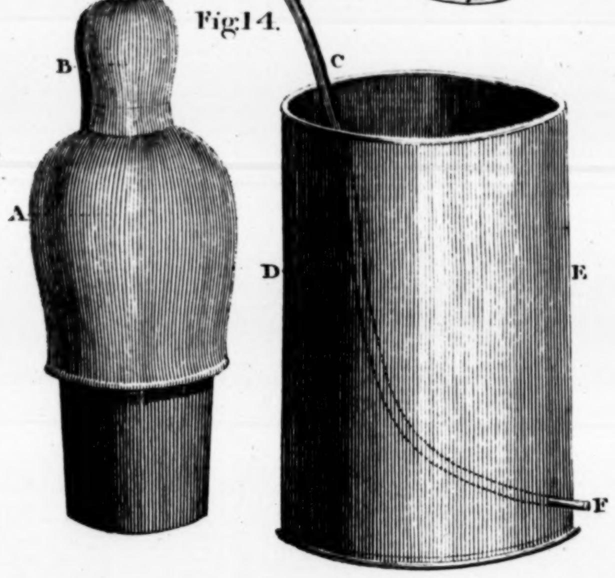

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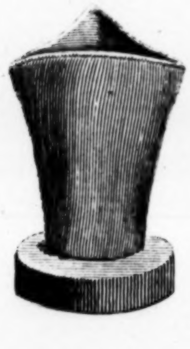

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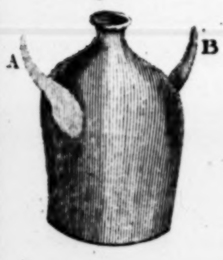
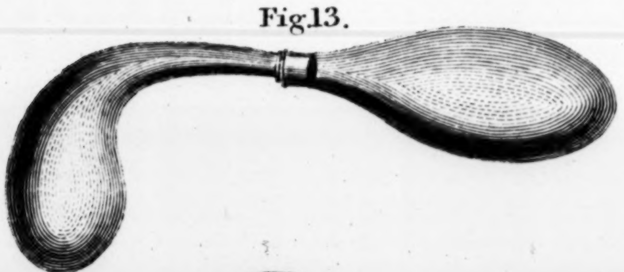


Fig. 13.



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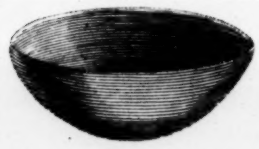

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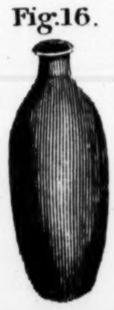

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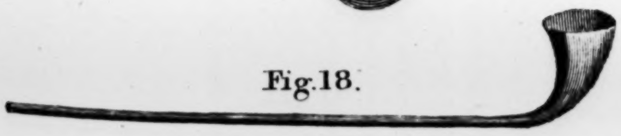

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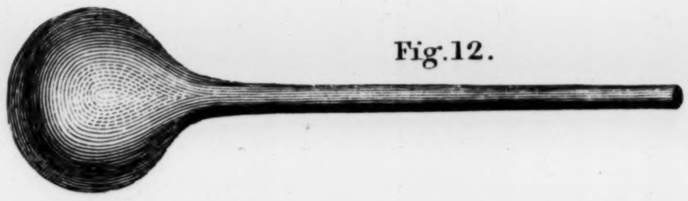

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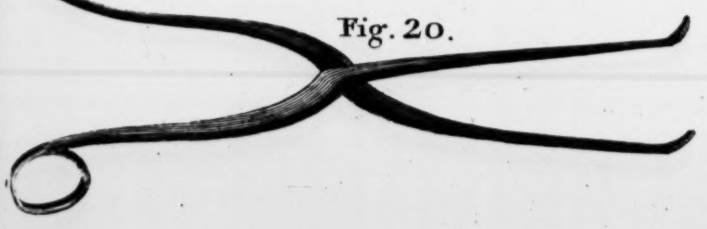

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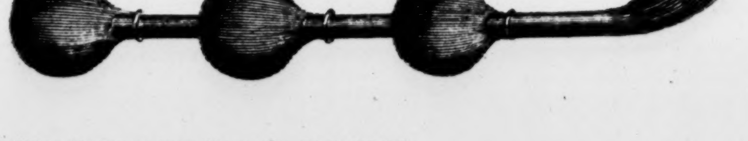

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CIBDELOSTRACIA, in natural hiſtory, the name of a genus of ſpars. The word is derived from κιϐδηλος, *fouled* or *adulterated with extraneous matter*, and οϛρακον, *a cruſt* or *ſhell*.

CIBOULS. See ONIONS.

CICADA, the balm cricket, in entomology, the name of a genus of inſects of the order of hemiptera, common in Italy, and ſome other parts of the world, but not found in England. It has large wings, and makes a loud noiſe, ſomething like that of a cricket.

CICADA *of North America*. There are two diſtinct ſpecies of cicadæ in North America. See a curious account of the largeſt ſort, by Mr. Collinſon, Phil. Tranſ. vol. liv. N° 10. an. 1764.

CICATRIX, in medicine, &c. a little ſeam, or elevation of callous fleſh, riſing on the ſkin, and remaining there after the healing of a wound, &c. ordinarily called a ſcar, or eſchar.

CICINDELA *Volans*. See GLOW-WORM.

CIDARIS, the mitre uſed by the Jewiſh high prieſts. Whenever there is mention of the high prieſt's mitre, the Hebrew word made uſe of to expreſs it is always *miznepheth*; and *mygbaoth* is uſed to ſignify the bonnet belonging to common prieſts.

It is to be obſerved, that the Hebrew prieſts never appeared in the temple without covering their heads. And ſtill at this day it is reckoned an incivility in the Eaſt, and a mark of contempt, for any man to pull off his hat or turban to another, or to ſhew his naked head before any one.

CIDARIS, in conchology. See TURBAN *Shell*.

CIDER, a briſk, tart, cool liquor, prepared from apples. For the method of making which ſee Syſtem of Huſbandry.

CIERGE, in conchology, a name given by the French to a ſea ſhell, a ſpecies of voluta. This is of the colour of common yellow wax, without any variegations on the ſurface; but when its rough coat is taken off, it makes a very different appearance, having the zones and colours of the onyx. It is preſerved in many cabinets, in this ſtate, under the name of the onyx ſhell.

CIGNE, in conchology, the ſwan ſhell, a name given by the French virtuoſi, to a ſpecies of *voluta*, which, beſide this name, is known by two other very different ones, cierge and onyx, and is taken by the generality of collectors for three different ſhells.

CILIA, in anatomy, the hairs wherewith the palpebræ, or eye lids, are fringed; eſpecially the upper, which are larger and ſtiffer than thoſe of the under.

Their uſe ſeems to be, to break the too fierce impreſſion of the rays of light; as alſo to keep out flies and moths, and other things floating in the air, which might annoy the eye.

CIMICIFUGA, in botany, a genus of the dioecia polyandria claſs, bearing male and female flowers; with a five leaved calyx, twenty ſtamina, but no corolla; the capſule is polyſpermous.

CINARA, artichoak, in botany. See ARTICHOAK.

CINCHONA, in botany, the name by which Linnæus calls the tree which produces the Jeſuits bark. This is a peculiar genus of plants, of the pentandria monogynia claſs. The ſeeds are very numerous, and are oblong, compreſſed, and ſurrounded with a foliaceous edge.

CINCLUS, in ornithology, a ſpecies of the tringa. It is given by ſome to the bird called in Engliſh the greater reed ſparrow, and by the generality of authors junco.

CINCLUS is alſo the name of a ſpecies of ſturnus or ſtarling.

CINCTURE, or CEINTURE, in architecture, a ring, or liſt, at the top and bottom of the ſhaft of a column; ſeparating the ſhaft, at one end, from the baſe: and at the other from the capital. See ARCHITECTURE, Plate I, and II.

CINERARIA, ſky flower, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs: with a naked receptacle; and ſingle, polyphyllous, equal calyx.

CINNA, in botany, a genus of the monandria digynia claſs. The calyx is a bivalve ſingle flowered glume; and the corolla is a bivalve glume. The ſeed is ſingle.

CINNABAR, in natural hiſtory, a mineral ſubſtance, red, heavy, and brilliant; found chiefly in the quickſilver mines, and being one of the ores of that mineral.

The word comes from κινναϐρα, *the ſmell of goats*; becauſe, ſays Matthiolus, in digging one kind of mineral cinnabar, it yields ſo ſtrong a ſcent, that the diggers are obliged to ſtop their noſtrils.

CINNAMON, an agreeable aromatic ſpice, brought from the Eaſt Indies; the whole taſte and flavour of which may be extracted by digeſtion with ſpirit of wine.

Cinnamon is allowed to be the bark of a tree growing in the iſland of Ceylon; and, as ſome ſay, alſo in Java, and in Malabar. It is a ſpecies of the bay.

By cinnamon is now underſtood that only produced in Ceylon; that of Java, Sumatra, and Malabar, is called *caſſia lignea*.

The chief virtue of the cinnamon tree is in its bark; which, when green, appears to be double: its exterior ſurface being browniſh, and the inner of the common cinnamon colour.

It is then diviſible into two barks of different colours; but theſe drying together become inſeparable, and paſs for the ſame bark; the browniſh colour changing in proportion as it dries.

Cinnamon, to be good, muſt have a briſk, agreeable taſte, and a bright brown colour. Its qualities are, to heat and dry; to promote the menſes, to fortify the ſpirits, and to help digeſtion: but its chief uſe, in medicine, is as an aſtringent; with which intention it is preſcribed in diarrhœas, and weakneſſes of the ſtomach.

We have lately been informed, by means of a letter from Mr. Wright to Sir Joſeph Banks, that the real cinnamon tree of ceylon is now ſucceſsfully cultivated in Jamaica, where they thrive luxuriantly with little trouble, and promiſe to be ſoon an uſeful addition to our commerce. This plant, with other valuable ones, was taken in a French ſhip by Admiral Rodney, and preſented to the aſſembly of that iſland.

CINNAMON *Water* is made by diſtilling the bark (firſt infuſed for ſome days) in ſpirits of wine, brandy, or white wine.

All the cinnamon conſumed in Europe comes from the Dutch; who have got the whole commerce thereof in their own hands, by becoming maſters of the iſle of Ceylon, and deſtroying all the other cinnamon trees about the kingdom of Cochin.

The Dutch who are the proprietors of Ceylon, are ſo jealous of this tree, which affords ſo valuable an article of their commerce, that the fruit or young plants are forbidden, by an order of the ſtates, to be ſent from thence, leſt other powers might avail themſelves of it.

Clove CINNAMON, is alſo the bark of a tree growing in Braſil and Madagaſcar; where it is known under the name of *ravendſara*. The Portugueſe call it *cravo de marenham*.

This bark, pulveriſed, is ſometimes ſubſtituted for real cloves, though far ſhort of them in reſpect of flavour.

Saſſafras is ſometimes alſo called cinnamon wood.

CINQUEFOIL, quinquefolium, or potentilla, in botany a genus of the icoſandria polygynia claſs.

There are many ſpecies of this genus preſerved in botanic gardens for variety, but they are not cultivated in other places for uſe or beauty.

The other ſorts are natives of different parts of Europe.

CINQUE PORTS, *Quinque Portus*, five havens that lie on the eaſt part of England, towards France; thus called by way of eminence, on account of their ſuperior importance; as having been thought by our kings to merit a particular regard, for their preſervation againſt invaſions.

Hence, they have a particular policy, and are governed by a keeper, with the title of lord warden of the Cinque ports; which office belongs to the conſtable of Dover: and their repreſentatives are called barons of the Cinque ports.

Camden tells, that William the Conqueror firſt appointed a warden of the Cinque ports; but king John firſt granted them their privileges; and that upon condition they ſhould provide eighty ſhips at their own charge for forty days, as often as the king ſhould have occaſion in the wars: he being then ſtreightened for a navy to recover Normandy.

There are alſo ſeveral towns adjoining, to which the privileges of the Cinque ports extend.

Theſe five ports are, Haſtings, Romney, Hythe, Dover, and Sandwich; to which Winchelſea and Rye have been ſince added. Thorn tells us, that Haſtings provided twenty one veſſels; and in each veſſel twenty one men. To this port belong Seaford, Pevenſey, Hedney, Winchelſea, Rye, Hamine, Wakeſbourn, Creneth, and Forthclipe. Romney provided five ſhips, and in each twenty four men. To this belong Bromhal, Lyde, Oſwarſtone, Dangemares, and Romenhal. Hythe furniſhed five ſhips, and in each twenty one ſeamen. To this belongs Weſtmeath. Dover, the ſame number as Haſtings. To this belong Folkſton, Feverſham, and Marge. Laſtly, Sandwich furniſhed the ſame with Hythe. To this belong Fordiwic, Reculver, Serre, and Deal.

CION, or CYON, in gardening, a young ſhoot, ſprout, or ſprig, put forth by a tree.

Grafting is performed by the application of the cion of one plant upon the ſtock of another.

CIPHER, or CYPHER, one of the numeral characters, or figures; formed thus, o.

The word cipher comes from the Hebrew כפך, *ſaphar*, *to number*.

The cipher of itſelf implies a privation of value; but when diſpoſed with other characters on the left thereof, in common arithmetic, it ſerves to augment each of their values by ten; and in decimal arithmetic, to leſſen the value of each figure to the right thereof, in the ſame proportion.

Theſe are frequently uſed on ſeals, coaches, and other moveables. Anciently, merchants and tradeſmen were not allowed to bear arms: in lieu thereof they bore their ciphers, or the initial letters of their names, artfully interwoven about a croſs; of which we have divers inſtances on tombs, &c.

CIPHERING, or CYPHERING, is properly uſed for the art of accompting; properly called arithmetic.

CIRCÆA, in botany. See *Enchanter's* NIGHT *Shade*.

CIRCLE, CIRCULUS, a plane figure, comprehended under one ſingle line, which returns into itſelf; having a point in the middle, from which all the lines drawn to its circumference are equal. See Syſtem of GEOMETRY.

Properly ſpeaking, it is the place included within the circumference, or periphery, that is the circle: though in the popular uſe of the word, circle is frequently uſed for the periphery alone.

The area of the circle is found by multiplying the periphery by the fourth part of the diameter; or half the periphery by half the diameter. The area is alſo had by finding a fourth proportional to 1,000,785, and the ſquare of the diameter: or, to 452,355, or to 14, 11, and the ſquare of the diameter.

Circles, and ſimilar figures inſcribed in them, are always as the ſquares of the diameters: ſo that they are in a duplicate ratio of their diameters; and therefore of their radii.

A circle is equal to a triangle whoſe baſe is equal to the periphery, and its altitude to the radius. Circles, therefore, are in a ratio compounded of the peripheries and the radii: but they are alſo in the duplicate ratio of their radii; therefore the peripheries are to each other as the radii.

CIRCUIT, in law, the journey or progreſs of the Judges, which they take twice every year through the ſeveral counties of England and Wales, to hold courts, and adminiſter juſtice, where recourſe cannot ſo well be had to the king's courts at Weſtminſter.

Theſe were firſt eſtabliſhed, with ſome little difference, by Henry II. and afterwards expreſsly ordained by *Magna Charta*.

England is divided into ſix circuits, viz. the Home circuit, Norfolk circuit, Midland circuit, Oxford circuit, Weſtern circuit, and Northern circuit. Two judges are appointed to each circuit. In Wales there are two circuits, North and South Wales.

In Scotland, the judges of the ſupreme criminal court, or court of juſticiary, are divided into three ſeparate courts, conſiſting of two judges each; and the kingdom into as many diſtricts. In certain boroughs of every diſtrict, each of theſe courts by rotation are obliged to hold two courts in the year, in ſpring and autumn; which are called circuit-courts.

CIRCULAR, in a general ſenſe, any thing that is deſcribed, or moved in a round, as the circumference of a circle, or ſurface of a globe.

CIRCULATION, the act of moving round, or in a circle. We ſay, the circulation of the blood; the circulation of the ſap; of the ſpirits, &c.

CIRCULATION *of the Blood*. See BLOOD. Alſo Part V. Sect. XXI. ANATOMY.

CIRCULATION *of the Sap of Vegetables*, is a natural motion of the nutritious juice of plants, ſuppoſed to be conveyed from the root to the extreme parts, and thence back again to the root.

The experiments of ſeveral naturaliſts and gardeners, ſeem to prove a circulation in the body of plants, by veins and arteries, analagous to that in animals.

The ingenious Dr. Hales has clearly ſhewn, by a variety of experiments and obſervations, that there is no circulation in vegetables analogous to that of the blood in animals. The motion of the ſap is ſolely occaſioned by the ſtrong attraction of the capillary ſap veſſels, aſſiſted by the vibrations reſulting from the warmth of the ſun; in conſequence of which the ſap is carried up to the top of the talleſt trees, and perſpired off through the leaves. The aſcent of the ſap is principally promoted by the plentiful perſpiration of the leaves; and this power, he obſerves, does not ſeem well adapted to make the ſap deſcend from the tops of vegetables, by different veſſels, to the root. He allows, indeed, that the ſap has an alternate, progreſſive, and receding motion, occaſioned by the interchanges of day and night, warmth and cold, moiſture and dryneſs. That the ſap does not deſcend between the bark and wood, he concludes from the experiment of taking off the bark of a tree, about three or four inches in breadth quite round; the conſequence of which will be that the bleeding of the tree above this part will much abate; whereas it ought to have the contrary effect, by intercepting the courſe of the refluent ſap, if it deſcended by the bark. But this experiment confirms the opinion which he has adopted, that the ſap aſcends between the bark and the wood, by the vigorous operation of the perſpiring leaves, and attracting capillaries.

CIRCULATION *of the Spirits*, or *Nervous Juice*. That the ſpirits circulate, is evinced, in the ſame manner as ſome authors chooſe to prove the circulation of the blood, viz. that as the heart drives out, every hour, three or four thouſand ounces of blood; whereas, ordinarily, there is not above two thouſand in the whole body: there is a neceſſity for the blood, driven out, to return to the heart, in order to ſupply a fund to be expelled.

Subterranean CIRCULATION. Dr. Plott is one of the many authors who have argued for a ſubterranean circulation of water, by means of which many ſprings and rivers are ſupplied with that water which they give again to the ſea. It is probable indeed, that many of the ſmaller ſprings are ſupplied by waters only where the country and ſituation are favourable: but the larger rivers, and the ſprings which ſupply them, muſt have their origin from ſuch a ſubterranean circulation, ſince all the water that falls in a year in the whole earth, is not one five hundredth part the quantity of that diſcharged into the ſea at the mouths of rivers, as appears by careful and moderate calculations.

CIRCULATION, in chymiſtry, is an operation whereby the ſame vapour, raiſed by fire, falls back, to be returned and diſtilled ſeveral times, and thus reduced into its moſt ſubtil parts. Circulation is performed by diſpoſing the liquor in a ſingle veſſel, ſtopped at top, called a pelican; or in a double veſſel, conſiſting of two pieces, luted on each other; the lower to contain the liquor, and its vapours.

It is performed either by the heat of a lamp, or that of aſhes, or of ſand moderately hot, or in dung, or by the ſun. It uſually demands a continued heat of ſeveral days, ſometimes of ſeveral weeks, or even ſeveral months. By circulation, the fineſt part of the fluid mounts to the top of the veſſel; and, finding no iſſue there falls back again, and rejoins the matter left behind at the bottom, whence it aroſe: and thus, by continuing to riſe and fall, alternately, in the veſſel, there is effected a kind of circulation, or remixtion, of the ſpirituous parts with the groſs ones; whereby the former are rendered finer, and more ſubtil, and are better diſpoſed to exert their activity, when ſeparated from the latter.

CIRCULATORY, *Circulatorium*, in chymiſtry, the veſſel wherein a fluid is put, to undergo the proceſs of circulation.

There are two kinds of circulatories; the diota, or double veſſel; and the pelican.

CIRCULUS, among chymiſts, is a round iron inſtrument, uſed in cutting off the necks of glaſs veſſels; which they effect thus. The inſtrument, being heated, is applied to the glaſs veſſels, and there kept till the latter grow hot: then, by a few drops of cold water, or a cold blaſt thereon, it flies evenly and regularly off. Thus they cut off the necks of retorts, or cucurbits.

There is another method of doing the ſame; viz. by tying a thread, firſt dipped in oil of turpentine, round the place where the ſection is to be; and then ſetting fire to the thread.

This done, ſome cold water being ſprinkled on the place, the glaſs will be cracked through preciſely where the thread was tied.

CIRCUMAMBIENT, an appellation given to a thing that ſurrounds another on all ſides; chiefly uſed in ſpeaking of the air.

CIRCUMCISION, the act of cutting off the prepuce; or a ceremony, in the Jewiſh and Mahometan religions, wherein they cut away the fore-ſkin of the males who are to profeſs the one, or the other law.

Circumciſion commenced in the time of Abraham; and was, as it were, the ſeal of a covenant ſtipulated between God and him: it was in the year of the world 2178, that Abraham, by divine appointment, circumciſed himſelf, and all the males of his family: from which time it became an hereditary practice among his deſcendants.

The practice of circumciſion, among the Hebrews, differed very conſiderably from that of the Egyptians. Among the firſt, it was a ceremony of religion, and was performed on the eighth day after the birth of the child; among the latter, it was a point of mere decency and cleanlineſs; and, as ſome will have it, of phyſical neceſſity; and was not performed till the thirteenth year; and then on girls, as well as boys.

The Perſians circumciſe their boys at thirteen years, and their girls from nine to fifteen. Thoſe of Madagaſcar cut off the fleſh at three ſeveral times; and the moſt zealous of the relations preſent catches hold of the preputium, and ſwallows it.

There is a kind of circumciſion practiſed at Otaheite, one of the newly diſcovered iſlands in the South Seas. The operation is performed by a prieſt, and conſiſts in ſlitting the prepuce through the upper part, to prevent its contracting over the glans. The practice ſeems to have taken its riſe from motives of cleanlineſs. Hawkeſworth's Voyages, Vol. II. p. 241.

Circumciſion is alſo practiſed on women, by cutting off the fore-ſkin of the clytoris, which bears a near reſemblance and analogy to the preputium of the male penis. Strabo ſays, the Egyptian women were circumciſed; Belon ſays the ſame of the Cophtæ; and P. Jovius and Munſter of the ſubjects of Preſter John.

CIRCUMCISION is alſo the name of a feaſt celebrated on the firſt of January, in commemoration of the circumciſion of our Saviour.

CIRCUMFERENCE, in a general ſenſe, denotes the line or lines bounding a plane figure. However, it is generally uſed in a more limited ſenſe, for the curve line which bounds a circle, and otherwiſe called a periphery; the boundary of a right-lined figure being expreſſed by the term perimeter.

CIRCUMFERENTOR, an inſtrument uſed in ſurveying, to take angles by. See SURVEYING.

CIRCUMFLEX, in grammar, an accent, ſerving to note, or diſtinguiſh, a ſyllable of an intermediate ſound between acute and grave; and generally ſomewhat long.

CIRCUMGYRATION, denotes the whirling motion of any body round a centre: ſuch is that of the planets round the ſun.

CIRCUMLOCUTION, a paraphraſtical method of expreſſing one's thoughts, or ſaying that in many words which might have been ſaid in few.

CIRCUMPOLAR *Stars*, an appellation given to thoſe ſtars, which, by reaſon of their vicinity to the pole, move round it without ſetting.

CIRCUMSCRIBED, in geometry, is ſaid of a figure which is drawn round another figure, ſo that all its ſides or planes touch the inſcribed figure.

CIRCUMSCRIBED, in a general ſenſe, denotes, the being limited in point of ſpace, ſituation or circumſtance in life.

CIRCUMSCRIBING, in geometry, denotes the deſcribing a polygonous figure about a circle, in ſuch manner, as that all its ſides are tangents to the circumference.

The term is ſometimes alſo uſed for the deſcribing of a circle about a polygon; ſo, as that each ſide is a chord. But in this caſe, we more uſually ſay, the polygon is inſcribed, than the circle circumſcribed.

CIRCUMSCRIPTION, in natural philoſophy, the termination, bounds, or limits of any natural body.

CIRCUMSTANCE, a particularity which, though not eſſential to any action, yet doth ſome way affect it.

CIRCUMSTANTIAL *Evidence*, in law, or the *Doctrine of Preſumption*, takes place next to poſitive proof.

CIRCUMVALLATION, in fortification, a line or trench, with a parapet, thrown up by the beſiegers, encompaſſing all their camp, to defend it againſt any army that may attempt to relieve the place. See Syſtem of FORTIFICATION.

CIRCUMVOLUTIONS, in architecture, the turns of the ſpiral line of the Ionic volute.

CIRCUS, in antiquity, a great building of a round or oval figure, erected by the ancients, to exhibit ſhews to the people.

The Roman circus was a large, oblong edifice, arched at one end, encompaſſed with porticos, and furniſhed with two rows of ſeats, placed aſcending over each other. In the middle was a kind of foot bank, or eminence, with obeliſks, ſtatues, and poſts at each end. This ſerved them for the courſes of their bigæ and quadrigæ.

Thoſe that have meaſured the circus ſay, that it was 2187 feet long, and 960 broad; ſo that it was the greateſt building in Rome: ſome ſay it would contain 150,000 people, others 260,000, or 300,000.

CIRRI, among botaniſts, fine ſtrings of thread like filaments, by which ſome plants faſten themſelves to walls, trees, &c. ſuch are thoſe of ivy.

CIRRI, in ichthyology, certain oblong and ſoft appendages, not unlike little worms, hanging from the under jaws or mouths of ſome fiſhes: theſe cirri, commonly tranſlated beards, afford marks to diſtinguiſh the different ſpecies of the fiſh, on which they are found.

CIRRIS, in ornithology, the name of a ſmall ſpecies of heron, called by ſome the ardea hæmatopus, or the red-legged heron. Its legs and feet are very beautifully red.

CIRRUS, among botaniſts, expreſſes the little fibres which plants ſend out from their ſtalks, and by which they are attached to other bodies.

CISSAMPELOS, in botany, a genus of the dioecia monadelphia claſs. There are two ſpecies which grow naturally in the warm parts of America.

CISSOID, in geometry, an algebraic curve, firſt invented by Diocles; whence it is peculiarly called the ciſſoid of Diocles. See Geometry.

CISTERCIANS, in church hiſtory, a religious order founded in the 11th century by St. Robert, a benedictine. They became ſo powerful, that they governed almoſt all Europe, both in ſpirituals and temporals. Cardinal de Vitri deſcribing their obſervances, ſays, they neither wore ſkins nor ſhirts; nor ever eat fleſh, except in ſickneſs; and abſtained from fiſh, eggs, milk and cheeſe.

CISTERN, denotes a ſubterraneous reſervoir of rain water; or a veſſel ſerving as a receptacle for rain or other water for the neceſſary uſes of a family.

CISTUS, the rock roſe; a genus of the monogynia order, belonging to the polyandria claſs of plants. There are 37 ſpecies, moſt of them natives of the ſouthern parts of Europe, but hardy enough to bear the open air in this country. They are beautiful evergreen ſhrubs, generally very branchy quite from the bottom, and forming diffuſed heads. They are very ornamental in gardens, not only as evergreens, making a fine variety at all ſeaſons with their leaves of different figures, ſizes and ſhades of green and white, but alſo as firſt-rate flowering ſhrubs, being very profuſe in moſt elegant flowers of white, purple, and yellow colours. Theſe flowers only laſt for one day; but there is a continual ſucceſſion of new ones for a month or ſix weeks on the ſame plant; and when there are different ſpecies, they will exhibit a conſtant bloom for near three months. They are propagated either by ſeeds or cuttings, and thrive beſt in a dry ſoil. Their proper ſituation in ſhrubbery works ſhould be towards the front of the clumps and other compartments, in aſſemblage with the choiceſt ſhrubs of ſimilar growth, diſpoſing them ſo as to make a variety, and to have ſhelter from the other plants; but they ought by no means to be crowded.

CITADEL, a place fortified with four, five, or ſix baſtions, built on a convenient ground near a city, that it may command it in caſe of a rebellion. The city therefore is not fortified on the part oppoſite to the citadel, though the citadel is againſt the city.

CITATION, in eccleſiaſtical courts, a ſummons to appear before an accleſiaſtical judge, on ſome affair relating to the church.

The word comes from *cito*, of *cico*, *I ſtir up*.

In the civil and ordinary courts, it is called ſummoning.

CITATION is alſo uſed in ſpeaking of military and monaſtic, as well as eccleſiaſtical courts. Such an heretic was cited to Rome; to a general council, &c.

CITATION is alſo an allegation, or quotation of ſome law, authority, or paſſage.

CITELLUS, in tetrapodology, a ſmall animal of the mouſe kind, which lives in holes of the earth. Its body is ſhaped like that of the common weaſel, very long and thin, but has no external ears. The tail is alſo long and thin. They are found in very cold climates, and in Bohemia, Auſtria, and Hungary.

CITHAREXYLON, in botany, fiddle wood, a genus of the didynamia angioſpermia claſs: There are two ſpecies, which are natives of the Weſt Indies, and grow to be very large trees greatly valued for durability in building; whence the French gave them the name of fidelle wood, which the Engliſh have rendered fiddle wood.

CITHARUS, in ichthiology, a ſpecies of fiſh, which is covered with rough ſcales. It is called in Engliſh a dab.

CITIZEN, or CITTIZEN, a native or inhabitant of a city, veſted with the freedom and rights thereof.

The word comes from *civis*; which authors derive from *ceo*, becauſe the citizens live together; or rather from *cieo*, I call together.

CITRIL, in ornithology, a bird common in Italy, and kept in cages for its beauty and fine notes.

CITRINELLA, in ornithology, the name of a ſmall bird, common in Italy, very much reſembling our common linnet in ſhape It ſings very finely, and is kept in cages in many parts of Italy.

CITRINUS, in natural hiſtory, the name of a peculiar ſpecies of ſprig cryſtal, which is of a beautiful yellow. It is very plentiful in the Weſt Indies, and is found in ſome parts of Bohemia. Our jewellers often cut ſtones for rings out of it, which are generally miſtaken for topazes.

CITRON *Tree*, citrus, in botany, a genus of the polyadelphia icoſandria claſs: there are ſeveral varieties of this fruit, with which the Engliſh gardens have been ſupplied from Genoa, where is the great nurſery which ſupplies the ſeveral parts of Europe with this, as well as orange and lemon trees.

Their culture and management is the ſame with that of the orange; but they are tenderer, and ſhould have a warmer ſituation in winter, otherwiſe they are ſubject to caſt their fruit; they ſhould alſo continue a little longer in the houſe in ſpring, and be carried ſooner into it in autumn, and have a warmer and better defended ſituation in ſummer.

The citron is an agreeable fruit, in colour, taſte, ſmell, &c. reſembling a lemon; and ſerving, like that, to cool, and quench thirſt.

The citron is diſtinguiſhed from the lemon, in that it is bigger and its pulp firmer; its ſmell briſker, and colour higher.

The diſtillers, perfumers, confectioners, &c. apply citrons to various purpoſes.

In Italy they make a liquid with the ſmall citrons, which they preſerve entire; and a dry ſweetmeat with the large ones, which they preſerve in quarters.

CITRON *Water*, a well known ſtrong water, or cordial.

CITRON *Wood*, the wood of an American tree, called by the natives candle wood, becauſe being cut into ſplinters, it burns like a candle. The tree is frequent in the Leeward iſlands, and grows to a conſiderable ſize.

CITY, a large town incloſed with a wall.

The term city had its riſe, among us, ſince the Conqueſt; for in the time of the Saxons there were no cities, but all great towns were called burghs. Thus, London was called Lunden Burgh. And for a long time after the Conqueſt, city and burgh were uſed promiſcuouſly.

CITY, *Civitas*, or *Urbs*, a large populous town, capital of ſome country, province, or diſtrict, and the ſee of a biſhop.

Town and city are frequently uſed in a ſynonymous ſenſe; however, cuſtom ſeems to have appropriated the term city to ſuch towns as are, or formerly were, the ſees of a biſhop: hence it is, that Edinburgh, Glaſgow, &c. are ſtill called cities, though they are no longer the ſees of biſhops, ſince the eſtabliſhment of preſbytery in Scotland.

Many cauſes concur to render cities more unhealthy than other places; as narrow and dirty ſtreets, crouded gaols and hoſpitals, burials within the body of the place, and the like. To the ſtagnation of air, and putrid effluvia, occaſioned by theſe means, are owing a multitude of malignant diſorders, not to be remedied but by a purer air and a country life.

Cities and villages held formerly, in the time of the feudal government, of ſome great lord, on whom they depended for protection, and to whoſe arbitrary juriſdiction they were ſubject. But the freedom of cities was firſt eſtabliſhed in Italy towards the beginning of the fourth century, in conſequence of the prevalence of commerce: and it was thence introduced into France and other countries of Europe. And this eſtabliſhment of communities, ſays Dr. Robertſon, contributed more, perhaps, than any other cauſe to introduce regular government, police, and arts, and to diffuſe them over Europe.

CITY, is particularly uſed to expreſs the heart of the place. At Paris they have the city and the univerſity; at London we have the city and the ſuburbs.

CIVET, a kind of perfume, bearing the name of the animal whence it is taken, and to which it is peculiar.

The civet, or civet cat, zibeta, is a little animal, in ſhape reſembling the wolf or dog; its ſnout is long and ſmall; its ears ſmall and roundiſh; its hair is like thoſe of the badger, but very ſoft; its feet ſmall and legs ſhort.

Good civet is of a clear, yellowiſh, or browniſh colour; not fluid nor hard, but about the conſiſtence of butter or honey, and uniform throughout; of a very ſtrong ſmell, quite offenſive when undiluted, but agreeable when only a ſmall portion of civet is mixed with a large one of other ſubſtances. It unites eaſily with oils both expreſſed and diſtilled, but not at all with water, or ſpirit of wine. The Italians make it an ingredient in perfumed oils, and thus obtain the whole of its ſcent; for oils wholly diſſolve the ſubſtance of it. It is very rare, however, to meet with civet unadulterated. A great trade of civet is carried on at Calicut, Baſſora, and other parts of the Indies, and in Africa, where the animal that produces the perfume is found. Live civet cats are to be ſeen alſo in France and Holland. The French keep them only as a rarity; but the Dutch, who keep a great number, draw the civet from them for ſale. It is moſtly uſed by perfumers.

CIVIL, in its general ſenſe, denotes ſomething that regards the policy, public good, or peace of the citizens, or ſubjects of a ſtate.

In this ſenſe, we ſay, civil government; civil law; civil rights; civil war, &c.

Civil *Liſt*, the money allotted for the ſupport of the king's houſhold, and for defraying certain neceſſary charges of government.

Civil *State*, conſiſts of the nobility and commonalty, excluſive of the clergy, and of the military and maritime orders.

Civil *War*, a war between people of the ſame ſtate, or the citizens of the ſame city.

CIVILISATION, a law, or judgment, which renders a criminal proceſs civil.

Civiliſation is performed by turning the information into an inqueſt, or vice verſa.

CIVILITY, good nature, or politeneſs in behaviour.

CLAIM, in law, a challenge of intereſt in any thing that is in poſſeſſion of another.

There are divers ſorts of claims; as claim by charter, by decent, by acquiſition, &c.

CLAIR-OBSCURE, or Chiaro-Scuro, in painting, the art of diſtributing to advantage the lights and ſhadows of a piece; both with regard to the eaſing of the eye, and heightening the effect of the whole compoſition.

Thus, when a painter gives his figures a ſtrong relief, by the managment of his lights and ſhadows, he is ſaid to underſtand the clair-obſcure.

CLAMEA *Admittenda in Itinere per Attornatum*, is a writ whereby the king commands the juſtice in eyre to admit a perſon's claim by an attorney, who, being employed in the king's ſervice, cannot come in perſon.

CLAMP, a piece of wood joined to another.

CLAMPING, in joinery, is the fitting a piece of board with the grain, to another piece of board croſs the grain. Thus the ends of tables are commonly clamped, to prevent their warping.

CLANDESTINE, any thing done ſecretly, and without the knowledge of ſome of the parties intereſted in it; or without the proper ſolemnities.

The word comes from the prepoſition *clam*, of κλειω, *claudo, I ſhut*; or κλεμμα, *furtum, theft*.

Thus, a marriage is ſaid to be clandeſtine, when performed without the publication of banns, the conſent of parents, or the knowledge of the miniſter.

CLAP, in medicine, the firſt ſtage, or ſtate, of the venereal diſeaſe, called alſo a gonorrhoea. See Syſtem of Surgery.

CLARENCIEUX, the ſecond king at arms; thus called from the duke of Clarence, to whom he firſt belonged.

His office is to marſhal, and diſpoſe of, the funerals of all the lower nobility, as baronets, and knights: whence he is alſo called Surroy, or Southroy, in contradiſtinction to Norroy.

CLARENDON, *Conſtitutions of*, certain conſtitutions made in the reign of Henry II. A. D. 1164, in a parliament held at Clarendon: whereby the king checked the power of the Pope and his clergy, and greatly narrowed the total exemption they claimed from ſecular juriſdiction.

CLARET, the name of a French wine.

CLARIAS, or Clarias *Nilotica*, in ichthyology, the name of a fiſh of the ſilurus kind, common in the Nile.

CLARIFICATION, in chymiſtry, the act of clearing, or fining of liquors from their groſſer parts.

Clarification is performed by decantation, ebullition, deſpumation, and colature, or filtration.

The term is chiefly applied to juices, decoctions, and ſyrups, which are clarified. See the Art of Confectionary.

The ſubſtances uſually employed for clarifying liquors, are whites of eggs, blood, and iſinglaſs. The two firſt are uſed for ſuch liquors as are clarified whilſt boiling hot; the laſt for thoſe which are clarified in the cold, ſuch as wines, &c. The whites of eggs are beat up into a froth, and mixed with the liquor, upon which they unite with and entangle the impure matters that floated in it; and preſently growing hard, by the heat, carry them up to the ſurface in form of a ſcum no longer diſſoluble in the liquid. Blood operates in the ſame manner, and is chiefly uſed in purifying the brine from which ſalt is made. Great quantities of iſinglaſs are conſumed for fining turbid wines. For this purpoſe ſome throw an entire piece, about a quarter of an ounce, into a wine caſk; by degrees the glue diſſolves, and forms a ſkin upon the ſurface, which at length ſubſiding, carries down with it the feculent matter which floated in the wine. Others previouſly diſſolve the iſinglaſs; and having boiled it down to a ſlimy conſiſtence, mix it with the liquor, roll the caſk ſtrongly about, and then ſuffer it to ſtand to ſettle.

CLARISSMI, among the Romans, a title of honour belonging to the third rank of nobility under the emperors.

CLARY, ſclared, in botany; Linnæus has joined this genus to the ſalvia or ſage. There are ſixteen ſpecies, natives of different places.

Clary is accounted to be of a warming and drying nature. Infuſed in wine, it comforts a cold windy ſtomach; it is particularly commended to ſtrengthen the kidneys, to relieve a fluor albus, and invigorate a cold relaxed womb.

Clary *Water*, a ſpirit drawn from an infuſion of the herb clary in ſpirit of wine; being a very pleaſant and excellent cordial.

CLASMIUM, in natural hiſtory, the name of a genus of foſſils of the claſs of the gypſums.

The word is derived from κλασμος, *a fragment*, or *ſmall particle*, from the flaky ſmall particles of which theſe bodies are compoſed. It neither gives fire with ſteel, nor ferments with aqua fortis; but calcines readily in the fire, and affords a very valuable plaſter of Paris.

CLASPERS, in botany, are tendrils, threads, or ligaments, of a middle nature between thoſe of a root, and trunk; whereby ſhrubs, and other leſſer plants, take hold of trees, or other things near them, for their ſupport, &c.

The wiſdom of the Creator is very conſpicuous, in this proviſion for ſome ſpecies of plants, which need it, as ivy, vines, bryony, &c.

CLASS, *Claſſis*, a diſtribution of perſons or things, ranged according to their merit, value, or nature. The word comes from claſſis, derived by ſome from the Greek καλεω, *congrego, convoco*; a claſs being nothing but a multitude, aſſembled apart.

Class, in natural hiſtory, is ſubdivided into quadrupeds, birds, fiſhes, &c. which are again ſubdivided into ſerieſes or orders; and theſe laſt into genera. See Botany.

Class is alſo uſed in ſchools, in a ſynonymous ſenſe with form for a number of boys all learning the ſame thing.

The diſtributing boys into claſſes, contributes not only to raiſe an emulation among them, but is of great advantage to the maſter; who, by this means, can teach double the number it would otherwiſe be poſſible for him to do.

CLASSIC, or Classical, an epithet chiefly applied to authors read in the claſſes at ſchools, and who are in great authority there. Thus Ariſtotle is a claſſic author in philoſophy; Aquinas, in ſchool divinity; Cicero and Virgil in the humanities, &c.

Classical learning may be underſtood to ſignify ſuch an intimacy with the beſt Greek and Latin writers, as not only enables the reader to ſee and admire the beauty of their ſeveral compoſitions, but to imitate their manner of writing, to tranſcribe their ſpirit and eloquence, and make their diction and their ſentiment his own.

CLATHRUS, in botany, a name given by Micheli, and continued by Linnæus, to a genus of fungi in the claſs of cryptogamia.

Clathrus is alſo the name of a ſpecies of turbo, in the order of teſtacea, belonging to the claſs of worms.

CLATTE, in heraldry, an appellation given to irregular lines, not reducible to thoſe commonly uſed.

CLAVARIA, in botany, the name given by Vaillant, and continued by Linnæus, to a genus of fungi in the claſs of cryptogamia.

CLAVICULÆ, collar bones, in anatomy, two ſmall bones, ſituate at the baſis of the neck, and top of the breaſt. See Plate I. Figure I.

They are about half a foot long, of the thickneſs of a finger, and a little bent at each end, and that different ways, ſomewhat like the letter S; and are thus called, as being the keys, *claves*, of the thorax.

CLAVIS, properly ſignifies a key; and is figuratively uſed in Engliſh, to denote an explanation of ſome obſcure paſſages in any book or writing.

CLAUSE, in grammar, a member of a period, or ſentence.

Clause alſo denotes an article, or particular ſtipulation, in a contract, a charge, or condition in a teſtament, &c. We ſay, a derogatory clauſe, a penal clauſe, ſaving clauſe, codicillary clauſe, &c.

CLAUSUM *Fregit*, an action of treſpaſs; thus called, becauſe the writ demands the perſon ſummoned to anſwer to *quare clauſum fregit*, of the plaintiff, why he committed ſuch a treſpaſs?

CLAVUS, in medicine, a name phyſicians give to a ſhooting pain in the head, commonly ſituate a little above the eyes, viz. on the *ſinus frontalis*.

Clavus *Hyſtericus*, in medicine, denotes a peculiar ſpecies of head-ach, more frequently attacking women than men, and with them uſually owing its origin to a ſuppreſſion of the menſtrual diſcharges. For Method of Cure, ſee Syſtem of Medicine.

Clavus is alſo uſed in medicine, for a callus formed on the toes; popularly called a corn.

Clavi ariſe from a too great compreſſion of the cutis; which by this means hardens, and forms itſelf into a knot.

CLAWS, among naturaliſts, denotes the ſharp pointed nails, with which the feet of certain quadrupeds and birds are furniſhed.

CLAY, *Argilla*, in natural hiſtory, a ſoft viſcous earth, found in various places, and uſed for various purpoſes; of ſeveral kinds and properties.

The diſtinguiſhing characters of earths principally uſed in the potter's trade are theſe: they are firmly coherent, weighty and compact; ſtiff, viſcid and ductile to a great degree while moiſt; ſmooth to the touch, and unctuous, not eaſily breaking between the fingers, nor readily diffuſible in water, and when mixed in it, not readily ſubſiding from it. It hardens by fire into a kind of ſtrong ſubſtance. It is not known that any kind of earth ſhrinks ſo much as clay, and hence the purity of clay may be judged from the degree of its contraction.

Such as are curious to know more of this ſubject may be fully gratified by conſulting M. Macquer's Mem. on Clays, in the Mem. of the A. D. S. in 1762.

CLAYES, in fortification, are wattles made with ſtakes, interwoven with oziers, &c. to cover lodgments.

CLAYTONIA, in botany, a genus of the pentandria monogynia claſs. There are two ſpecies, natives of America.

CLEAR, in building, is ſometimes uſed amongſt workmen for the inſide of a houſe, &c.

CLEATS, in ſhip building, are pieces of wood of different ſhapes, uſed occaſionally to faſten ropes upon, in a ſhip: ſome have one arm, ſome two, and others have no arms, but are hollowed in the middle, and nailed to the deck or ſides of the ſhip.

CLEAVERS, **Clivers**, or **Goose** *Graſs*, aparine, in botany, the name of a genus of plants.

Linnæus has claſſed the gooſe graſs with ſmooth ſeed under gallum, and the low tailing trailing gooſe graſs with a blue flower under valantia. It is very common on banks under hedges.

CLECHE, in heraldry, a kind of croſs, charged with another croſs of the ſame figure, but of the colour of the field.

CLEDGE, a name given by miners to the upper part of the ſtratum of fuller's earth. See Fuller's *Earth*.

CLEF, or **Cliff**, in muſic, a mark at the beginning of the lines of a ſong, which ſhews the tone, or key, in which the piece is to begin.

It is called clef, or key, becauſe hereby we know the names of all the other lines, and conſequently the quantity of every degree or interval: but becauſe every note in the octave is called a key, there is a letter marked for diſtinction ſake, denominated the ſigned clef; and by this key is meant the principal note of a ſong, in which the melody cloſes See Syſtem of Music.

CLEFTS, or **Cracks**, in the heels of horſes, are occaſioned by hard labour, unwholeſome food, want of exerciſe, and waſhing them when hot. They are cured by cutting off the hair, and anointing with the oil of hempſeed, or linſeed, and keeping them clean.

CLEOME, in botany, a genus of the ſiliquoſa, order, belonging to the tetradynamia claſs of plants. There are 15 ſpecies; all of them, except two, natives of warm climates.

CLEPSYDRA, a kind of water cock, or an hour glaſs ſerving to meaſure time by the fall of a certain quantity of water.

Clepsydra is alſo uſed for an hour glaſs of ſand.

CLERGY, *Clerus*, κληρος, a general name given to the body of eccleſiaſtics of the Chriſtian church, in contradiſtinction to the laity.

The diſtinction of Chriſtians into clergy and laity was derived from the Jewiſh church, and adopted into the Chriſtian by the apoſtles themſelves: whenever any number of converts were made, as ſoon as they were capable of being formed into a congregation or church, a biſhop or preſbyter, with a deacon, were ordained to miniſter to them. Of the biſhops, prieſts, and deacons, the clergy originally conſiſted; but in the third century, many inferior orders were appointed, as ſubſervient to the office of deacon, ſuch as ſubdeacons, acoluthiſts, readers, &c.

The clergy of the church of Rome are diſtinguiſhed into regular and ſecular: the regular clergy conſiſts of thoſe monks or religious, who have taken upon them holy orders of the prieſthood, in their reſpective monaſteries. The ſecular clergy are thoſe which are not of any religious order, and have the care and direction of pariſhes. The proteſtant clergy are all ſeculars.

Clergy, *Privilegium Clericale*, or *Benefit of Clergy*, denotes an ancient privilege of the church, which was formerly admitted, even in caſes of murder; but the ancient courſe of the law is much altered upon this head. By the ſtatutes of 18 Eliz. cap. vii. clerks are no more committed to their ordinary to be purged; but every man, to whom the benefit of clergy is granted, though not in orders, is put to read at the bar, after he is found guilty and convicted of ſuch felony, and ſo burnt on the hand, and ſet free for the firſt time, if the ordinary or deputy ſtanding by do ſay, *legit ut clericus*, otherwiſe he ſhall ſuffer death.

CLERK, *Clericus*, a word formerly uſed to ſignify a learned man, or man of letters.

The word comes from κληρος, uſed for clergy, but more properly ſignifying lot, or heritage, becauſe the lot and portion of clerks or eccleſiaſtics is to ſerve God. Accordingly, *clerus* was at firſt uſed to ſignify thoſe who had a particular attachment to the ſervice of God. The origin of the expreſſion is derived from the old Teſtament, where the tribe of Levi is called the lot, heritage, κληρος; and God is reciprocally called their portion; becauſe the tribe was conſecrated to the ſervice of God, and lived on the offerings made to God, without any other ſettled proviſion, as the reſt had.

The term was applied indifferently to all who made any profeſſion of learning; or who knew how to manage the pen: though, originally, it was appropriated to eccleſiaſtics.

As the nobility and gentry were uſually brought up to the exerciſe of arms; there were none but the clergy left to cultivate the ſciences: hence, as the clergy alone made any profeſſion of letters, a very learned man came to be called a great clerk.

Ronſard, in his old language, uſes the word femininely, *clergeſſe*, for a learned woman. "*Mais trop plus eſt à craindre une femme*" "*clergeſſe*."

Clerk, in general, is uſed for all thoſe of the eccleſiaſtical ſtate, who are in holy orders, of any degree, or kind; from the deacon to the prelate.

Clerk, in the way of trade and buſineſs, is one who exerciſes any function with the pen.

Clerk is alſo a title given to ſeveral officers of this kind in the royal palace, the courts of juſtice, revenue, army, navy, &c.

CLERMONT *Manuſcript*, is a copy of St. Paul's Epiſtles, found in the monaſtery of Clermont in France, and uſed by Beza, together with the Cambridge MS. in preparing his edition of the New Teſtament, which is a copy of the Goſpels and Acts of the Apoſtles in Greek and Latin. Beza found it in the monaſtery of Irenæus, at Lyons, in the year 1562, and gave it to the univerſity of Cambridge in 1582. It is a quarto ſize, and written on vellum. Sixty ſix leaves of it are much torn and mutilated, ten of which are ſupplied by a later tranſcriber. Beza conjectures that this manuſcript might have exiſted ſo early as the time of Irenæus. The Clermont copy is in the octavo form, and is written on fine vellum in Greek and Latin, with ſome mutilations. Beza ſuppoſes that it is of equal antiquity with the Cambridge copy; but both were probably written by a Latin ſcribe in a later period than he aſſigns to them. The various readings, of this MS. were communicated to archbiſhop Uſher, and they are preſerved by Walton. The MS. itſelf was in the poſſeſſion of Morinus; and after his death depoſited among the MS. copies of the Royal Library at Paris.

CLETHRA, in botany, a genus of the decandria monogynia claſs. We know but one ſpecies of this genus of ſhrubs, which is a native of Virginia and Carolina.

It is hardy enough to bear the open air of England; and is one of the moſt beautiful ſhrubs at its flowering ſeaſon. It thrives beſt in moiſt land, and in a ſheltered ſituation.

CLEW *of the Sail of a Ship*, is the lower corner of it which reaches down to that earing where the tackles and ſheets are faſtened; a ſhip is ſaid to have a great clew, when ſhe has a very long yard, and ſo has much canvas in her ſails.

Clew *Garnet*, a rope faſtened to the clew of the ſail, and from thence running in a block ſeized to the middle of the main and fore-yard. Its uſe is to hale up the clew of the ſail cloſe to the middle of the yard, in order to its being furled.

Clew *Line* is the ſame to the top-ſails, top-gallant-ſails, and ſprit-ſails, that the clew garnet is to the main-ſail and fore-ſail, and has the very ſame uſe.

CLIENT, a perſon who employs a lawyer to carry on a ſuit.

CLIFFORTIA, in botany, a genus of the polyandria order, belonging to the diœcia claſs of plants. There are three ſpecies, all of them natives of Africa; ſo require to be kept in a green houſe when cultivated in this country. Their flowers make no great appearance; but the plants themſelves are very ornamental evergreens.

CLIMATE, **Clima**, or **Clime**, in geography, a part of the ſurface of the earth, bounded by two circles parallel to the equator, and of ſuch a breadth, as that the longeſt day in the parallel near the pole, exceeds the longeſt day in that next the equator by ſome certain ſpace; viz. half an hour.

The word comes from κλιμα, *inclinamentum*, an inclination; becauſe the difference of climates ariſes from the different inclination or obliquity of the ſphere.

The beginning of the climate, is the parallel circle wherein the day is the ſhorteſt. The end of the climate is that wherein the day is the longeſt. The climates therefore are reckoned from the equator to the pole; and are ſo many bands, or zones, terminated by lines parallel to the equator; though in ſtrictneſs there are ſeveral climates in the breadth of one zone.

Vulgarly, the term climate is beſtowed on any country or region differing from another, either in reſpect of the ſeaſons, the quality of the ſoil, or even the manners of the inhabitants; without any regard to the length of the longeſt day.

Varenius gives us a table of thirty climates; but without any regard to the refraction. Ricciolus furniſhes a more accurate one, wherein the refractions are allowed for: an abſtract of which follows:

A Table of CLIMATES.

Mid. of Cl.	Long. Day	Lat.	Cli-mates	Long. Day	Lat.	Mid. of Clim.	Lat.	N. Con. Day.	Lat. Con. night	S. Con. Day.	Lat. Con. night
I	12h 30	7° 18	VIII	16h 0	48° 15	XV	66° 53	31d	27d	30d	28d
II	13 0	15 36	IX	17 0	53 40	XVI	69 30	62	58	60	59
III	13 30	23 8	X	18 0	57 44	XVII	73 0	93	87	89	88
IV	14 0	29 49	XI	19 0	60 39	XVIII	78 6	124	117	120	118
V	14 30	35 55	XII	20 0	62 44	XIX	84 0	156	148	150	149
VI	15 0	40 32	XIII	22 0	65 10	XX	90 0	188	180	178	177
VII	15 30	44 42	XIV	24 0	65 54						

Some of the moderns reckon the different climates by the increaſe of half an hour in the length of the longeſt day, beginning at the equator, and going on till they come to the polar circle towards the pole: they then count the climates by the increaſe of a whole natural day, in the length of the longeſt day, till they come to a parallel, under which the day is of the length of fifteen natural days, or half a month; from this parallel they proceed to reckon the climates by the increaſe of half or whole months, in the artificial day, till they come to the pole itſelf, under which the length of the day is ſix months. Thoſe between the equator and the polar circles are called hour climates; and thoſe between the polar circles and the poles, month climates.

CLIMAX, or **Gradation**, in rhetoric, a figure wherein the word or expreſſion which ends the firſt member of a period begins the ſecond, and ſo on; ſo that every member will make a diſtinct ſentence, taking its riſe from the next foregoing, till the argument and period be beautifully finiſhed: or in the terms of the ſchools, it is when the word or expreſſion, which was predicate in the firſt member of a period, is ſubject to a ſecond, and ſo on, till the argument and period be brought to a noble concluſion; as in the following gradation of Dr. Tillotſon. "After we have practiſed good actions a while, they become eaſy; and when they are eaſy, we begin to take pleaſure in them; and when they pleaſe us, we do them frequently; and by frequency of acts, a thing grows into a habit; and confirmed habit is a ſecond kind of nature, and ſo far as any thing is natural, ſo far it is neceſſary, and we can hardly do otherwiſe; nay, we do it many times, when we do not think of it." Thus,

A climax by gradation ſtill aſcends,
Until the whole with finiſhed period ends.

CLINOPODIUM, field baſil; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants. There are ſix ſpecies which are remarkable only for their ſtrong odour, being ſomewhat between marjoram and baſil.

CLIO, the firſt of the nine muſes, whence Ovid calls the reſt her ſiſters. She was the miſtreſs of hiſtory, is ſtyled ΚΛΕΙΩ ΙC-TORIAN; and alſo, the patroneſs of heroic poets.

Clio, in vermeology, a genus of inſects belonging to the order of vermes mollufca. The ſpecies are three, principally diſtinguiſhed by the ſhape of their vagina, and all natives of the ocean.

CLITORIA, in botany, a genus of the decandria order, belonging to the diadelphia claſs of plants. There are four ſpecies, all of them herbaceous perennials, or annuals, of the kidney bean kind.

CLITORIS, in anatomy, a long round body in the forepart of the vulva, or natural parts of a woman, where the nymphæ form an angle with each other; being one of the organs of generation in that ſex. Its figure repreſents that of a glans or acorn. *See Organs of Generation in the Syſtem of* Anatomy, Part V. Sect. XII.

It has two muſcles which erect it in coition; on which occaſion it ſwells, and grows hard. Its uſe is to produce a titillation in the coitus, and to increaſe the pleaſure.

The extremity of this part is ſometimes cut off; as in circumciſion, where it advances out too far. It is ſometimes ſo large and preponderant, that it bears a full reſemblance to the virile member; whence the perſons in whom it is ſo found, frequently paſs for hermaphrodites.

When the clitoris is too large, it may be ſo extirpated as to remove the unneceſſary part; but this requires much care, for a further extirpation ſubjects the patient to an involuntary diſcharge of urine.

CLOACA, in comparative anatomy, imports that canal in birds, through which the egg deſcends from the ovary in its exit. In this it is remarkable, that the part which is next the ovary is jagged, like the morſus diaboli, and fluctuates in the abdomen without any attachment to the ovary: hence anatomiſts have been ſomewhat puzzled to comprehend by what means the egg falls into the ovary.

CLOATHS, or **Clothes**, a covering of the body deſigned for uſe and ornament.

CLOCK, a machine conſtructed in ſuch a manner, and regulated by ſuch uniform movements, as to meaſure time, and all its ſubdiviſions, with great exactneſs. For Invention and Mechaniſm ſee Syſtem of Horology.

CLOISTER, *Clauſtrum*, a habitation ſurrounded with walls, and inhabited by canons or religious, &c.

In a general ſenſe, cloiſter is uſed for a monaſtery of religious of either ſex: conſiſting of a ſquare built around; ordinarily between the church, the chapter-houſe, and the refectory; and over which is the dormitory. Petrus Bleſenſis obſerves, that it was here the monks held their lectures. Lanfranc obſerves, that the proper uſe of the cloiſter was for the monks to meet in, and converſe together, at certain hours of the day.

CLONARIUM, in botany, that ſmall pedicle which ſupports every ſeparate flower, or fruit in a cluſter, as grapes in bunches, and berries in a corymbus of ivory, &c.

CLOSE, in heraldry. When any bird is drawn in a coat of arms with its wings cloſe down about it, (i. e. not diſplayed), and in a ſtanding poſture; they blazon it by this word *cloſe*; but if it be flying, they call it *volant*.

Close *Fights*, aboard a ſhip, are bulky heads put up fore and aft in the ſhip, for the men to ſtand behind in a cloſe engagement, and fire on the enemy; or, if the ſhips be boarded to ſcour the decks.

Close *Hauled*, in navigation, the general arrangement or trim of a ſhip's ſails when ſhe endeavours to make a progreſs in the neareſt direction poſſible towards that point of the compaſs from which the wind blows. In this diſpoſition of the ſails, they are all extended ſideways on the ſhip, ſo that the wind, as it croſſes the ſhip obliquely toward the ſtern from forwards, may fill their cavities. But as the current of winds alſo enters the ſails in an oblique direction, the effort of it to make the ſhip advance is conſiderably diminiſhed: ſhe will therefore make the leaſt progreſs when ſailing in this manner. The ſhip is ſaid to be cloſe hauled, becauſe at this time her tacks, or lower corners of the principal ſails, are drawn cloſe down to her ſide to windward, the ſheets hauled cloſe aft, and all the bow-lines drawn to their greateſt extenſion to keep the ſails ſteady.

Close *Quarters*, in ſea language, denote ſtrong beams of wood extended along a merchant ſhip in ſeveral places: as they are a place of retreat, when the ſhip is boarded by an adverſary, they are fitted with ſmall loop holes, through which the ſhip's crew may fire ſmall arms to defend themſelves, and annoy the enemy. They are likewiſe furniſhed with powder-cheſts, filled with powder, old nails, &c. which may be fired upon the boarders.

CLOSET, in heraldry, ſignifies the half of a bar.

CLOTH, in commerce, a manufacture made of wool wove on the loom.

Cloth is applicable alſo to other manufactures made of hemp, flax, &c. but in a more particular ſenſe it implies the web or tiſſue of woollen threads interwoven, ſome whereof, called the warp, are extended in length from one end of the piece to the other; the reſt, called the woof, diſpoſed acroſs the firſt, or breadth-wiſe of the piece,

Cloths are of divers qualities, fine or coarſe. The goodneſs of cloth, according to ſome, conſiſts in the following particulars, 1. That the wool be of a good quality, and well dreſſed. 2. It muſt be equally ſpun, carefully obſerving that the thread of the warp be finer and better twiſted than that of the woof. 3. The cloth muſt be well wrought and beaten on the loom, ſo as to be every where equally compact. 4. The wool muſt not be finer at one end of the piece than in the reſt. 5. The liſt muſt be ſufficiently ſtrong, of the ſame length with the ſtuff, and muſt conſiſt of good wool, hair, or oſtrich-feathers, or, what is ſtill better, of Daniſh dog's hair. 6. The cloth muſt be free from knots, and other imperfections. 7. It muſt be well ſcoured with fuller's-earth, well fulled with the beſt white ſope, and afterwards waſhed in clear water. 8. The hair or nap muſt be well drawn out with the teazle, without being too much opened. 9. It muſt be ſhorn cloſe without making it thread bare. 10. It muſt be well dried. 11. It muſt not be tenter-ſtretched to force it to its juſt dimenſions. 12. It muſt be preſſed cold, not hot-preſſed, the latter being very injurious to woollen cloth

ART OF MANUFACTURING CLOTHS.

The beſt wool for the manufacturing of cloths are thoſe of England and Spain, eſpecially thoſe of Lincolnſhire and Segovia. To uſe thoſe wools to the beſt advantage, they muſt be ſcoured, by putting them into a liquor ſomewhat more than lukewarm, compoſed of three parts fair water, and one of urine. After the wool has continued long enough in the liquor to ſoak, and diſſolve the greaſe, it is drained and well waſhed in running water. When it feels dry, and has no ſmell but the natural one of the ſheep, it is ſaid to be duly ſcoured.

After this, it is hung to dry in the ſhade, the heat of the ſun making it harſh and inflexible: when dry, it is beat with rods upon hurdles of wood, or on cords, to cleanſe it from duſt, and the groſſer filth; the more it is thus beat and cleanſed, the ſofter it becomes, and the better for ſpinning. After beating, it muſt be well picked, to free it from the reſt of the filth that had eſcaped the rods.

It is now in a proper condition to be oiled, and carded on large iron cards, placed ſlopewiſe. Olive oil is eſteemed the beſt for this purpoſe; one fifth of which ſhould be uſed for the wool intended for the woof, and a ninth for that deſigned for the warp. After the wool has been well oiled, it is given to the ſpinners, who firſt card it on the knee with ſmall fine cards, and then ſpin it on the wheel, obſerving to make the thread of the warp ſmaller by one third than that of the woof, and much compacter twiſted.

The thread thus ſpun, reeled, and made into ſkeins; that deſigned for the woof is wound on little tubes, pieces of paper, or ruſhes, ſo diſpoſed, as that they may be eaſily put in the eye of the ſhuttle. That for the warp is wound on a kind of large wooden bobbins, to diſpoſe it for warping. When warped, it is ſtiffened with ſize, the beſt of which is that made of ſhreds of parchment, and when dry is given to the weavers, who mount it on the loom.

The warp thus mounted, the weavers, who are two to each loom, one on each ſide, thread alternately on the treddle, firſt on the right ſtep, and then on the left, which raiſes and lowers the threads of the warp equally; between which they throw tranſverſly the ſhuttle from the one to the other: and every time that the ſhuttle is thus thrown, and a thread of the woof inſerted within the warp, they ſtrike it conjunctly with the ſame frame, wherein is faſtened the comb or reed, between whoſe teeth the threads of the warp are paſſed, repeating the ſtroke as often as is neceſſary.

The weavers having continued their work till the whole warp is filled with the woof, the cloth is finiſhed; it is then taken off the loom by unrolling it from the beam whereon it had been rolled in proportion as it was wove; and now given to be cleanſed of the knots, ends of threads, ſtraws, and other filth, which is done with iron nippers.

In this condition it is carried to the fullery, to be ſcoured with urine, or a kind of potter's clay, well ſteeped in water, put along with the cloth in the trough wherein it is fulled: the cloth being again cleared from the earth or urine, is returned to the former hands to have the leſſer filth, ſmall ſtraws, &c. taken off as before: then it is returned to the fuller to be beat and fulled with hot water, wherein a ſuitable quantity of ſope has been diſſolved; after fulling, it is taken out to be ſmoothed, or pulled by the liſts lengthwiſe, to take out the wrinkles, crevices, &c.

The ſmoothing is repeated every two hours, till the fulling be finiſhed, and the cloth brought to its proper breadth; after which it is waſhed in clear water, to purge it of the ſoap, and given wet to the carders to raiſe the hair or nap on the right ſide with the thiſtle or reed. After this preparation, the cloth worker takes the cloth, and gives it its firſt cut or ſheering: then the carders reſume it, and after wetting, give it as many more courſes with the teazle, as the quality of the ſtuff requires, always obſerving to begin againſt the grain of the hair, and to end with it; as alſo to begin with a ſmoother thiſtle, proceeding ſtill with one ſharper and ſharper, as far as the ſixth degree.

After theſe operations, the cloth being dried, is returned to the cloth-worker, who ſheers it a ſecond time, and returns it to the carders, who repeat their operation as before, till the nap be well ranged on the ſurface of the cloth, from one end of the piece to the other.

The cloth thus wove, ſcoured, napped, and ſhorn, is ſent to the dyer: when dyed, it is waſhed in fair water, and the worker takes it again wet as it is, lays the nap with a bruſh on the table, and hangs it on the tenters, where it is ſtretched both in length and breadth ſufficiently to ſmooth it, ſet it ſquare, and bring it to it's proper dimenſions, without ſtraining it too much; obſerving to bruſh it afreſh, the way of the nap, while a little moiſt on the tenters.

When quite dry, the cloth is taken off the tenters and bruſhed again on the table, to finiſh the laying of the nap; after which it is folded, and laid cold under a preſs to make it perfectly ſmooth and even, and give it a gloſs.

Laſtly, the cloth being taken out of the preſs, and the papers, &c. for gloſſing it removed, it is in a condition for ſale or uſe.

With regard to the manufacture of mixed cloths, or thoſe wherein the wools are firſt dyed, and then mixed, ſpun and wove of the colours intended, the proceſs, except what relates to the colour, is moſt the ſame with that juſt repreſented.

CLOUD, in phyſiology, a collection of condenſed vapour, ſuſpended in the atmoſphere.

A cloud is a congeries of watery particles, or veſiculæ raiſed from the waters, or watery parts of the earth, by the ſolar, or ſubterraneous, or electrical fire; which at their firſt riſe from our globe, are too minute, and too much ſeparated by their mutual repulſion, to be perceived; but as they mount, meeting with a greater degree of cold, loſing their electricity, or by any other proceſs which nature employs for this purpoſe, are condenſed and rendered opaque, by the reunion of their part; ſo as to reflect light, and become viſible.

The vapours, however raiſed, being ſpecifically lighter than air, mount in it, till having reached ſuch a region of the atmoſphere as is of the ſame ſpecific gravity with themſelves, they will be ſuſpended; till the watery veſicles, which were at firſt too thin to be perceived, being now condenſed by the cold of the ſuperior regions; and conſequently the parts ſet cloſer together; their denſity is firſt augmented ſo as to render them opaque enough to reflect the ſun's light, and become viſible; and their ſpecific gravity increaſed, ſo as to make them deſcend: in the former ſtate they are called clouds; and in the latter, when they arrive at us, rain.

Clouds, beſide their uſe when they deſcend in ſhowers, are of ſervice, while ſuſpended in the atmoſphere: as they help to mitigate the exceſſive heat of the torrid zone, and ſcreen it from the beams of the ſun, eſpecially when in his zenith.

From the obſervable motions of the clouds it appears, that there are different currents in the air at the ſame time, and in the ſame quarter, under one another. Phil. Tranſ. N° 458. p. 537.

CLOVE *Tree*, caryophyllus, a genus of the monogynia order, belonging to the polyandria claſs of plants. Of this there is but one ſpecies, viz. the aromaticus, which is a native of the Molucca iſlands, particularly of Amboyna, where it is principally cultivated.

The clove, to be in perfection, muſt be full ſized, heavy, oily, and eaſily broken; of a fine ſmell, and of a hot aromatic taſte, ſo as almoſt to burn the throat. In the Eaſt Indies, and in ſome parts of Europe, it is ſo much admired as to be thought an indiſpenſible ingredient in almoſt every diſh. It is put into their food, liquors, wines, and enters likewiſe the compoſition of their perfumes. Conſidered as medicines, cloves are very hot, ſtimulating, aromatics; and poſſeſs in an eminent degree the general virtues of ſubſtances of this claſs. The Dutch in long voyages eat them after meals, to promote digeſtion. No plant, or part of any plant, contains ſuch a quantity of oil as cloves do.

Clove *Water*, is prepared of brandy, and cloves bruiſed therein and diſtilled.

Clove *July Flowers*, a ſpecies of caryophyllus, greatly recommended as cordials, and given in diſorders of the head, palpitations of the heart, and in nervous complaints of all kinds.

CLOVER *Graſs*. See Trefoil.

CLUNY, or Clugni, a celebrated abbey of Benedictine monks, in a city of that name in France; being the head or chief of a congregation denominated from them.

This order of monks was brought into England by William earl of Warren, ſon-in-law to William the Conqueror, who built a houſe for them at Lewes, in Suſſex, about the year 1077. There were twenty ſeven priories and cells of this order in England, which were governed by foreigners, afterwards made denizens.

CLUPEA, in ichthyology, a genus of malacopterygious fiſhes, whoſe bronchioſtege membrane contains eight ſmall bones, and the abdomen is acute and ſerrated. To this genus belong the Herring, Shad, Anchovy, and Sprat; which ſee.

CLUSIA, the balſam tree; a genus of the monæcia order, belonging to the polygamia claſs of plants. There are four ſpecies, all natives of America.

CLUTIA, a genus of the gynandria order, belonging to the diœcia claſs of plants. There are three ſpecies, all of them natives of warm climates.

CLYPEOLA, *treacle muſtard*; a genus of the filiculoſa order, belonging to the tetradynamia claſs of plants. There are two ſpecies, both natives of France, Italy, and the warm parts of Europe, but hardy enough to bear the winters in this country.

CLYSSUS, in chymiſtry, an extract prepared, not from one, but ſeveral bodies mixt together; and, among the moderns, the term is applied to ſeveral extracts prepared from the ſame body, and then mixed together.

CLYSTER, in medicine, is a liquid remedy to be injected chiefly at the anus into the larger inteſtines. It is uſually adminiſtered by the bladder of a hog, ſheep, or ox, perforated at each end, having at one of the apertures an ivory pipe faſtened with pack thread. But the French, and ſometimes the Dutch, uſe a pewter ſyringe, by which the liquor may be thrown in with more eaſe and expedition than with the bladder, and likewiſe more forcibly expelled into the large inteſtines. This remedy ſhould never be adminiſtered either too hot or too cold, but tepid; for either of the former will be injurious to the bowels.

Clyſters are prepared of different ingredients, according to the different intentions propoſed, whether to ſoften the indurated fæces, correct the acrid, acid, and ſaline recrements, evacuate the contents of the large inteſtines, corroborate the languid fibres of the inteſtines, and augment their impaired periſtaltic motion; to mitigate the ſpaſms of the inteſtinal coats, and relax their conſtricted fibres; to cauſe a revulſion downwards in lethargic diſorders of the head; to promote labour, whether the fœtus be living or dead; and to expel the ſecundines where they are preternaturally detained.

Nouriſhing Clysters, are thoſe applied with deſign to nouriſh and ſupport a patient who can ſwallow little or no aliment, by reaſon of ſome impediment in the organs of deglutition; in which caſes they may be made of broth, milk, ale, and decoctions of barley and oats with wine. The Engliſh introduced a new kind of clyſter, made of the ſmoke of tobacco, which has been uſed by ſeveral other nations, and appears to be of conſiderable efficacy when other clyſters prove ineffectual, and particularly in the iliac paſſion, and in the hernia incarcerata, though it may likewiſe be uſed in an obſtinate conſtipation or obſtruction of the bowels, &c.

Uterine Clysters are injections into the womb.

CNEORUM, widow wail, a genus of the monogynia order, belonging to the triandria claſs of plants. There is but one ſpecies, a little evergreen, and very ornamental ſhrub. It is propagated from ſeeds, and requires no other care than to be kept free from weeds.

CNICUS, bleſſed thiſtle, a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants. There are ſeven ſpecies.

COACH, a vehicle for commodious travelling, ſuſpended on leathers, and moved on wheels. In England, and throughout Europe, the coaches are drawn by horſes, except in Spain, where they uſe mules. In a part of the Eaſt, eſpecially the dominions of the great Mogul, their coaches are drawn by oxen. In Denmark they ſometimes yoke rein deer in their coaches; though rather for curioſity than uſe. The coachman is ordinarily placed on a ſeat raiſed before the body of the coach. But the Spaniſh policy has diſplaced him in that country by a royal ordnance; on occaſion of the duke d'Olivares, who found that a very important ſecret, whereon he had conferred in his coach, had been overheard and revealed by his coachman: ſince that time the place of the Spaniſh coachman is the ſame with that of the French ſtage coachman, and our poſtillion, viz. on the firſt horſe on the left.

The invention of coaches is owing to the French: yet are not coaches of any great antiquity, even in France; ſcarce reaching beyond the reign of their Francis I.

Coaches are diſtinguiſhed, with regard to their ſtructure, as chariots, landaus, vis-a-vis, and berlins. With regard to the circumſtances of their uſe, &c. we diſtinguiſh ſtage coaches, hackney coaches, &c.

Hackney COACHES, thoſe expoſed to hire, in the ſtreets of London, and ſome other great cities, at rates fixed by authority.

Stage COACHES, are thoſe appointed for the conveyance of travellers from one city or town to another.

COADUNATÆ, in botany, an order of plants in the fragmenta methodi naturalis of Linnæus.

COAGMENTATION, is uſed among chymiſts, for the act of melting down a matter, by caſting in certain powders, and afterwards reducing the whole into a concrete, or ſolid.

COAGULATION, in chymiſtry, denotes certain operations, in which fluid bodies become ſolid; as, for example, the chriſtallization of ſalts. See Syſtem of CHYMISTRY.

COAKS. For the exciting of intenſe heats, as for the ſmelting of iron ore, and for operations where the acid and oily particles would be detrimental, as the drying of malt, foſſil coals are previouſly charred, or reduced to coaks; that is, they are made to undergo an operation ſimilar to that by which charcoal is made. By this operation coals are deprived of their phlegm, their acid liquor, and part of their fluid oil. The heavy oil and the earth, together with the acid concrete ſalt, which, though volatile, is diſſolved by iron.

COAL, a black, ſulphureous inflammable matter, dug out of the earth; ſerving in many counties as the common fuel.

This we ſometimes call pit coal, foſſil coal, earth coal, and natural coal. We have three ſpecies of this foſſil in common uſe for our fuet in different parts of the kingdom. 1. A hard duſky black coal. This is in common uſe with us, under the name of Scotch coal. It burns briſkly, and turns wholly to aſhes, not leaving any cinders. There is a vaſt deal of this dug about Lymington in Hampſhire, whence it is often called by the dealers Lymington coal. 2. A hard gloſſy coal. This is ſometimes ſold in London with the former, under the name of Scotch coal, but it is more determinately known in many parts of the kingdom by the name of Welch coal. It is diſtinguiſhed from the others by its great hardneſs, and gloſſy black, where freſh broken, and is much eſteemed for burning with leſs ſmoak than any other kind; and in ſome parts of this kingdom, and generally in Wales, they uſe it to make malt. 3. The third is our common coal too well known to need any deſcription, but diſtinguiſhed from all the others by its ſhattery friable ſtructure, and its great gloſs when freſh broken. It is common in moſt countries of Europe; though the Engliſh coal is of moſt repute, even in foreign countries.

COAL *Spirits*. Coals diſtilled in a retort not only afford a phlegm, and black oil, but a ſpirit, which is apt to force the lute and break the glaſſes, and will catch fire at the flame of a candle. We are told that bladders may be filled with this ſpirit, or inflammable air; which may be kept a conſiderable time. If the bladder be pierced with a pin, and ſqueezed near the flame of a candle, the ſpirit will take fire, and afford an amuſing ſpectacle. See Phil. Tranſ. N° 452. Sect. V.

Small COAL, or CHARCOAL, a kind of fuel, conſiſting of half-burnt bruſh wood, much uſed by artificers of different profeſſions for poliſhing braſs or copper-plates, &c.

The beſt ſmall coal for common uſe is that made of oak; but in the manufacture of gunpowder they commonly uſe that made of alder.

COALESCENCE, the union or growing together of two bodies before ſeparate.

COALITION, the re-union, or growing together of parts before ſeparated.

It is alſo uſed in another ſenſe, ſuch as agreement between parties, who before held opinion diametrically oppoſite, as in the memorable inſtance of coalition between Lord North and Mr. Fox.

COAST, a ſea-ſhore, or the country adjoining to the edge of the ſea.

COASTING, in navigation, the act of making a progreſs along the ſea-coaſt of any country. The principal articles relating to this part of navigation are, the obſerving the time and direction of the tide; knowledge of the reigning winds; of the roads and havens; of the different depths of the water, and qualities of the ground.

COAT *of Arms*, in heraldry, a cloak, or habit, worn by the ancient knights over their arms, both in war, and at tournaments; and ſtill borne by the heralds at arms.

It was a kind of ſurcoat, reaching only as low as the navel; open at the ſides, with ſhort ſleeves; ſometimes furred with ermines and vair; whereon were applied the armories of the knight.

COATI, in tetrapodology. See RACKOON.

COATING in electricity, denotes a covering of ſheet lead, tin-foil, or any other conducting ſubſtance, applied to the Leyden phial, or to any electric body, and ſerving to accumulate the electricity, to increaſe the force of the charge, and to facilitate the operation of diſcharging.

COBALT, a genus of foſſils of the order of the aſphurelata. In its purer ſtates it is conſiderably compact and heavy.

Cobalt contains a great quantity of arſenic, and it is from this mineral that moſt of the arſenic we have is prepared.

COBBAN, in botany, a ſmall tree like a peach tree, which grows in Sumatra.

The fruit is very proper to quench thirſt: but the kernel, however bitter, is far ſuperior in virtue.

COBBING, in ſea-language, a puniſhment inflicted at ſea on thoſe who quit their ſtation during the night watch. It conſiſts of a number of ſtrokes on the breech with a flat piece of wood called the cobbing board.

COBITIS, the loache, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The ſpecies are five; three of which are natives of Europe.

COCCIFEROUS, in botany, ſuch plants or trees as bear berries.

COCCINELLA, or COCHINEAL, in entomology, a genus of inſects of the coleoptera order. See COCHINEAL.

COCCO, the name of a plant in the Weſt Indies, and in ſome of the iſlands of the South Sea, called alſo Indian kale.

COCCOTHRAUSTES, in ornithology, the name of a very remarkable bird, conſiderably larger than the chaffinch, very ſhort bodied, and large beaked, whence it is called in Engliſh, the groſsbeak or hawfinch.

COCCOTHRAUSTES *Virginiana criſtata*, the Virginian nightingale: it is about the ſize of a blackbird, and diſtinguiſhed from the former ſpecies by its creſt, and beautiful ſcarlet colour.

COCCULUS INDICUS, the name of a poiſonous berry, too frequently mixed with malt liquors, in order to make them intoxicating; but this practice is expreſsly forbid by act of parliament. It is the fruit of the meniſpermum occulus. Fiſhermen have a way of mixing it with paſte: this the fiſh ſwallow greedily, and are thereby rendered lifeleſs for a time, and float on the water. The good women uſe it with ſtaveſacre, for deſtroying vermin in children's heads.

COCCUS, in entomology, a genus belonging to the order of hemiptera. The ſpecies are 22, denominated principally from the plants they frequent.

COCCUS *Maldivia*, the Maldivia nut, in the materia medica; the name of the fruit of the palva Maldivienſis of Johnſton; an oval figured fruit, of a ſweet taſte, and famous for its virtues in nervous diſorders.

COCCUS *Polonicus*, an inſect which may properly enough be called the cochineal of the northern parts of the world. As the cochineal loves only the hot climates, this creature affects only the cold ones. It is collected for the uſe of dyers, but the crops of it are much ſmaller, more difficultly made, and the drug itſelf greatly inferior to the true cochineal. It is commonly known by the name of *Coccus Polonicus*, or the ſcarlet grain of Poland. It is very much hid by nature from the eyes of common obſervers. There is a particular account of this inſect in the Philoſophical Tranſactions, Vol. LIV. N° 15. and Vol. LVI. N° 20. See COCHINEAL.

COCCYGÆUS *Anterior*, a muſcle fixed, by a broad inſertion, in the anterior portion of the ſmall tranſverſe ligament at the upper part of the foramen ovale of the os innominatum; from thence it runs between this great ligament and the muſculus obturator intimus, with which it is often confounded by anatomiſts, and contracting in breadth, it is inſerted in the lower part of the os occycygis.

COCCYGÆUS *Poſterior*, a muſcle fixed to the inner, or concave edge of the two firſt vertebræ of the os ſacrum, to the inner and lower edge of the ligamentum ſacro ſciaticum, and to the ſpine of the os iſchium; from thence, contracting in breadth, it is inſerted in the inſide of the os occygis, above the anterior.

COCCYGIS *Os*, in anatomy, a bone joined to the extremity of the os ſacrum; compoſed of three or four bones, whereof the lower is ſtill leſs than the upper, till the laſt ends in a ſmall cartilage. See Syſtem of ANATOMY, Plate I. Fig. 12.

It reſembles a little tail turned inwards; or rather, as ſome imagine, the beak of a cuckow; whence the name.

Its uſe is to ſuſtain the ſtraight gut: it yields to the preſſure of the fœtus in women in travail; and midwives uſe to thruſt it backwards; but ſometimes too violently, which is the occaſion of great pain, and ſeveral bad effects.

COCCYGIS *Oſſis muſculi.* Theſe are ſmall, thin, radiated muſcles, lying on the inner, or concave ſide of the *os ſacrum*, and neighbouring parts of the pelvis. They are four in number, two on each ſide, one placed more forward, the other more backward; for which reaſon the firſt may be termed *coccygæus anterior*, ſive *iſchio coccygæus*, and the other *coccygæus poſterior*, ſive *ſacro coccygæus*. See MYOLOGY, in ANATOMY, Part III.

COCCINELLA, a genus of inſects, of the coleoptera order. The ſpecies are forty nine.

The coccinella cacti, a native of the warmer parts of America, is the famous cochineal animal, ſo highly valued in every part of the world for the incomparable beauty of its red colour, which it readily communicates to wool and ſilk, but with much more difficulty to linen and cotton. This inſect like others, is of two ſexes, but exceeding diſſimilar in their appearance. The male is very ſcarce, and is ſufficient for 300 females or more; it is active, ſmall, and ſlender in compariſon with the female.

COCHINEAL, was ſuppoſed to be a vegetable production, a ſeed, or an excreſcence of a plant; but it is now acknowledged to be an inſect, living upon the opuntia, or Indian fig, on the juice of which it feeds.

The principal countries where the cochineal inſects are bred, are in the kingdom of New Spain; and Hambato, Loja, and Tucuman in Peru: but it is only in Oaxaca, that they are gathered in large quantities, and form a branch of commerce, the cultivation of theſe little creatures being there the chief employment of the Indians.

From this little inſect is formed a valuable drug. With us, it pays no duty, and is eſteemed a great cordial, ſudorific, alexipharmic, and febrifuge, and much uſed by dyers and painters, the high crimſon colour it affords being ſcarcely equalled by any thing; and making, according to their different management of it, all the degrees and kinds of red.

COCHLEA, in anatomy, the third part of the labyrinth, or inner cavity of the ear.

The cochlea lies directly oppoſite to the ſemicircular canals, and is properly ſo called from the reſemblance it has to the ſhells that ſnails lie in; through its parietes a ſmall branch of the auditory nerve paſſes.

COCHLEA, in conchyology, the ſnail ſhell, a genus of univalve ſhell-fiſh, of a ſpiral figure, and containing only one cell.

This is a very comprehenſive genus, and therefore ſubdivided into three ſeries, viz. 1. The cochleæ which have a round or nearly round mouth, called cochleæ lunares. 2. The cochleæ with a ſemicircular mouth, called cochleæ ſemilunares. 3. The cochleæ with a narrow oval mouth, as if the ſides were cruſhed together, called cochleæ ore depreſſo.

COCHLEA, in mechanics, one of the five mechanical powers; otherwiſe called the ſcrew.

It is thus denominated, from the reſemblance a ſcrew bears to the ſpiral ſhell of a ſnail, which the Latins call cochlea.

COCK, in ornithology, the Engliſh name of the males of gallinaceous birds, but more eſpecially uſed for the common dunghill cock. The diſtinguiſhing characters of which are, that the feet have each four toes, the front of the head has a comb, and the wattles are two, and are naked and flat. See Plate III. Syſtem of ORNITHOLOGY.

COCK *of the Mountain*, Urogallus, the name of a bird of the gallinaceous kind, being a ſpecies of the tetrao.

In ſhape it reſembles the turkey, and approaches to it in ſize. Its legs are feathered down to the toes before, and naked behind. It is common on the Alps, and in ſome parts of Italy, and is ſaid to be found alſo in the mountainous parts of Ireland. Its fleſh is very delicate.

COCK *Boats*, ſmall boats uſed in rivers, or near the ſhore, which are of no ſervice at ſea, becauſe too tender, weak, and ſmall.

COCK's *Comb*, a genus of the monogynia order, belonging to the pentandria claſs of plants. There are eight ſpecies, of which the moſt worthy of notice is the criſtata, or common cock's comb, ſo called on account of its creſted head of flowers, reſembling a cock's comb; of theſe there are a great variety of ſpecies. The principal colours of their flowers are red, purple, yellow, and white; but there are ſome whoſe heads are variegated with two or three colours. The heads are ſometimes divided like a plume of feathers, and are of a beautiful ſcarlet colour. Theſe plants are very tender exotics, and require a great deal of care to cultivate them in this country.

COCKATOO, a name uſually given to the white macaw, but more properly belonging to the whole macaw tribe.

COCKET, is a ſeal belonging to the king's cuſtom-houſe, or rather a ſcroll of parchment ſealed and delivered by the officers of the cuſtoms to merchants, as a warrant that their merchandiſes are cuſtomed.

It is alſo uſed for the office where goods tranſported were firſt entered, and paid their cuſtom, and had a cocket or certificate of diſcharge.

COCKPIT, on which game cocks fight their battles.

COCKPIT, in a man of war, is a place on the lower floor, or deck, abaft the main capſtan, lying between the platform, and the ſteward's room; where are ſubdiviſions, or partitions, for the purſer, the ſurgeon, and his mates. See NAVAL ARCHITECTURE, Plate I. z.

COCKSWAIN, an officer on board a man of war, who hath the care of the boat, or barge, and all things belonging to it. He is always to be ready with his boat's gang, or crew, and to man the boat on all occaſions. He ſits in the ſtern of the boat, and ſteers.

COCOA, or more properly CACAO, the nut whoſe kernel yields the chocolate. See CACAO.

COCOS, the Cocoa nut tree; a genus of the order of palmæ, belonging to the monœcia claſs of plants. There is only one ſpecies known, which is cultivated in both the Indies, and is of the greateſt uſe to the inhabitants. The nuts hang at the top of the trees in cluſters of a dozen each.

As the nut ripens, the ſubſtance becomes more ſolid; and at length lines the whole inſide of the nut for above a quarter of an inch thick, being as white as ſnow, and of the flavour of an almond. The quantity of liquor in a full grown nut is frequently a pint and upwards.

The liquor contained in the ſhell is a moſt cooling, wholeſome beverage in thoſe ſultry climates, and the white kernel a moſt agreeable food. The ſhells of theſe nuts, being tipped with ſilver, are frequently uſed for drinking bowls.

COCTION, a general name for all alterations made in bodies, by the application of fire, or heat.

There are various ſpecies of coction; as maturation, friction, elixation, aſſation, torrefaction, uſtion, decoction, and concoction.

COD, in ichthyology, a genus of fiſhes belonging to the order of jugulares. The head is ſmooth; there are ſeven cylindrical rays in the branchioſtege membrane; the body is oblong, with deciduous ſcales; the whole fins are covered with the common ſkin of the fiſh; the rays of the back-fins are blunt, and thoſe of the breaſt are ſharp. There are 17 ſpecies, principally diſtinguiſhed by their cirri and the number of back-fins.

The great rendezvous of the cod fiſh is on the banks of Newfoundland, and the other ſand banks that lie off the coaſts of Cape Breton, Nova Scotia, and New England. They prefer thoſe ſituations, by reaſon of the quantity of worms produced in thoſe ſandy bottoms, which tempt them to reſort there for food.

The increaſe of ſhipping that reſort to thoſe fertile banks, is now unſpeakable. Britain ſtill enjoys the greateſt ſhare; which ought to be eſteemed our chiefeſt treaſure, as it brings wealth to individuals, and ſtrength to the ſtate.

All this immenſe fiſhery is carried on by the hook and line only. We have been informed that they fiſh from the depth of 16 to 60 fathoms, according to the inequality of the bank, which is repreſented as a vaſt mountain, under water, above 500 miles long, and near 300 broad; and that ſeamen know when they approach it by the great ſwell of the ſeas and the thick miſts that impend over it. The bait is herring, a ſmall fiſh called a capelin, a ſhell fiſh called clams, and bits of ſea fowl; and with theſe are caught fiſh ſufficient to find employ for near 15,000 Britiſh ſeamen, and to afford ſubſiſtence to a much more numerous body of people at home, who are engaged in the various manufactures which ſo vaſt a fiſhery demands.

The food of the cod is either ſmall fiſh, worms, teſtaceous or cruſtaceous animals, ſuch as crabs, large whelks, &c.; and their digeſtion is ſo powerful, as to diſſolve the greateſt part of the ſhells they ſwallow. They are very voracious, and catch at any ſmall body they perceive moved by the water, even ſtones and pebbles, which are often found in their ſtomachs. Fiſh of twelve and fourteen inches have frequently been taken out of their maws.

Iſinglaſs is alſo made of this part by the Iceland fiſhermen: a proceſs which deſerves the attention of the natives of the north of Scotland, where theſe fiſh are plentiful.

Providence has kindly ordained, that this fiſh, ſo uſeful to mankind, ſhould be ſo very prolific as to ſupply more than the deficiencies of the multitudes annually taken. Leuwenhoek counted 9,384,000 eggs in a cod fiſh of a middle ſize; a number, ſure, that will baffle all the efforts of man, or the voracity of the inhabitants of the ocean, to exterminate, and which will ſecure to all ages an inexhauſtible ſupply of grateful proviſion.

The largeſt that we ever heard of taken on our coaſts, weighed 78 pounds: the length was five feet eight inches; and the girth round the ſhoulders, five feet. It was taken at Scarborough in 1755, and was ſold for one ſhilling. But the general weight of theſe fiſh in the Yorkſhire ſeas, is from 14 to 40 pounds. This ſpecies is ſhort in proportion to its bulk, the belly being very large and prominent.

CODE, *Codex*, a collection of the laws and conſtitutions of the Roman emperors, made by the order of Juſtinian.

The code is accounted the ſecond volume of the civil law, and contains twelve books, the matter of which is nearly the ſame with that of the Digeſts, eſpecially the firſt eight books; but the ſtyle is neither ſo pure, nor the method ſo accurate as that of the Digeſts.

The Theodoſian code, compriſed in ſixteen books formed out of the conſtitutions of the emperors from Conſtantine the Great to Theodoſius the Younger: this was obſerved almoſt over all the Weſt, till it was abrogated by the Juſtinian Code. There were alſo ſeveral later codes, particularly the ancient Gothic, and thoſe of the French kings, as the Code of Euridic, Code Lewis, Code Henry, Code Marchande, Codes des Eaux, &c. and the late king of Pruſſia publiſhed a code which comprizes the laws of his country in a very ſmall volume.

CODIA, Κωδια, in botany, is uſed for the top or head of any plant; but by way of eminence, for that of the white poppy, whence the ſyrup made therewith, is called diacodium.

CODICIL, is a writing, by way of ſupplement to a will, when any thing is omitted that the teſtator would have added, or wants to be explained, altered, or recalled.

CODLIN, an apple uſeful in the kitchen, being the moſt proper for baking.

CODLING, an appellation given to the cod-fiſh when young.

COECUM, in anatomy, the firſt of the three large inteſtines, called from their ſize *inteſtina craſſa*. The cœcum is ſituated at the right of the os ilium, and reſembles a bag, and has a vermiform appendage affixed to it.

COEFFICIENTS, in algebra, are ſuch numbers, or known quantities, as are put before letters or quantities, whether known or unknown, and into which they are ſuppoſed to be multiplied.

COELESTIAL, in general, denotes any thing belonging to the heavens: thus we ſay, cœleſtial obſervations, the cœleſtial globe, &c.

Cœleſtial obſervations are thoſe made by aſtronomers under the phænomena of the heavenly bodies, with a ſuitable apparatus of aſtronomical inſtruments, in order to determine their places, motions, &c.

Cœlestial *Globe*. See Globe.

COELIAC *Artery*, the firſt artery detached from the deſcending trunk of the aorta into the abdomen.

COELIAC *Paſſion*, is a ſort of diarrhœa, or flux of the belly; wherein the aliment comes away either crude or chylified, in lieu of excrements.

COEUR, in heraldry. *Party en Cœur*, ſignifies a ſhort line of partition in pale, in the centre of the eſcutcheon, which extends but a little way, much ſhort of top and bottom; being met by other lines, which form an irregular partition of the eſcutcheon.

COFFEE, *Coffea*, in botany, a genus of the monogynia order, belonging to the pentandria claſs of plants. There is but one ſpecies, ſuppoſed to be a native of Arabia Felix.

The coffee tree is cultivated in Arabia, Perſia, the Eaſt Indies, the Iſle of Bourbon, and ſeveral parts of America. It is alſo raiſed in botanic gardens in ſeveral parts of Europe.

Coffee alſo denotes a kind of drink prepared from theſe berries.

The preparation of coffee conſiſts in roaſting, or giving it a juſt degree of torrefaction, on an earthen, or metalline plate, till it hath acquired a browniſh hue, equally deep on all ſides: it is then ground in a mill, as much of it as ſerves the preſent occaſion. A proper quantity of water is next boiled, and the ground coffee put in it. After it has juſt boiled, it is taken from the fire; and the decoction having ſtood a-while to ſettle, and fine, they pour, or decant it into diſhes.

"The following curious and important obſervation is extracted from a letter from Sir John Pringle, in April 1783. Coffee is the beſt abater of the paroxyſms of the periodic aſthma that I have ſeen. The coffee ought to be of the beſt Mocco, newly burnt, and made very ſtrong immediately after grinding it. I have commonly ordered an ounce for one diſh; which is to be repeated freſh after the interval of a quarter or half an hour; and which I direct to be taken without milk or ſugar. The medicine in general is mentioned by Muſgrave, in his treatiſe *De arthritide anomala*; but I firſt heard of it from a phyſician, who having once practiſed it in Litchfield, had been informed by the old people of that place, that Sir John Floyer, during the latter year of his life, kept free from, or at leaſt lived eaſy under, his aſthma, from the uſe of very ſtrong coffee. This diſcovery, it ſeems, he made after the publication of his book upon that diſeaſe. Since the receipt of that letter, I have frequently directed coffee in the aſthma with great ſucceſs."

COFFER, *Capſa*, in architecture, a ſquare depreſſure, or ſinking, in each interval between the modillions of the Corinthian cornice; ordinarily filled up with a roſe, ſometimes with a pomegranate, or other enrichment.

Coffer, in fortification, denotes a hollow lodgment, athwart a dry moat, from ſix to ſeven feet deep, and from fixteen to eighteen feet broad; the upper part made of pieces of timber raiſed two feet above the level of the moat; which little elevation has hurdles laden with earth for its covering; and ſerves as a parapet, with embraſures.

COFFERER *of the King's Houſhold*, a principal officer in the court, next under the comptroller; who, in the compting-houſe, and elſewhere at other times, has a ſpecial charge and overſight of other officers of the houſe, for their good demeanor and carriage in their offices: to all whom he pays the wages

COFFIN, in a general ſenſe, a wooden box or trunk, into which the bodies of dead perſons are put, in order for burial.

COGGESHALL's *Sliding Rule*, an inſtrument uſed in gauging, ſo called from its inventor.

COGITATION, the act or operation of thinking.

COGNATION, in the civil law, the bond of relation between all the deſcendents of the ſame ſtock, both males and females.

COGNISEE, or **Connusee**, in law, is the perſon to whom a fine of lands, &c. is acknowledged.

COGNISOR, or **Conusor**, is he that paſſeth, or acknowledgeth, a fine of lands and tenements to another.

COGNITIVE is ſometimes applied to that faculty or power of the human mind, by which we know any thing, or are enabled to diſtinguiſh truth from falſity.

COGNIZANCE, or **Conusance**, in law, is the acknowledgment of a fine; or the conceſſion of a thing done. In which ſenſe we ſay, *cognoſcens latro, a thief that confeſſes*.

Cognizance is ſometimes uſed alſo for an audience, or hearing of a matter judicially. In which ſenſe we ſay, *to take cognizance*, &c.

COGNOVIT *Actionem*, in law, is where a defendant acknowledges or confeſſes the plaintiff's cauſe againſt him to be juſt and true; and after iſſue, ſuffers judgment to be entered againſt him without trial. But moſt frequently the defendant confeſſes one part of the complaint, and traverſes or denies the reſt.

COHABITATION, denotes the ſtate of a man and a woman who live together without being legally married. By the common law of Scotland, cohabitation for year and day, or a complete twelvemonth, is deemed equivalent to matrimony.

CO-HEIR, a perſon who ſhares an inheritance or eſtate with another heir.

COHESION, or **Cohæsion**, in phyſics, the action whereby the particles, or primary corpuſcles, whereof natural bodies conſiſt, are connected, or bound together, ſo as to form particles; and thoſe, again, kept together, ſo as to form ſenſible maſſes, or bodies.

COHOBATION, in chymiſtry, the returning a liquor diſtilled from any ſubſtance back upon the ſame ſubſtance, and diſtilling it again, either with or without an addition of freſh ingredients.

The deſign of this operation is to procure the united virtues of any ſubſtance, in their utmoſt ſtrength. Cohobated waters are much extolled by Boerhaave.

COIF, the badge of a ſerjeant at law; who is hence alſo called Serjeant of the Coif.

COIN, a ſpecies of money, made of metal, as gold, ſilver, or copper.

It is one of the royal prerogatives belonging to every ſovereign prince, that he alone, in his own dominions, may order the quantities, value, and faſhion of his coin: but the coin of one king is not current in the kingdom of another, unleſs at a great loſs; though our king, by his prerogative, may make any foreign coin lawful money of England, at his pleaſure, by proclamation. By ſtatute any perſon may break or deface any piece of coin ſuſpected to be counterfeited or diminiſhed, otherwiſe than by wearing: but if ſuch pieces, on breaking, &c. are found to be good coin, it will be at the breaker's peril, who ſhall ſtand to the loſs of it. Coins of gold or ſilver are to paſs, notwithſtanding ſome of them are cracked or worn; but not if they are clipped. Counterfeiting, clipping, or impairing the king's coin, is high treaſon; as alſo the making any ſtamps, dye, mould, &c. for coining, except by perſons employed in the mint, &c. and the conveying ſuch out of the mint is the ſame, and ſo is colouring metal, reſembling gold or ſilver coin, marking it on the edges, &c. The ſtatutes which ordained milled money to be made, give liberty to any perſon to refuſe hammered ſilver coin, as not being the lawful coin of this kingdom: counterfeiting the coin extends only to gold and ſilver; for the coining of halfpence or farthings, or pieces to go for ſuch, of copper, incurs a penalty of five pounds for every pound weight.

In the firſt ages, each perſon cut his metal into pieces of different ſizes and forms, according to the quantity to be given for any merchandize, or according to the demand of the ſeller, or the quantity ſtipulated between them: to this end, they went to market, loaden with metal, in proportion to the purchaſe to be made, and furniſhed with inſtruments for proportioning it, and with ſcales for dealing it out, according as occaſion required.

By degrees it was found more commodious to have pieces ready weighed; and as there were different weights required, according to the value of the different wares, all thoſe of the ſame weight began to be diſtinguiſhed with the ſame mark, or figure; thus were coins carried one ſtep further.

At length, the growing commerce of money beginning to be diſturbed with frauds, both in the weights and the matter, the public authority interpoſed; and hence aroſe the firſt ſtamps, or impreſſions, of money; to which ſucceeded the names of the moneyers; and at length the effigy of the prince, the date, legend, and other precautions to prevent the alterations of the ſpecies: and thus were coins completed.

COITION, the intercourſe between male and female in the act of generation.

COKE, denotes pit coal or ſea coal charred. It is prepared by burning them in ovens conſtructed for this purpoſe, and extinguiſhing the fire in the manner uſed for making charcoal.

COLAPTICE, the art of carving, or cutting, the reſemblances and figures of natural things in ſtone. The term for the artiſt is lithoxos.

COLASISI, in natural hiſtory, a name given by the people of the Philippine iſlands to a very ſmall but very beautiful ſpecies of the parrot, common in that part of the world, and called by ot hers cuſiand gula ſiſi.

COLCHICUM, meadow ſaffron, a genus of the tryginia order, belonging to the hexandria claſs of plants. There are three ſpecies. Their colours afford a beautiful variety, being purple, variegated purple, white, red, roſe coloured, yellow, &c. with ſingle and double flowers. The root of this plant is poiſonous.

COLCOTHAR, *Natural*, otherwiſe called chalcitis, is a red vitriol, brought from Germany, formed from the common green vitriol, calcined naturally by ſome ſubterraneous fire.

COLCUICUILTIC, in ornithology, a kind of American quail, beautifully variegated with black, white, and red, diſpoſed in ſtreaks on the upper part of the body, and in roundiſh ſpots on the belly. Its legs and feet are blue. It is a well taſted bird.

COLD, in a relative ſenſe, generally ſignifies that ſenſation which accompanies the tranſition of the fine veſſels of the human body from an expanded to a more contracted ſtate. In an abſolute ſenſe, it means the agent by which that ſenſation is produced.

Concerning the cauſe of this ſenſation, which alone can be properly called cold in the abſtract, philoſophers are by no means agreed; ſome maintaining, that the term is merely relative, and owing only to the different degrees of heat contained in different bodies; others, that cold is as really and truly a ſubſtance as heat itſelf.

Cold, in medicine, ariſes from obſtructed perſpiration, and is found to be productive of inflammatory diſorders.

Cold *Finch*, in ornithology, the name of a bird of the œnanthe kind, common about the Peak in Derbyſhire.

COLDENIA, a genus of the tetragynia order, belonging to the tetrandria claſs of plants. There is but one ſpecies, a native of India.

COLE *Fiſh*, a name of a fiſh of the whiting kind.

Cole *Mouſe*, in ornithology, the ſmalleſt bird of the titmouſe kind.

Cole *Pearch*, in ichthyology, a name given to a ſmall fiſh, much eſteemed about Dantzick for its delicate flavour.

Cole *Seed*, the ſeed of the napus ſativa, or long rooted, narrow leaved rapa, called in Engliſh navew, and reckoned by Linnæus among the braſſicas, or cabbage kind.

COLEOPTERA, or beetle tribe, the name of Linnæus's firſt order of inſects, comprehending thoſe with four wings; the external pair of which are hard, rigid, and opake, and form a kind of caſe for the interior pair; add to this, that the mouth conſiſts of two tranſverſe jaws.

These animals are known in England by the general name of beetles; of which authors have eſtabliſhed a great many genera, from the different figures of their *antennæ*, or horns, and other general diſtinctions; ſuch are the *ſcaracbæus*, or beetle properly ſo called, the *dermeſtes*, *caſſida*, *coccinella*, *chryſomela*, *dytiſcus*, *tenebrio*, &c.

COLEWORTS, in gardening; the common colewort, or Dorſetſhire kale, is cultivated near London; where the markets are uſually ſupplied with cabbage plants inſtead of them. Indeed, where farmers ſow coleworts to feed their milch cattle in the ſpring, when there is a ſcarcity of herbage, the common colewort is to be preferred, as being ſo very hardy that no froſt will deſtroy it.

COLIC, in medicine, a ſevere gnawing pain, felt in the lower venter; ſo called, becauſe the ordinary ſeat of the diſorder was anciently ſuppoſed to be in the inteſtine colon.

Phyſicians uſually diſtinguiſh four kinds of *colics*, the *bilious*, *inflammatory*, *windy*, and *nephritic*.

Bilious **Colic**, proceeds from ſharp, ſtimulating humours in the inteſtines.

Inflammatory **Colic**, ariſes from an inflammation of the ſtomach and bowels.

Wind **Colic**, is produced by windy vapours, which ſwell and diſtend the inteſtines in which they are incloſed.

Nephritic **Colic**, is that felt particularly in the reins. The *pareira brava* is ſaid to be a ſpecific for nephritic caſes.

COLIN, in ornithology, the name of an American bird, called by moſt authors a quail, but ſuppoſed by Nieremberg, to be rather a ſpecies of partridge. There are ſeveral diſtinct ſpecies of this bird, all very common in the Spaniſh Weſt Indies, very well taſted, and much valued at table.

COLLAR, an ornament worn by the knights of ſeveral orders, hanging over their ſhoulder, on the mantle; and its figure drawn around their armories. See HERALDRY. Plate IV.

Collar, is likewiſe that part of the harneſs which is round a horſe's neck; the part of the dreſs which ſurrounds the neck.

COLLATERAL, in geography, any thing, place, country, &c. ſituate by the ſide of another.

The word is compounded of *con*, *with*, and *latus*, *ſide*.

Collateral *Points*, in coſmography, the intermediate points; or thoſe between the cardinal points.

Collateral *Winds*, are thoſe blowing from collateral points. Such are the north eaſt, ſouth eaſt, north weſt, ſouth weſt, &c. with their ſubdiviſions.

Collateral, in genealogy, is underſtood of thoſe relations which proceed from the ſame ſtock, but not in the ſame line of aſcendants, or deſcendants; but being, as it were, aſide of each other.

Collateral *Aſſurance*, in law, is a bond, or other ſecurity, made over, and beyond the deed itſelf, for the performance of covenants between man and man; thus called, as being external, and without the nature and eſſence of the covenant.

COLLATION, in canon law, the conferring, or beſtowing a benefice by a biſhop, who has it in his own gift, or patronage and this he does, *jure pleno*.

Collation differs from inſtitution, in that the latter is performed by the biſhop, at the motion or preſentation of another: and the former on his own motion.

Collation, in common law, is the compariſon, or preſentation of a copy to its original, to ſee whether or no it be conformable: or the report, or act of the officer who made the compariſon.

Cold **Collation**, a light ſupper, compoſed chiefly of fowls, lobſters, ſallads, tarts, creams, ice, and confectionary of various kinds, and ſerved up at aſſemblies, and upon other feſtive occaſions.

Collation *of Seals*, denotes one ſeal ſet on the ſame label, on the reverſe of the other.

COLLEAGUE, a companion, partner, or aſſociate in the ſame office, or magiſtrature.

COLLECT, **Collection**, a voluntary gathering of money for ſome pious or charitable purpoſe.

Collect, in the liturgy of the church of England, and the maſs of the Romaniſts, denotes a prayer accommodated to any particular day, occaſion, or the like.

COLLECTION, *Collectio*, in logic, a term uſed by ſome for what is commonly called ſyllogiſm, and ratiocination.

COLLECTIVE *Idea*, in logic, is a complex idea, which unites many ideas of the ſame kind under one name, or under one view: as army, dictionary, flock, &c.

Collective, in grammar, a term applied to the word that expreſſes a multitude; though itſelf be ſingular.

COLLECTOR, in general, denotes a perſon who gets or brings together things, formerly diſperſed and ſeparated.

Collector, a perſon nominated by the commiſſioners of any duty, the inhabitants of a pariſh, or the like, to raiſe or gather any tax, &c.

COLLEGATORY, in the civil law, a perſon who has a legacy left him in common with one or more other perſons.

COLLEGE, an aſſemblage of ſeveral bodies or ſocieties, or of ſeveral perſons into one ſociety.

There are various colleges among the moderns, founded on the model of thoſe of the ancients. Such are the three colleges of the empire, viz.

College *of Electors, or their Deputies*, aſſembled in the diet of Ratiſbon.

College *of Princes*; the body of princes, or their deputies, at the diet of Ratiſbon.

College *of Cities*, is, in like manner, the body of deputies which the imperial cities ſend to the diet.

College *of Cardinals*, or the *Sacred* **College**; a body compoſed of the three orders of cardinals.

College is alſo uſed for a public place endowed with certain revenues, where the ſeveral parts of learning are taught.

An aſſemblage of ſeveral of theſe colleges conſtitute an univerſity. The erection of colleges is part of the royal prerogative, and not to be done without the king's licenſe.

The eſtabliſhment of colleges or univerſities, is a remarkable period in literary hiſtory. The ſchools in cathedral and monaſtries confined themſelves chiefly to the teaching of grammar. There were only one or two maſters employed in that office. But, in colleges, profeſſors are appointed to teach all the different parts of ſcience.

College *of Civilians*, commonly called Doctors Commons, founded by Dr. Hervey, dean of the arches, for the profeſſor of the civil law reſiding in the city of London. The judges of the arches, admiralty, and prerogative court, with ſeveral other eminent civilians, commonly reſide here.

To this college belong 34 proctors, who make themſelves parties for their clients, manage their cauſes, give licenſes for marriages, &c.

In the common-hall of Doctors Commons are held ſeveral courts, under the juriſdiction of the civil law; particularly the high court of admiralty, the court of delegates, the arches court of Canterbury,

bury, and he prerogative court of Canterbury, whoſe terms for ſitting are much like thoſe at Weſtminſter, every one of them holding ſeveral court days; moſt of them fixed and known by preceding holidays, and the reſt appointed at the judge's pleaſure.

College *of Phyſicians*; a corporation of phyſicians in London, whoſe number, by charter, is not to exceed 80. The chief of them are called fellows; and the next candidates, who fill up the places of fellows as they become vacant by death or otherwiſe. Next to theſe are the honorary fellows; and laſtly, the licentiates; that is, ſuch as being found capable, upon examination, are allowed to practiſe phyſic.

The college is governed by a preſident, four cenſors, and 12 electors.

Edinburgh College *of Phyſicians* was erected on the 29th of November, 1681. The deſign of this inſtitution was, to prevent the abuſes daily committed by foreign and illiterate impoſters, quacks, &c.

Edinburgh College *of Surgeons*. This is but a very late inſtitution, by which the ſurgeons of Edinburgh are incorporated into a Royal College, and authoriſed to carry into execution a ſcheme for making proviſion for their widows and children, &c.

College *of Juſtice*, the ſupreme civil court of Scotland, otherwiſe called Court of Seſſion, or, of Council and Seſſion.

Sion College, or the college of the London Clergy, was formerly a religious houſe, next to a ſpital or hoſpital; and now it is a compoſition of both, viz. a college for the clergy of London, who were incorporated in 1631, at the requeſt of Dr. White, under the name of the Preſident and Fellows of Sion College; and an hoſpital of 10 poor men; the firſt within the gates of the houſe, and the latter without.

This college conſiſts of a preſident, two deans, and four aſſiſtants, who are annually choſen from among the rectors and vicars in London, ſubject to the viſitation of the biſhop. They have one of the fineſt libraries in England, built and ſtocked by Mr. Simpſon, chiefly for the clergy of the city, without excluding other ſtudents on certain times; they have alſo a hall with chambers for the ſtudents, generally filled with the miniſters of the neighbouring pariſhes.

College *of Heralds*, commonly called the Herald's Office; a corporation founded by charter of king Richard III. who granted them ſeveral privileges.

This college is ſubordinate to the earl marſhal of England. They are aſſiſtants to him in his court of chivalry, uſually held in the common hall of the college, where they ſit in their rich coats of his majeſty's arms.

COLLEGIATE, or Collegial *Churches*, are thoſe which have no biſhop's ſee, yet have the ancient retinue of the biſhop, the canons and prebends. Such are Weſtminſter, Windſor, &c. governed by deans and chapters.

COLLET, among jewellers, the ſmall horizontal plane, or face, at the bottom of the brilliant.

COLLETICS, Colletica, in medicine, ſuch remedies as join and glue together the ſeparated parts, or lips of a wound, or ulcer; and thus re-eſtabliſh them in their natural union.

The word comes from κολλητικος, ſomething that has the virtue of gluing together; of *κολλα, gluten*.

COLLIERS, are veſſels employed to carry coals from one port to another; and ſerving as an excellent nurſery for ſeamen.

The moſt remarkable colliery, or coal work, that we have ever had in this iſland, was that wrought at Burrowſtoneneſs, under the ſea.

This famous colliery belonged to the earl of Kinkardin's family. This coal pit continued to be wrought many years to the great profit of the owners, and the wonder of all thoſe that ſaw it; but, at laſt, an unexpected high tide drowned the whole at once, and the labourers had not time to eſcape, but periſhed in it. Phil. Tranſ. N° 93.

COLLIMATION, *Line of*, in a teleſcope, is a line paſſing through the interſection of thoſe wires, which are fixed in the focus of the object glaſs and the centre of the ſame glaſs. It is alſo called the line of ſight.

COLLINSONIA, in botany, a genus of the monogynia order belonging to the decandria claſs of plants. There is but one ſpecies, a native of North America, but poſſeſſed of no remarkable properties.

COLLIQUAMENTUM denotes a very tranſparent fluid, obſervable in an egg two or three days after incubation, containing the firſt rudiments of a chick. It is incloſed in its own proper membrane, diſtinct from the albumen. Harvey calls it *oculus*.

COLLIQUATION, in chymiſtry, is applied to animal, vegetable, and mineral ſubſtances, tending towards fuſion.

Colliquation, in phyſic, a term applied to the blood, when it loſes its craſis or balſamic texture; and to the ſolid parts, when they waſte away, by means of the animal fluids flowing off through the ſeveral glands, and particularly thoſe of the ſkin, faſter than they ought: which occaſions fluxions of many kinds, but moſtly profuſe, greaſy, and clammy ſweats.

COLLIQUATIVE *Fever*, in phyſic, a fever attended with a diarrhœa, or with profuſe ſweats.

COLLISION, the ſtriking of one hard body againſt another; or the friction or percuſſion of bodies moving violently with different directions, and daſhing againſt each other.

COLLUSION, in law, a ſecret underſtanding between two parties, who plead or proceed fraudulently againſt each other, to the prejudice of a third perſon.

COLLYRIUM, in pharmacy, a topical remedy for a diſorder of the eyes; deſigned to cool and repel hot ſharp humours.

They are generally of two kinds; the one liquid, and the other dry. Liquid collyria are compoſed of ophthalmic powders in waters; as roſe water, plantain water, or that of fennel, eyebright, &c. wherein tutty, white vitriol, or ſome other proper powder, is diſſolved.

The dry coillerium is troches of rhaſis, ſugar candy, tutty prepared, &c. blown into the eye.

COLOBOMA, in medical writers, is uſed for the preter-natural growing together of the lips or eyelids, or for the adheſion of the ears to the head.

COLOCOLO, in ornithology, a name given by the people of the Philippine iſlands to a ſpecies of bird, called alſo there *caſſili*, and by ſome authors, the water raven, *corvus fluviatilis*. It is very much of the ſhape of a common raven, but it is truly an amphibious bird, living more of its time under water than in the air.

COLOCYNTHIS, in botany, the name of a genus of plants of the gourd kind, of which there are many ſpecies, the Coloquintida of the ſhops being the pulp of one of them. In the Linnæan diſtribution, it is a ſpecies of the cucumber, or cucumis. The characters which diſtinguiſh this genus from the others of the ſame claſs, are, that the leaves are very deeply divided, and the fruit is not eatable, but of an intolerable bitterneſs.

COLOGNE *Earth*, a ſubſtance uſed in painting, as a water colour, much approaching to amber in its ſtructure, and of a deep brown. It has generally been eſteemed a genuine earth, but has been diſcovered to contain a great deal of vegetable matter.

COLON, in anatomy, the firſt and moſt conſiderable of the large inteſtines. See Anatomy, Part V. Sect. VI.

Colon, in grammar, a point, or character, formed thus [:] ſerving to mark a pauſe, and to divide the members of a period.

COLONEL, in military matters, the commanders in chief of a regiment, whether horſe, foot or dragoons.

A colonel may lay any officer of his regiment in arreſt, but muſt acquaint the general with it; he is not allowed a guard, only a centry from the quarter guard.

Colonel *Lieutenant*, he who commands a regiment of guards, whereof the king, prince, or other perſon of the firſt eminence, is colonel. Theſe colonel-lieutenants have always a colonel's commiſſion, and are uſually general officers.

Lieutenant Colonel, the ſecond officer in a regiment, who is at the head of the captains, and commands in the abſence of the colonel.

COLONNADE, in architecture, a periſtyle of a circular figure; or a ſeries of columns diſpoſed in a circle, and inſulated within ſide.

COLONY, Colonia, a company of people of all ſexes and conditions, tranſported into a remote province, in order to cultivate and inhabit it.

Such is the laſt colony planted in New Holland at Port Jackſon, near Botany Bay, for the reception of the convicts. For a particular account of which, ſee N° I. Bankes's Geography.

COLOPHONY, in natural hiſtory, and chymiſtry, a reſinous ſubſtance prepared of turpentine, by boiling it in water. When cold, it becomes of a hard conſiſtence, and has the ſame properties as other reſins, and the ſame principles may be obtained from it by analyſis.

COLOQUINTIDA, or Colocynthis, uſually called bitter apple, is brought to us from Aleppo and the iſland of Crete. If a hole is made in one of theſe ripe gourds, and a glaſs of rum poured in, and ſuffered to remain 24 hours, it proves a powerful purgative. The pulp itſelf dried and powdered is commonly uſed as a purgative in this country, but is one of the moſt draſtic and diſagreeable we know. If taken in a large doſe, it not only often brings away blood, but produces colics, convulſions, ulcers in the bowels, and fatal ſuper-purgations. The moſt effectual corrector of theſe virulent qualities is to triturate it finely with ſugar, or ſweet almonds.

COLORISATION, or Coloration, in pharmacy, a term applied to the ſeveral changes of colour which bodies undergo in the various operations of nature, or art; as by fermentations, lotions, coctions, calcinations, &c.

COLOSSUS, a ſtatue of enormous or gigantic ſize. The moſt eminent of this kind was the Coloſſus of Rhodes; a ſtatue of Apollo deemed one of the wonders of the world, ſo high, that ſhips paſſed with full ſails betwixt its legs. It was the workmanſhip of Chares, a diſciple of Lyſippus; who ſpent 12 years in making it: it was at length overthrown by an earthquake, after having ſtood 1360 years. Its height was ſixſcore and ſix feet.

When the Saracens became poſſeſſed of the iſland, A. D. 672, the ſtatue was found proſtrate on the ground: they ſold it to a Jew, who loaded nine hundred camels with the braſs, which amounted to ſeven hundred and twenty thouſand pounds weight.

COLOUR, in phyſics, a property inherent in light, by which, according to the various ſizes of its parts, or from ſome other cauſe, it excites different vibrations in the optic nerve; which propagated to the ſenſorium, affect the mind with different ſenſations.

Colour, in painting, is applied both to the drugs, and to the tints produced by thoſe drugs variouſly mixed and applied.

The mineral colours are thoſe which being drawn from metals, &c. are able to bear the fire, and therefore uſed by enamellers. Changeable and permanent colours is another diviſion, which, by ſome, is made of colours.

Changeable colours are ſuch as depend on the ſituation of the objects with reſpect to the eye, as that of a pigeon's neck, taffeties, &c. the firſt however being attentively viewed by the microſcope, each fibre of the feathers appears compoſed of ſeveral little ſquares, alternately red and green, ſo that they are fixed colours.

Difference of **Colour** *of the Human Species.* Few queſtions in philoſophy have engaged the attention of naturaliſts more than the diverſities among the human ſpecies, among which that of colour is the moſt remarkable. The great differences in this reſpect have given occaſion to ſeveral authors to aſſert, that the whole human race have not ſprung from one original; but that as many different ſpecies of men were at firſt created, as there are now different colours to be found among them. It remains, however, a matter of no ſmall difficulty to account for the remarkable variations of colour that are to be found among different nations. On this ſubject Dr. Hunter hath publiſhed a theſis, in which he conſiders the matter more accurately than hath commonly been done, and determines abſolutely againſt any ſpecific difference among mankind. He introduces his ſubject by obſerving, that when the queſtion has been agitated, whether all the human race conſtitute only one ſpecies or not, much confuſion has ariſen from the ſenſe in which the term ſpecies has been adopted. He therefore thinks it neceſſary to ſet out with a definition of the term. He includes under the ſame ſpecies all thoſe animals which produce iſſue capable of propagating others reſembling the original ſtock from whence they ſprung. This definition he illuſtrates by having recourſe to the human ſpecies as an example. And in this ſenſe of the term he concludes, that all of them are to be conſidered as belonging to the ſame ſpecies. And as, in the caſe of plants, one ſpecies comprehends ſeveral varieties depending upon climate, ſoil, culture, and ſimilar accidents; ſo he conſiders the diverſities of the human race to be merely varieties of the ſame ſpecies, produced by natural cauſes. Of the different colours obſervable among mankind, he gives the following view:

Black. Africans under the line. Inhabitants of New Guinea. Inhabitants of New Holland.

Swarthy. The Moors in the northern parts of Africa. The Hottentots in the ſouthern parts of it.

Copper-coloured. The Eaſt Indians.

Red-coloured. The Americans.

Brown-coloured. Tartars, Perſians, Arabs, Africans on the coaſt of the Mediterranean, Chineſe.

Brownish. The inhabitants of the ſouthern parts of Europe; as, Sicilians, Abyſſinians, Spaniards, Turks, and likewiſe the Samoiedes and Laplanders.

White. Moſt of the European nations; as Swedes, Danes, Engliſh, Germans, Poles, &c. Kabardinſki, Georgians, Inhabitants of the iſlands in the Pacific Ocean.

In attempting to inveſtigate the cauſes of theſe differences, our author obſerves, that there can be no diſpute of the ſeat of colour being placed in the ſkin; that it is not even extended over the whole of this, but confined to that part named the cuticle, conſiſting of the epidermis and reticulum; and that it chiefly occupies the latter of theſe. The cuticle is much thicker and harder in black people than in white ones; the reticulum in the latter being a thin mucus, in the former a thick membrane. He concludes that this ſeat of colour in whites is tranſparent, and either totally deprived of veſſels, or only furniſhed with very few; as the yellow colour appearing in the jaundice vaniſhes on the cauſe of the diſeaſe being removed; which is not the caſe with ſtains in the cuticle from gunpowder, or ſimilar cauſes. He next points out three cauſes deſtroying the pellucidity of the cuticle, giving it a brown colour, and rendering it thicker. Theſe are, acceſs of air, naſtineſs, and the heat of the ſun. The influence of each of theſe he proves by many examples; and from theſe he is inclined to conſider the laſt as by much the moſt powerful. If, however, it be admitted that theſe cauſes have this effect, he thinks that all the diverſity of colour, which is to be obſerved among mankind, may be thus accounted for. He remarks, that all the inhabitants of the torrid zone incline more or leſs to a black colour. When we obſerve the differences which occur amongſt them, we muſt at the ſame time remember, that a black colour is not referred to heat alone, but to the other cauſes alſo: and when we attend to the diverſity of temperature that occurs even in the torrid zone, the exiſtence of a white nation there would by no means deſtroy the argument. He is farther of opinion, that the exiſtence of a brown colour, and of conſiderable varieties from white, in the northern and coldeſt parts of Europe, may very eaſily be explained. This he accounts for from the manner of life of the inhabitants, by which they are either expoſed to the inclemency of the air, or to conſtant naſtineſs from ſmoky houſes.

Having thus attempted to account, from natural cauſes, for the varieties which occur among mankind with reſpect to colour, our author obſerves, that, to all this reaſoning, an objection will naturally be made, from conſidering that infants bring theſe marks into the world along with them, before they can be expoſed to any ſuch cauſes. Dr. Hunter imagines, however, that this may readily be explained upon the ſuppoſition that many peculiarities acquired by parents are tranſmitted to their poſterity; and of this, he thinks, no one can entertain the leaſt doubt who attends to hereditary diſeaſes. Thus, gout, ſcrophula, mania, and many other affections, although at firſt induced by particular accidents, will continue to affect families for many generations. In the ſame manner, a parent expoſed to cauſes deſtroying the natural whiteneſs of his complexion, will beget ſwarthy children; and the ſame cauſes continuing to operate upon the ſon, the blackneſs will be increaſed. Thus all the different ſhades may have been at firſt induced, and afterwards continued.

Colour, in heraldry. The colours generally uſed in heraldry are red, blue, black, green and purple, which the heralds call gules, azure, ſable, vert or ſinople, and purpure; tenne or tawny, and ſanguine, are not ſo common: as to yellow and white, called *or*, and *argent*, they are metals, not colours.

The metals and colours are ſometimes expreſſed in blazon by the names of precious ſtones, and ſometimes by thoſe of planets or ſtars.

Colours, in the military art, include the banners, flags, enſigns, &c. of all kinds, borne in the army or fleet.

Colour *of the Clouds*, is thus accounted for by Sir Iſaac Newton. Concluding from a ſeries of experiments, that the tranſparent parts of bodies, according to their ſeveral ſizes, reflect rays of one colour, and tranſmit thoſe of another, he hence obſerves, that when vapours are firſt raiſed, they are divided into parts too ſmall to cauſe any reflection at their ſurfaces, and therefore do not hinder the tranſparency of the air; but when they begin to coaleſce, in order to compoſe drops of rain, and conſtitute globules of all intermediate ſizes, theſe globules are capable of reflecting ſome colours, and tranſmitting others, and thus form clouds of various colours, according to their ſizes.

COLOURING, in painting, the manner of applying, and conducting the colour of a picture; or the mixture of lights and ſhadows, formed by the various colours employed in a painting.

The colouring is one of the principal branches in painting. M. Felibien divides the painter's art into four parts; the drawing the deſign, the compoſition, and the colouring. The colouring ſtrikes the moſt; but among maſters it always gives place to exactneſs of deſign.

Colour *Making*, the art of preparing the different kinds of colours uſed in painting.

Colouring *of Glaſs*. See **Glass**.

Colouring *of Earthen Ware*. See **Glazing**.

Colouring *of Porcelain*. See **Porcelain**.

Colouring *of Spirits*. See **Spirits**.

COLT, in tetrapodology, a young horſe.

Colt's *Foot*, Alpine or foreign, *Cacalia*, in botany, a genus of the ſyngeneſia polygamia æqualis claſs.

COLUBER, in entomology, a genus of ſerpents belonging to the order of amphibia. Linnæus enumerates no leſs than 97 ſpecies under this name, diſtinguiſhed ſolely by the number of ſcuta and ſcutellæ.

COLUMBA *Marina*, in ichthyology, the ſea dove, the name of an Eaſt India fiſh, a ſpecies of the orbis, or moon fiſh.

Columba *Noachi*, a ſmall conſtellation in the Southern hemiſphere, conſiſting of ten ſtars.

COLUMBINE, aquilegia, in botany, a genus of the pontagynia order, belonging to the polyandria glaſs. There are four ſpecies.

COLUMBO *Root*, is produced in Aſia, from whence it was tranſplanted to Columbo, a town in the iſland of Ceylon, whence its name, and from whence all the Eaſt Indies is ſupplied with it.

It is brought into Europe in circular pieces of different ſizes up to three inches diameter.

It has an aromatic ſmell, but is diſagreeably bitter, and ſlightly pungent to the taſte.

It is almoſt a ſpecific in the cholera morbus, nauſea, vomiting, purging, diarrhœa, dyſentery, bilious fever, indigeſtion, want of appetite, acidity in the primæ viæ, and moſt diſorders of the ſtomach and bowels. It is powerfully ſedative, corroborant, and antiſeptic.

COLUMN, in architecture, a round pillar made to ſupport and adorn a building, and compoſed of a baſe, a ſhaft, and a capital. For the deſcription of the five orders of columns, ſee the Syſtem of **Architecture**, and for the repreſentation, ſee the five firſt plates of **Columns**.

Coupled **Columns**, are thoſe diſpoſed, by two and two, ſo as almoſt to touch each other at their baſes, and capitals.

Trajan **Column**, a famous hiſtorical column, erected in Rome, in honour of the emperor Trajan.

Lactary Column, at Rome, according to Feſtus, was a column erected in the herb market, which is now the place Montanara; it had a cavity in its pedeſtal, wherein young children, abandoned by their parents out of poverty or inhumanity, were expoſed, to be brought up at the public expence.

Column, among printers, is half a page, when the page is divided into two parts, from top to bottom; as in this work.

COLUMNÆ *Carneæ*, in anatomy, called alſo lacertuli, and columſtæ cordis, are ſeveral ſmall muſcles in the ventricles of the heart; derived, and, as it were, detached from the parieties of thoſe ventricles, and connected by tendinous extremities to the valves of the heart.

COLUMNEA, in botany, a genus of the angioſpermia order, belonging to the didynamia claſs of plants. There is but one ſpecies, a native of Martinico, of which we have no particular deſcription.

COLUMNELLA, little column, in botany, denotes the ſubſtance that paſſes through the capſule, and connects the ſeveral partitions and ſeeds.

COLUMNIFERI, an order of plants in the Fragmenta Methodi Naturalis of Linnæus.

COLURES, in aſtronomy and geography, two great circles ſuppoſed to interſect each other at right angles, in the poles of the world, and to paſs through the ſolſtitial and equinoctial points of the ecliptic. See Geography.

The word is derived from κολος, *mutilus*, or *truncatus*, and ερα, *tail*; q. d. appearing with his tail cut off; becauſe never ſeen entire above the horizon.

COLYMBUS, in ornithology, a genus belonging to the order of anſeres. The bill has no teeth, is ſubulated, ſtrait, and ſharp-pointed; the teeth are in the throat; the noſtrils are linear, and at the baſe of the bill; and the legs are unfit for walking. This genus includes the grebes and divers. The ſpecies are eleven.

COMA, in medicine, a ſort of ſleepy diſeaſe, otherwiſe called cataphora; always bringing on a violent propenſity to ſleep.

Coma *Berenices*, berenice's hair, in aſtronomy, a conſtellation in the northern hemiſphere, compoſed of ſtars near the lion's tail. This conſtellation conſiſts of three ſtars, according to Ptolemy; of 13, according to Tycho; and of 40, in the Britannic Catalogue.

Coma *Somnolentum*, is when the patient continues in a profound ſleep, and, when awaked, immediately relapſes, without being able o keep open his eyes.

COMARUM, marſh cinquefoil; a genus of the polygynia order, belonging to the icoſandria claſs of plants. There is but one ſpecies, a native of Britain.

Coma, in botany, a ſpecies of fulcra, compoſed of large bracteæ in form of a bruſh of hair, which terminates the ſtalk.

COMB, an inſtrument made of horn, ivory, &c. and uſed for ſeparating and adjuſting the hair, &c.

Comb, in huſbandry, a meaſure of corn, conſiſting of four Wincheſter buſhels: in ſome places the buſhel contains eight gallons and a quart.

Comb, in natural hiſtory, the creſt, or red fleſhy turft growing on the head of a cock.

Comb, in a ſhip, a little piece of timber, ſet under the lower part of the beak head, near the middle: it has two holes in it, and ſupplies to the fore tacks, what the cheſt trees do to the main-tacks; that is, to bring the main tacks aboard.

COMBAT, in a general ſenſe, denotes an engagement, or a difference decided by arms.

Combat, in our ancient law, was a formal trial of ſome doubtful cauſe or quarrel, by the ſwords of baſtons or two champions. This form of proceeding was very frequent, not only in criminal but in civil cauſes; being built on a ſuppoſition that God would never grant the victory but to him who had the beſt right. The laſt trial of this kind in England, was between Donald lord Ray appellant, and David Ramſay, Eſq; defendant; when after many formalities, the matter was referred to the king's pleaſure.

COMBATANT, in heraldry, a term for two beaſts, as lions or boars, borne in a coat of arms in a fighting poſture, erect on their hinder feet, and affrontee, or with their faces toward each other.

COMBINATION, properly denotes an aſſemblage of ſeveral things two by two.

Combination, in mathematics, is the variation or alteration of any number of quantities, letters, or the like, in all the different manners poſſible. See Syſtem of Mathematics.

Combination, in chymiſtry, denotes the union of two bodies of different natures, from which a new compound body reſults.

Combination, in law. Combinations to do unlawful acts are puniſhable before the unlawful acts are executed: this is to prevent the conſequences of combinations and conſpiracies, &c. 9 Rep. 57.

COMBING *of Wool*, in commerce, the drawing or paſſing wool acroſs the teeth of a kind of card, called a comb, to diſpoſe it for ſpinning.

COMBRETUM, in botany, a genus of the octandria monogynia claſs.

COMBUSTION, in chymiſtry, denotes the decompoſition of bodies by the action of fire; or the diſengagement of the phlogiſton or inflammable principle contained in them, from the union of which in larger or leſs quantities, or in various degrees of combination, they are ſaid to be more or leſs combuſtible.

COMEDY, in its proper ſenſe, a dramatic piece, repreſenting ſome agreeable and diverting tranſaction: or an allegorical repreſentation of ſomething in private life, for the amuſement and inſtruction of the audience, in order to recommend virtue and expoſe the vices and follies of mankind, in an humourous and laughable manner.

Comedy may be defined as an image, or repreſentation of the ordinary life of men: it exhibits their common actions and paſſions; expoſes and ridicules their failings, to preſerve the ſpectators from them or to correct them. Cicero defines it the imitation of life, the mirror of cuſtom, and the image of truth.

Comedy has parts of quality and parts of quantity. Of the firſt kind there are four eſſential, the fable, the manners, the ſentiments, and the diction; to which two are added, which only relate to the repreſentation, viz. the muſic and decoration.

The parts of quantity are alſo four. 1. The entrance. 2. The working up of the plot. 3. The full growth of the plot, or the counter-turn. 4. The diſcovery, or unravelling of the plot. Theſe, in the language of the antients, are called the protaſis, epitaſis, cataſtaſis, and cataſtrophe.

Comedy and tragedy were originally one and the ſame thing: their common origin ſee under Tragedy. M. Bereau ſays, comedy took its riſe at Athens, from the happy iſſues or concluſions of tragedies. On this principle, the cataſtrophe ſhould have been the proper criterion, or diſtinguiſhing mark, between tragedy and comedy; and all other differences only accidental.

After the grave and ſerious became ſeparated from the ridiculous, and tragedy and comedy were become two diſtinct arts, people applied themſelves to cultivate the former and neglected the latter; ſo that comedy continued in its infancy, with little improvements, while tragedy grew up to a perfect art: this once arrived at its height, they began to think of cultivating comedy.

With regard to the various changes and revolutions comedy has undergone, it is commonly diſtinguiſhed into three kinds; viz. the ancient, wherein there was nothing ſeigned; the middle, where the ſubject was real, but the names were fictitious; the new, where both names and things are fictitious.

The ancient was that firſt in uſe, when the ſupreme power was in the hands of the people; and when, on that account, the poets were at their full liberty to ſay what they pleaſed, and of whom they pleaſed; by name to rail at people in authority, and openly to charge magiſtrates with crimes; ſparing no age, ſex, or quality. This is very obſervable in the frogs, and the clouds of Ariſtophanes; where it is to be noted, that though the railing part was occaſional diſtributed among all the actors, yet the chief of it was laid on the chorus.

The acts are divided into ſcenes: the number whereof is not fixed, but depends on the buſineſs to be done in each act, the number of perſons to be repreſented in each act, and the number of perſons to be employed.

In the repreſentation, comedy was diſtinguiſhed from tragedy by the ſock worn in the former, and the buſkin in the latter. Among us comedy is diſtinguiſhed from farce, in that the former repreſents nature as ſhe is: the other diſtorts or overcharges her; they both paint from life, but with different views: the one to make nature known, the other to make her ridiculous.

Dramatic entertainments are compoſed of tragedy, comedy, farce, and opera: the latter is diſtinguiſhed by being interſperſed with ſongs, which in general conſtitute its peculiar merit, or it may be otherwiſe defined as an entertainment in which ſenſe it is rendered ſubſervient to ſound.

COMET, an opaque, ſpherical, and ſolid body like a planet, performing revolutions about the ſun in elliptical orbits, which have the ſun in one of their foci.

There is a popular diviſion of comets into tailed, bearded, and hairy comets: though this diviſion rather relates to the different circumſtances of the ſame comet, than to the phenomina of ſeveral. Thus when the light is weſtward of the ſun, and ſets after it, the comet is ſaid to be tailed, becauſe the train follows it in the manner of a tail: when the comet is eaſtward of the ſun, and moves from it, the comet is ſaid to be bearded, becauſe the light precedes and goes before it, in the manner of a beard. Laſtly, when the comet and the ſun are diametrically oppoſite, (the earth between them), the train is hid behind the body of the comet, except a little that appears round it in form of a border of hair: and from this laſt appearance the word comet is derived; as κομητης, *cometa*, comes from κομη, *coma*, hair. But there have been comets whoſe diſk was as clear, as round, and as well defined, as that of Jupiter, without either tail, beard, or comet. See Astronomy, Sect. XIII. where the nature and phenomena of comets are fully explained.

COMEUS, in mythology, a ſurname of Apollo, under which title he was worſhipped at Seleucia, whence his ſtatue was carried to Rome, and placed in the temple of Apollo Palatine.

COMFREY, ſymphytum, in botany, a genus of plants, of the pentandria monogynia claſs.

COMITATU *Commiſſo*, in law, a writ or commiſſion, by which a ſheriff is authoriſed to take upon him the charge of the county.

COMITATUS, in law, a county. Ingulphus tells us, that England was firſt divided into counties by king Alfred; and the counties into hundreds, and theſe again into tythings; and Forteſcue writes, that *regnum Angliæ per comitatus, ut regnum Franciæ per ballivatus diſtinguitur*. Sometimes it is taken for a territory or juriſdiction of a particular place; as in Mat. Paris, anno 1234.

COMITIA, in Roman antiquity, an aſſembly of the people, either in the *Comitium* or *Campus Martius*, for the election of magiſtrates, or conſulting on the important affairs of the republic.

There were certain days fixed for theſe aſſemblies, called *dies comitiales*, marked with a C in Julius Cæſar's calendar.

There were three kinds of comitia, viz. curiata, centuriata, and tributa; ſo diſtinguiſhed from the manner in which the people voted, and gave their ſuffrages, which was, by curiæ or pariſhes, tribes, or centuries.

Comitia *Curiata*, owe their original to the diviſion which Romulus made of the people into thirty curiæ, which anſwer in moſt reſpects to our pariſhes.

Comitial *Aſſemblies*, held for the election of conſuls, were called conſular comitia. In like manner, the other comitia were named from the officer to be created, whether a tribune, pontiff, ædile, or the like.

The power of calling theſe aſſemblies belonging at firſt only to the kings; but on the eſtabliſhment of the democracy, the ſame privilege was allowed to moſt of the chief magiſtrates, and ſometimes to the pontiffs.

Comitial *Days*, thoſe which were not only regularly deſtined to the aſſemblies of the people, but on which the ſenate alſo might be convened, after the popular aſſemblies were diſſolved, and had the power, whenever they found it expedient, to ſuperſede and poſtpone the aſſemblies of the people to another day, and might appoint their own meetings upon them.

COMMA, in grammar, a point, or character, formed thus [,]; ſerving to mark a ſhort ſtop, or pauſe; and to divide the members of a period.

The word is formed of *κοπτω*, *ſeco*, I cut.

Comma, in muſic, is the ſmalleſt of all the ſenſible intervals of tone. Muſical writers have enumerated three kinds of comma. The greater comma, or the interval of two ſounds, having the ratio of 81 to 80, which is the difference of the major and minor tones. To this the term is commonly applied. It is ſeldom in uſe, except in the theory of muſic, to ſhew the juſtneſs of the concords; for in the practice, the diviſion is drowned and loſt. The ſmaller comma is the difference between the greater and leſſer ſemitones; and the proportion expreſſing it is thereof 2048 to 2025.

COMMAND, authority or power; figuratively the exerciſe of authority, or enforcing obedience. In a military ſenſe, the power of overlooking and taking or annoying a place.

COMMANDER, he that has the direction of, or authority over others. In a military ſenſe, a leader, chief, or officer.

COMMELINA, in botany, a genus of the monogynia order, belonging to the triandria claſs of plants. There are ten ſpecies, all of them natives of warm climates. They are herbaceous plants, riſing from two or four feet high, and adorned with blue or yellow flowers. Their culture differs in nothing from that of the common exotics.

No medicinal properties are attributed to this plant.

COMMEMORATION, the remembrance of any one; or ſomething done in honour of a perſon's memory.

Commemoration is alſo the name of two religious feaſts, otherwiſe called *All Saints*, and *All Souls*. The occaſion of their inſtitution is variouſly related.

COMMENDAM, in the canon law, expreſſes the charge, truſt, and adminiſtration of the revenues of a benefice, given to a layman to enjoy, by way of depoſitum, for the ſpace of ſix months, in order to its being repaired, &c. or to another biſhop, or eccleſiaſtic, to perform the paſtoral offices thereof, till ſuch time as the benefice is provided of a regular incumbent.

Commendatory *Letters*, are ſuch as are written by one biſhop to another in behalf of any of the clergy, or others of his dioceſe travelling thither.

COMMENDATUS, one that lives under the protection of a great man.

COMMENSURABLE *Quantities*, in geometry, which may be meaſured by ſome common meaſure, ſo as to leave no remainder in either.

COMMENTARY, or Comment, an interpretation, affixed to ſome ancient obſcure, or difficult author, to render him more intelligible, or to ſupply what he has left undone.

Commentary alſo ſignifies an expoſition of the ſacred writings of the Old and New Teſtament, as in *Southwell's Bible*, comprizing two volumes in folio; wherein all the difficult paſſages are fully explained and illuſtrated.

Commentary is alſo uſed for a new hiſtory, written by a perſon who had a chief hand in the tranſactions related. Such are the Commentaries of Cæſar, &c.

COMMERCE, the exchange of commodities; or, the buying, ſelling, or trafficking of merchandize, money, or even paper, in order to profit by the ſame.

There is no doubt but commerce is nearly as ancient as the world itſelf; neceſſity ſet it on foot; the deſire of conveniency improved it; and vanity, luxury, and avarice, have brought it to its preſent pitch. At firſt it could only conſiſt in the exchange of things neceſſary for life: the plowman gave his corn and hay to the ſhepherd, and received milk and wool in exchange: which method of commerce by exchange ſubſiſts ſtill in many places; as about the coaſts of Siberia, and the Daniſh and Muſcovite Lapland; among ſeveral nations on the coaſts of Africa; among ſome of thoſe of America, and many of Aſia.

It is not preciſely known when the commerce by buying and ſelling firſt began; nor when coins, and the ſeveral ſpecies of gold, ſilver, and copper, had their riſe. The firſt moneys were leather, and iron; and even at this day, it is the cuſtom in ſome places of both Indies, to give a certain value in coco-nuts, for merchandiſes, drugs, &c.

Of all the nations in Europe, the Engliſh and Dutch, have now the ſuperiority in point of trade. Holland, by the favourable reception it gives to ſtrangers, and the refuge it affords religionaries, enjoys a vaſt trade. As to England, the convenience and multitude of its ports, the goodneſs of its commodities, induſtry and ingenuity of its workmen, &c. have eſtabliſhed its trade, ſo as to admit of no rival but the Dutch. England trades in all parts of the world; nor does any nation drive ſuch a commerce as ſhe does with her own commodities; for the Dutch trade chiefly conſiſts in the tranſportation of foreign goods from one country to another.

A great part of the foreign commerce of England is now carried on by collective companies: ſome incorporated by the king's charters, with an excluſive privilege, as the Eaſt India company; others only private aſſociations, as the Turkey and Hamburgh companies.

COMMINATORY, an appellation given to whatever threatens puniſhment, or ſome penalty: ſuch is that part of a felon's ſentence of baniſhment, which makes it death if he returns before a certain time.

COMMINUTION, denotes the breaking, or rather grinding a body, into very ſmall particles.

COMMISSARY, an officer in the eccleſiaſtical law.

Commissary, in a military ſenſe, is of three ſorts.

Commissary *General of the Muſters*, an officer appointed to muſter the army, as often as the general thinks proper, in order to know the ſtrength of each regiment and company, to receive and inſpect the muſter rolls, and to keep an exact ſtate of the ſtrength of the army.

Commissary *General of the Stores*, an officer in the artillery, who has the charge of all the ſtores, for which he is accountable to the officer of ordnance.

Commissary *General of Proviſions*, an officer who has the charge of furniſhing the army with proviſions.

COMMISSION, in common law, the warrant or letters patent, which all perſons, exerciſing juriſdiction, have to empower them to hear or determine any cauſe or ſuit; as the commiſſion of the judges, &c.

The officers, judicial, miniſterial, naval, and military, of the realm, are made by commiſſion: by means of commiſſion, oaths, cognizance of fines, anſwers in chancery, &c. are taken; witneſſes examined, offices found, &c.

Commission *of Bankruptcy*, a commiſſion under the great ſeal, directed to five or more commiſſioners, to enquire into the particulars of a man's circumſtances, who hath failed, or broke; and to act according to certain ſtatutes made in that behalf.

Commission *of Lunacy*, a commiſſion out of chancery to enquire whether a perſon repreſented to be a lunatic, be ſo or not; that, if lunatic, the king may have the care of his eſtate.

Commission, in trade, by which one perſon undertakes to diſpoſe of a commodity for another, and receives from the proprietor from one to five *per cent.* commiſſion without incurring any riſk.

COMMISSIONER, a perſon authoriſed by commiſſion, letters patent, or other lawful warrant, to examine any matters, or execute any lawful commiſſion.

Beſides thoſe relating to judicial proceedings, there are commiſſioners of the cuſtoms; of the dock yards; of exciſe; of the navy; lords commiſſioners of the treaſury; commiſſioners of trade, &c.

COMMITMENT, in law, the ſending of a perſon to priſon by warrant or order, who hath been guilty of any offence not bailable.

COMMITTEE, in law, one or more perſons, to whom the conſideration of any matter is referred, either by a court, or by conſent of the parties concerned.

Committee *of Parliament*, is a board conſiſting of certain number of members, appointed by the whole houſe for the examining of a bill, or making report of an inquiry, or proceſs of an inquiry, o rproceſs of the houſe, &c.

Sometimes the whole houſe is reſolved into a committee, on which occaſion each perſon has a right to ſpeak, and reply as much, and as often as he pleaſes; an expedient they uſually have recourſe to in extraordinary caſes, and where any thing is to be thoroughly canvaſſed. When the houſe is not in a committee, each gives his opinion regularly, and is only allowed to ſpeak once, unleſs to explain himſelf.

The ſtanding committees, appointed by every new parliament, are thoſe of privileges and elections, of religion, of grievances; of courts of juſtice, and of trade; though only on the former act.

COMMODORE, in the Britiſh marine, a general officer inveſted with the command of a detachment of ſhips of war deſtined on any particular enterprize: during which time he bears the rank of a brigadier general in the army, and his ſhip is diſtinguiſhed by a broad red pendant tapering towards the outer end, and ſometimes forked.

Commodore is alſo a name given to a ſelect ſhip in a fleet of merchantmen, which leads the van in time of war, bearing a light in her top to conduct the reſt.

COMMON, *Communis*, ſomething that belongs to all alike; is owned or allowed by all; and is not confined to one perſon more than another.

Common *Land*, ſignifies that ſoil, the uſe whereof is common to a particular town or lordſhip: or it is a profit that a man hath in the land of another perſon, uſually in common with others; or a right which a perſon hath to put his cattle to paſture into ground that is not his own.

Common, in grammar, denotes the gender of nouns which is equally applicable to both ſexes, male and female.

Common *Place Book* is a regiſter of things which occur worthy to be noted, and retained in the courſe of a man's reading, or ſtudy; ſo diſpoſed, as that among a multiplicity of ſubjects, any one may be eaſily found.

Common *Prayer* is the liturgy in the church of England; ſee Liturgy. Clergymen are to uſe the public form of prayers preſcribed by the Book of Common Prayer; and refuſing to do ſo, or uſing any other public prayer, are puniſhable by ſtat. Eliz. c. ii.

COMMONALTY, the lower of the two diviſions of the civil ſtate.

COMMONER, is uſed for a ſtudent in ſome univerſities, entered in a particular rank.

The word is alſo applied to a member of the Houſe of Commons, in contradiſtinction to a peer.

Commoner, or *Gentleman* **Commoner**, in the univerſities, a ſtudent entered into a certain rank.

COMMONS, or *Houſe* of **Commons**, a denomination given to the lower houſe of parliament.

In theſe elections, anciently, all the people had votes; but king Henry VI. to avoid tumults, firſt appointed, that none ſhould vote for knights but ſuch as were freeholders, did reſide in the county, and forty ſhillings yearly revenue.

The peculiar laws and cuſtoms of the houſe of commons relate principally to the raiſing of taxes, and the elections of members to ſerve in parliament.

Commons is alſo uſed for the ſtated and ordinary diet, or eating, of a college, inn of court, or other ſociety.

COMMONWEALTH. See Republic.

COMMOTION, applied to a ſtate; tumult, diſturbance, ſedition, diſorder, or confuſion ariſing from the turbulent diſpoſition of its members, ſuch as the commotions in France; for a particular account of which, ſee the tranſactions of the year, 1789, in the laſt part of the chronological table in this work.

COMMUNES, in botany, the name of a claſs in Linnæus's methodus calicyna, conſiſting of plants, which, like teazel and dandelion, have a calix or flower-cup common to many flowers or florets. Theſe are the aggregate or compound flowers of other ſyſtems.

COMMUNICATION, the act of imparting knowledge or making one thing connect with another.

COMMUNION, in matters of religion, the being united in doctrine and diſcipline; in which ſenſe of the word, different churches are ſaid to hold communion with each other.

Communion *Service*, denotes that part of the liturgy of the church of England which relates to the adminiſtration of the ſacrament.

COMMUNITY, a ſociety of men living in the ſame place, under the ſame laws, the ſame regulations, and the ſame cuſtoms.

COMMUTATION, in law, the change of a penalty or puniſhment from a greater to a leſs; as when death is commuted for baniſhment, &c.

COMPACT, in philoſophy, is ſaid of bodies which are of a cloſe, denſe, and heavy texture, with few pores, and thoſe very ſmall.

Compact, in a legal ſenſe, ſignifieſan agreement or contract ſtipulated between ſeveral parties.

COMPANY, in a commercial ſenſe, is a ſociety of merchants, mechanics, or other traders, joined together in one common intereſt.

The word is formed of the French *compagnie*, and that of *companio*, or *companies*, which Chifflet obſerves, are found in the Salique law, tit. 66. and are properly military words, underſtood of ſoldiers, who, according to the modern phraſe, are comrades, or meſs mates, i. e. lodge together, eat together, &c. of the Latin *cum, with*, and *panis, bread*. It may be added, that in ſome Greek authors under the Weſtern empire, the word κομπανια occurs in the ſenſe of ſociety.

When there are only two or three joined in this manner, it is called a partnerſhip; the term company being reſtrained to ſocieties conſiſting of a conſiderable number of members, aſſociated together by a charter obtained from the king.

The mechanics of all corporations, or towns incorporated, are thus, erected into companies which have charters of privileges and large immunities. Thoſe of London are very numerous, the principal are:

The Mercers, Grocers, Drapers, Fiſhmongers, Goldſmiths, Skinners, Merchant Taylors, Haberdaſhers, Salters, Ironmongers, Vintners, and Clothiers.

Beſides theſe twelve principal companies of London, there are others very conſiderable.

The following are the principal companies of Merchants, ſome of which trade with joint ſtocks, and all of them enjoy by charter many privileges. However injurious theſe companies at the preſent day may be deemed to the nation in general, it is certain they give riſe to all our foreign commerce; private traders upon their own bottom being diſcouraged from hazarding their fortunes in foreign countries, till the method of traffic had been ſettled by joint ſtock companies; and from this very principle it is, that we find ſeveral nations at preſent endeavouring to extend their trade by the ſame means.

The Turkey, or Levant Company; the Royal African Company, the Hudſon's Bay Company, and the Ruſſia Company, were incorporated at different periods; but their trade is now open to private merchants upon paying a ſmall conſideration to the reſpective companies.

The Eaſt India Company were incorporated in the year 1600, and impowered to trade to all countries lying eaſtward of the Cape of Good Hope. Towards the end of king William's reign, an act of parliament paſſed granting all private merchants, who ſhould raiſe a certain ſum for the ſupply of government, the privilege of trading to theſe parts. Accordingly numbers ſubſcribed, and were called the New Eaſt India Company, which ſoon found it expedient to unite with the old one, and trade with one joint ſtock; ſince which time they have been ſtiled the New Eaſt India Company, and are now in poſſeſſion of many conſiderable forts on the coaſt of Malabar, the Coromandel coaſt, the Bay of Bengal, &c.

The Eaſtland Company, the Greenland Company, the Hudſon's Bay Company, the South Sea Company, have likewiſe their ſeveral charters and privileges for trading to the places from which they take their denominations.

Theſe are the principal trading companies belonging to the crown of Great Britain. Of a ſingular nature are the Dutch Eaſt and Weſt India Companies, the French Eaſt and Weſt India Companies, &c.

As theſe ſeveral companies obtained their charters by the diſburſement of very conſiderable ſums, and are liable to great expences on divers accounts; it would be injuſtice that any other people ſhould trade to the places within their charters, without paying the ſame duties towards the company's charge, as the preſent adventurers pay.

But then there appears to be no reaſon why any of the king's ſubjects ſhould be barred from thoſe places, or forced to pay a great fine for admiſſion, that are willing to pay the company's duties, and ſubmit to their regulations and orders in other reſpects.

Company, in ſea language, denotes the whole crew of a ſhip, including her officers.

Company *of Ships*, is uſed for a fleet of merchant-veſſels, who make a kind of charter-party among themſelves; whereby, under ſeveral clauſes and conditions tending to their common ſafety, they engage not to quit one another, but to defend each other reciprocally, during their voyage.

Rule of **Company**, or *Fellowſhip*, in arithmetic, is a rule whereby we diſcover, or aſcertain, the ſhare of the profits, or loſſes, belonging to the ſeveral partners, or aſſociates, in any enterprize, in proportion to the ſtock each contributed thereto, and the time that ſtock was in bank.

Company, in a military ſenſe, denotes a body of infantry, commanded by a captain.

The French uſe the word indifferently for the horſe, or foot; but the Engliſh appropriate the term troop to a company of horſe.

COMPARATES, *Comparata*, in logic, the terms or ſubjects of a compariſon; or the two things compared to each other.

COMPARATIVE ANATOMY.

The ſubject under our preſent conſideration, though omitted in all Dictionaries of Arts and Sciences publiſhed in England, we deem it of the higheſt importance, and therefore cannot diſmiſs it as others have done without notice; but have appropriated two ſheets of our work to the diſcuſſion of this intereſting ſubject, preſuming it will be more acceptable to ſcientific readers to preſent them with the productions of men of philoſophical knowledge, than tire them with long and tedious definitions of uſeleſs words, obſolete phraſes, and old and rejected theories.

INTRODUCTION.

COMPARATIVE ANATOMY is that branch of anatomy which conſiders the ſecondary objects, or the bodies of other animals; ſerving for the more accurate diſtinctions of ſeveral parts, and ſupplying the defect of human ſubjects.

It is otherwiſe called the anatomy of beaſts, and ſometimes zootomy; and ſtands in contradiſtinction to human anatomy, or that branch of the art which conſiders the human body, the primary object of anatomy.

The principal advantages of comparative anatomy are the following: firſt, it furniſhes us with a ſufficient knowledge of the different parts of animals, to prevent our being impoſed upon by thoſe authors who have delineated and deſcribed ſeveral parts from brutes as belonging to the human body. Secondly, it helps us to underſtand ſeveral paſſages in the ancient writers in medicine, who have taken many of their deſcriptions from brutes and reaſoned from them. The third and great uſe we reap from this ſcience, is the light it caſts on ſeveral functions in the human œconomy, about which there have been ſo many diſputes among anatomiſts. There is then no occaſion for a complete oſteology, myology, &c. of the animals we ſhall treat of, nor need we trouble ourſelves about the ſtructure of any of the parts, unleſs when it ſerves to illuſtrate ſome of the forementioned purpoſes.

That the firſt uſe we propoſed from examining the ſtructure of the parts in brutes is real and of conſequence, is evident from looking into the works of ſome of the earlieſt and greateſt maſters of anatomy, who for want of human ſubjects have often borrowed their deſcriptions from other animals. The great Veſalius, although he juſtly reproves Galen for this fault, is guilty of the ſame himſelf, as is plain from his delineations of the kidneys, uterus, the muſcles of the eyes, and ſome other parts. Nor is antiquity only to be charged with this, ſince in Willis's Anatomia Cerebri (the plates of which were reviſed by that accurate antomiſt Dr. Lower) there are ſeveral of the pictures taken from different brutes, eſpecially the dog, beſides thoſe he owns to be ſuch. We ſhall give ſeveral examples of the ſecond uſe in the ſequel of this Syſtem.

The animal kingdom, as well as the vegetable, contains the moſt ſurpriſing variety, and the deſcent in each is ſo gradual, that the little tranſitions and deviations are almoſt imperceptible. The bat and flying ſquirrel, though quadrupeds, have wings to buoy themſelves up in the air. Some birds inhabit the waters, and there are fiſhes that have wings, and are not ſtrangers to the airy regions; the amphibious animals blend the terreſtrial and aquatic together.

As there is then ſuch a vaſt variety, it is not only needleſs but impoſſible to conſider all of them particularly. We ſhall take only ſome of the moſt remarkable genera, and hope from what will be ſaid of them, any of the intermediate degrees may be underſtood.

In treating of quadrupeds, we ſhall divide them into the carnivorous, i. e, thoſe that feed indifferently on animal and vegetable ſubſtances, and granivorous; as an inſtance of theſe laſt we ſhall take the ruminant kind. The fowls we ſhall alſo divide into thoſe that feed on grain, and thoſe that feed on fleſh. The diſtinction we ſhall make in treating of fiſhes, ſhall be of thoſe that have lungs, and thoſe that have them not. The firſt indeed are with difficulty procured, and at the ſame time differ very little from quadrupeds. As the ſtructure of inſects is ſo very minute, and lends us but little aſſiſtance for the ends propoſed, we purpoſely omit them.

In inquiring into the ſtructure of different animals, we ought to be previouſly acquainted with the form of their body, manner of life, kind of food; or in ſhort, with their natural hiſtory, which will lead us to account for the reaſon of their different ſtructure, and thence explain the actions of the human body.

SECT. I.

ANATOMY OF QUADRUPEDS.

All quadrupeds have a covering of hair, wool, &c. to defend them from the injuries of the weather, which varies in thickneſs according to the ſeaſon of the year, and difference of the climate: thus in Ruſſia and the northern countries, the furs are very thick and warm, while the little Spaniſh lap dogs and Barbary cows, have little or no hair at all.

Moſt part of quadrupeds want clavicles, whereby their anterior extremities fall upon their cheſt, ſo as to make their thorax proportionally narrower than the human. This ſmall diſtance of their anterior extremities is very neceſſary for their uniform progreſſion: monkies indeed and ſquirrels have clavicles to allow them a more full uſe of their extremities in climbing, but when they ſit down on all-four they walk but indifferently.

We may firſt obſerve of the dog, as indeed of moſt quadrupeds, that its legs are much ſhorter in proportion to its trunk than in man, the length of whoſe ſteps depends entirely on the length of his inferior extremities; however, to balance this, his ſpine is more flexible, by which he is able at each ſtep to bring his poſterior extremities nearer to his anterior. The dogs common teguments are much a-kin to thoſe of other quadrupeds, only they allow little or no paſſage for ſweat, but when he is overheated the ſuperfluous matter finds an exit by the ſalivary glands, for he lolls out his tongue and ſlavers plentifully.

The pyramidal muſcles are wanting, to ſupply which the rectum is inſerted fleſhy into the os pubis.

The omentum reaches down to the os pubis, which conſidering the poſture of the animal we find to be a wiſe proviſion, ſince its uſe is to ſeparate an oily liquor for lubricating the guts and facilitating their periſtaltic motion; ſo in our erect poſture the natural gravity of the oil will determine it downward, but in the horizontal poſition of theſe creatures, if all the inteſtines were not covered, there would be no favourable derivation of the fluid to the guts lying in the poſterior part of the abdomen, which is the higheſt; and beſides, had the omentum reached much farther down in us, we had been in continual hazard of an epiplocele, which the dog is not ſubject to, as his viſcera do not preſs ſo much on the rings of the abdominal muſcles.

This animal's ſtomach, though pretty much reſembling the human in its ſhape, is ſomewhat differently ſituated. It lies more longitudinal, as indeed all the other viſcera do to accommodate themſelves to the ſhape of the cavity in which they are contained, that is, its inferior orifice is much farther down with reſpect to the ſuperior than the human: by this means the groſs food has an eaſier paſſage into the duodenum. It ſeems to be much larger in proportion to the bulk of the animal than the human, that it might contain a greater quantity of food at once, which was very neceſſary, ſince this animal cannot at any time get its ſuſtenance as men do. The turbillion is not ſo large, nor is there any coarction forming the antrum Williſii as in the ſtomach of man. It is conſiderably thicker and more muſcular than ours for breaking the coheſion of their food, which they ſwallow without ſufficient chewing. Hence it is evident the force of the ſtomach is not ſo great as ſome have ſuppoſed, nor the contraction ſo violent; otherwiſe that of dogs would be undoubtedly wounded by the ſharp bones, &c. they always take down; for the contraction here is ſtill greater than in the human ſtomach, which is much thinner.

The inteſtines of this animal are proportionally much ſhorter than ours; for the food which theſe creatures moſtly uſe, ſoon diſſolves and then putrifies; on which account there was no occaſion for a long tract of inteſtines, but on the contrary that it ſhould be quickly thrown out of the body: the ſame is to be obſerved of all the carnivorous animals. The muſcular coat of the inteſtines is alſo ſtronger than the human, to protrude the hard bones, leſt they ſhould ſtop ſomewhere in the canal.

The duodenum differs conſiderably in its ſituation from the human; it is fixed as the pylorus to the concave ſurface of the liver, and hangs looſe and pendulous with the meſentery backwards into the cavity of the abdomen, then turning up again is fixed to the back bone, where it ends in the jejunum.

All animals that live on vegetable food, have not only their ſmall guts conſiderably longer, but alſo their great guts more capacious than ſuch creatures as feed on other animals. Hence man from this form of his inteſtines and that of the teeth, ſeems to have been originally deſigned for feeding on vegetables, and ſtill the moſt of his food is of that claſs.

The reaſon of this difference ſeems to be, that as animal food is not only much more eaſily reduced into chyle, but alſo more prone to putrefaction, too long a remora of the juices might occaſion the worſt conſequences. So it was neceſſary that their receptacles ſhould not be too capacious, but on the contrary, being ſhort and narrow, might conduce to the ſeaſonable diſcharge of their contents. Whereas vegetable food being with more difficulty diſſolved and converted into an animal nature, there was a neceſſity for ſuch creatures as fed on it to be provided with a long internal canal, that this food in its paſſage might be conſiderably retarded, and have time to change its indoles into one more agreeable to our nature. Beſides which, there is another advantage which accrues to man in particular, from having his great guts very capacious; for as he is a rational being, and moſtly employed in the functions of ſocial life, it would have been very inconvenient for him to have been too frequently employed in ſuch ignoble exerciſes, ſo that having this large reſervoir for his fæces alvinæ, he can retain them for a conſiderable time without any trouble.

The human liver has no fiſſures or diviſions, unleſs we reckon that ſmall one betwixt the two pylæ, where the large veſſels enter: whereas in a dog and all other creatures that have a large flexion in their ſpine, as lions, leopards, cats, &c. the liver and lungs are divided into a great many lobes by deep ſections, reaching the large blood-veſſels, which in great motions of the back-bone may eaſily ſhuffle over one another, and ſo are in much leſs danger of being torn or bruiſed than if they were formed of one entire piece, as we really ſee it is in horſes, cows, and ſuch creatures as have their back-bone ſtiff and immoveable. There is here no ligamentum latum connecting the liver to the diaphragm, which in our ſituation was neceſſary to keep the viſcus in its place; whereas in a dog it naturally gravitates forwards, and by the horizontal poſition of the animal is in no danger of preſſing againſt the vena cava: the preventing of which is one uſe generally aſſigned to this ligament in man. Had the liver of the dog been thus connected to the diaphragm, the reſpiration muſt neceſſarily have ſuffered.

We come next, after having examined the chylopoietic viſcera, to diſcourſe of thoſe organs that ſerve for the ſecretion and excretion of urine, and firſt of the kidneys, which in this animal are ſituated much in the ſame way as in the human ſubject, but have no fat on their inferior ſurface, where they face the abdomen, and are of a more globular form than the human. The reaſon of theſe differences will eaſily appear, if you compare their ſituation and poſture in this animal with thoſe in a man who walks erect. They are placed in this ſubject in the inferior part of the body, ſo are not liable to the preſſure of the viſcera, which ſeems to be the principal cauſe of the fatneſs of thoſe organs in us; and perhaps may likewiſe be the cauſe of our being more ſubject to the ſtone than other animals. Hence there is no need of any cellular ſubſtance to ward off this preſſure where there would neceſſarily be fat collected; but the ſuperior part of their kidneys is pretty well covered with fat, leſt they ſhould ſuffer any compreſſion from the action of the ribs and ſpine.

In the internal ſtructure there is ſtill a more conſiderable difference; for the papillæ do not here ſend out ſingle the ſeveral tubuli uriniferi, but being all united they hang down in form of a looſe pendulous flap in the middle of the pelvis, and form a kind of ſeptum medium; ſo that a dog has a pelvis formed within the ſubſtance of the kidney. The only thing that is properly analogous to a pelvis here, is that ſac or dilatation of the ureters formed at the union of the ductulæ uriniferæ. The reaſon of theſe particularities may probably be, that the liquors of this animal, as of all thoſe of the carnivorous kind, being much more acrid than thoſe that live on vegetable food, its urine muſt incline much to an alcaleſcency; as indeed the ſmell and taſte of liquor in dogs, cats, leopards, &c. evidently ſhew, being fetid and pungent, and therefore not convenient to be long retained in the body. For this end it was proper, that the ſecerning organs ſhould have as little impediment as poſſible by preſſure, &c. in the performing their functions; and for that deſign, the mechaniſm of their kidneys ſeems to be excellently well adapted: we have moſt elegant pictures in Euſtachius of the kidneys of brutes delineated, as ſuch, with a view to ſhew Veſalius's error in painting and deſcribing them for the human.

The glandulæ or capſulæ atrabilariæ, are thicker and rounder than the human, for the ſame reaſon as the kidneys.

The ureters are more muſcular than the human, becauſe of the favourable paſſage the urine has through them: they enter the bladder near its fundus.

The bladder of urine differs conſiderably from the human; and firſt in its form, which is pretty much pyramidal or pyriform: this ſhape of the dog's bladder is likewiſe common to all quadrupeds, except the monkey and thoſe of an erect poſture. In men it is by no means pyriform, but has a large ſac at its poſterior and inferior part: this form depends entirely on the urine gravitating in our erect poſture to its bottom, which it will endeavour to protrude; but as it cannot yield before, being contiguous to the os pubis, it will naturally ſtretch out where there is the leaſt reſiſtance, that is, at the poſterior and lateral parts; and were it not for this ſac we could not come at the bladder to extract the ſtone either by the leſſer or lateral operation of lithotomy. Moſt anatomiſts have delineated this wrong, ſo that ſcarce any have juſtly painted it.

To ſupply this defect, Mr. HALL, *Author of the Syſtem of* ANATOMY *in this work, furniſhed the draughtſman with a preparation from the dead ſubject, in order to delineate it with the utmoſt accuracy. We ſhall not ſay any thing in commendation of it, but only remark, that it is executed by Mr. Birnie, anatomical draughtſman to the late Dr. Hunter, whoſe abilities in this line are too well known to need any comment. For the repreſentation of this, the Reader is referred to the Plate of the Male Organs of Generation.*

As to its connection, it is faſtened to the abdominal muſcles by a proceſs of the peritoneum, and that membrane is extended quite over it; whereas in us its ſuperior and poſterior parts are only covered by it: hence in man alone the high operation of lithotomy can be performed without hazard of opening the cavity of the abdomen. Had the peritoneum been ſpread over the bladder in its whole extent, the weight of the viſcera in our erect poſture would have ſo bore upon it, that they would not have allowed any conſiderable quantity of urine to be collected there; but we muſt have been obliged to diſcharge its contents too frequently to be conſiſtent with the functions of a ſocial life. Whereas by means of the peritoneum the urine is now collected in ſufficient quantity, the viſcera not gravitating this way.

It may be taken for a general rule, that thoſe creatures that feed upon animal food have their bladder more muſcular and conſiderably ſtronger, and leſs capacious than thoſe that live on vegetables, ſuch as horſes, cows, &c. whoſe bladder of urine is perfectly membranous, and very large. This is wiſely adapted to the nature of their food; for in theſe firſt, as all their juices are more acrid, ſo in a particular manner their urine becomes exalted, which as its remora might be of very ill conſequence muſt neceſſarily be quickly expelled. This is chiefly effected by its ſtimulating this viſcus more ſtrongly to contract, and ſo diſcharge its contents. That a ſtimulus is one of the principal cauſes of the excretion of urine, we learn from the common ſaline diuretic medicines that are given, which are diſſolved into the ſerum of the blood, and carried down by the kidneys to the bladder: the ſame appears likewiſe from the application of cantharides, or without any of theſe, when the parts are made more ſenſible, as in excoriation of the bladder, there is a frequent deſire to make water. Accordingly we find theſe animals evacuate their urine much more frequently than man, or any other creature that lives on vegetable food. And if theſe creatures, whoſe fluids have already a tendency to putrefaction, are expoſed to heat or hunger, the liquids muſt for a conſiderable time undergo the actions of the containing veſſels, and frequently perform the courſe of the circulation without any new ſupplies of food; by which the fluids becoming more and more acrid, the creature is apt to fall into feveriſh and putrid diſeaſes. Theſe cauſes have been thought ſufficient to produce that fatal and melancholy diſtemper the *rabies canina, vulpina*, &c. in ſuch animals; whereas thoſe that feed on vegetable food ſeldom or never contract theſe diſeaſes but by infection. That the cauſes commonly aſſigned for the rabies canina are inſufficient to produce it in dogs and other animals of that kind, is denied in a diſſertation on this diſeaſe by Dr. Heyſham. That heat is inſufficient, he proves from the diſeaſe being totally unknown in South America, where the heat is much greater than in this country. Putrid aliment he alſo ſays is taken in great quantity by dogs without any inconvenience; and as it ſeems in this ſtate to be moſt agreeable to them, the rabies canina cannot with any probability be aſcribed to it. As to want of water, he obſerves that the diſeaſe often originates among dogs that are plentifully ſupplied with that element, while others long deprived of it have remained perfectly free. In ſhort, Dr. Heyſham totally denies, not only the efficacy of the cauſes commonly aſſigned for the rabies canina, but the nature of the diſtemper itſelf; and conjectures that the cauſe of it is not a putreſcency but an acidity of the fluids.

The ſcrotum in the dog is ſhorter and not ſo pendulous as the human, this it has in common with all the dog kind that want the veſiculæ ſeminales, who have it pretty cloſe tucked up, that the ſeed at each copulation might the ſooner be brought from the teſtes, thus in ſome meaſure ſupplying the place of the veſiculæ ſeminales; for the courſe of the ſeed through the vaſa deferentia is thus ſhortened by placing the ſecerning veſſels nearer the excretory organs. This at the ſame time explains the reaſon why this creature is ſo tedious in copulation.

The ſtructure of the teſticles is much the ſame with the human; as are likewiſe the corpus pyramidale varicoſum or pampiniforme, and the epididymis or excretory veſſel of the teſticle.

The præputium has two muſcles fixed to it; one that ariſes from the ſphincter ani, and is inſerted all along the penis, and this is called retractor præputii, but the other, whoſe office is directly contrary to this, is cutaneous, and ſeems to take its origin from the muſcles of the abdomen, or rather to be a production of their tunica carnoſa.

The corpora cavernoſa riſe much in the ſame way as the human; but theſe ſoon terminate, and the reſt is ſupplied by a triangular bone, in the inferior part of which there is a groove excavated for lodging the urethra. There are upon the penis two protuberant bulbous fleſhy ſubſtances, at the back of which are two veins, which by the erectores penis are compreſſed in the time of coition, and the circulation being ſtopt, the blood diſtends the large cavernous bodies: after the penis is thus ſwelled, the vagina, by its contraction, gripes it cloſely, and ſo the male is kept in action ſome time contrary to his will; till time be given for bringing a quantity of ſeed ſufficient to impregnate the female; and thus by that orgaſmus veneris of the female organs, the want of the veſiculæ ſeminales are in ſome meaſure ſupplied. But as it would be a very uneaſy poſture for the dog to ſupport himſelf ſolely upon his hinder feet, and for the bitch to ſupport the weight of the dog for ſo long a time; therefore as ſoon as the bulbous bodies are ſufficiently filled, he gets off and turns averſe to her; had then the penis been pliable as in other animals, the urethra muſt of neceſſity have been compreſſed by this twiſting, and conſequently the courſe of the ſeed intercepted; but this is wiſely provided againſt by the urethra's being formed in the hollow of the bone. After the emiſſion of the ſeed, the parts turn flaccid, the circulation is reſtored, and the bulbous parts can be eaſily extended.

The diſpoſition and ſituation of the mammæ vary as they bear one or more young. Thoſe of the uniparous kind have them placed between the poſterior extremities, which in them is the higheſt part of their bodies, whereby their young get at them without the inconvenience of kneeling; nevertheleſs, when the creatures are of no great ſize, and their breaſt large, as in ſheep, the young ones are to take this poſture. In multiparous animals they muſt have a great number of nipples, that their ſeveral young ones may have room at the ſame time, and theſe diſpoſed over both thorax and abdomen; and the creatures generally lie down when the young are to be ſuckled, that they may give them the moſt favourable ſituation. From this it does not appear to be from any particular fitneſs of the veſſels at certain places, for giving a proper nouriſhment to the child, that the breaſts are ſo placed in women, as we find them, but really from that ſituation being the moſt convenient, both for mother and infant.

The heart of the dog is ſituated with its point almoſt downwards, according to the creatures poſture, and is very little inclined to the left ſide. Its point is much ſharper, and its ſhape more conoidal than the human. Here the names of right and left ventricles are proper enough, though not ſo in the human, which ought rather to be called anterior and poſterior, or ſuperior, and inferior.

The egreſs of the large blood-veſſels from the heart is ſomewhat different from the human, for here the left ſubclavian comes off firſt, and then a large trunk runs ſome way upwards before it gives off the left carotid, and ſplits into the carotid and ſubclavian of the right ſide: ſo that neither here, properly ſpeaking, is there an aorta aſcendens, more than in the human; but this name has probably been impoſed upon it from obſerving this in a cow, where indeed there is an aſcending and deſcending aorta.

We look on it as a general rule, that all quadrupeds, as having occaſion to gather their food from the ground, are provided with longer necks than man; but as a long neck not only gives the advantage of too long a lever to the weight of the head, but alſo when the animal is gathering his food, makes the brain in danger of being oppreſſed with too great a quantity of blood, by the liquor in theſe arteries having the advantage of a deſcent, while that in the veins muſt remount a conſiderable way contrary to its own gravity; it was therefore neceſſary that a part of the length of the neck ſhould be ſupplied by the length of the jaws. Thus we ſee horſes, cows, &c. who have no occaſion for opening their mouths very wide, yet have long jaws. Bull dogs indeed, and ſuch animals as have occaſion for very ſtrong jaws, muſt of neceſſity have them ſhort; becauſe the longer they are, the reſiſtance to be overcome acts with a longer lever. Another exception to this general rule, is, ſuch animals as are furniſhed with ſomething analogous to hands to convey their food to their mouths, as cats, monkies, &c. *as repreſented in the Plate of* COMPARATIVE *Anatomy*.

The teeth of the dog plainly ſhews it to be of the carnivorous kind, for there are none of them made for grinding their food, but only for tearing and dividing it. Even its poſterior teeth are not formed with rough broad ſurfaces as ours are; but are made conſiderably ſharper, and preſs over one another when the mouth is ſhut; that ſo they may take the firmer hold of whatever comes betwixt them.

The tongue in conſequence of the length of the jaws, is much longer than ours; and as this creature feeds with his head in a depending poſture, the bolus would always be in danger of falling out of the mouth, were it not for ſeveral prominences placed moſtly at the root of the tongue, and crooked backwards in ſuch a manner as to allow any thing to preſs eaſily down to the jaws; but to hinder its return. In ſome animals who feed on living creatures, theſe under hooks are ſtill more conſpicuous; as in ſeveral large fiſhes, where they are almoſt as large as their teeth in the forepart of their mouth, and near as firm and ſtrong.

In the upper part of the pharynx, behind the cricoid cartilage, there is a pretty large gland to be found, which ſerves not only for the ſeparation of a mucous liquor to lubricate the bolus as it paſſes this way, but alſo ſupplies the place of a valve, to hinder the food from regurgitating in the mouth, which it would be apt to do by reaſon of the deſcending ſituation of the creature's head.

The œſophagus is formed pretty much in the ſame way as the human; authors indeed generally alledge, that quadrupeds have their gullet compoſed of a double row of ſpiral fibres decuſſing one another; but this is proper to ruminating animals, who have occaſion for ſuch a decuſſation of fibres. The action of theſe may eaſily be obſerved in a cow chewing her cud.

The noſe is generally longer than in man, and its external paſſage much narrower. The internal ſtructure is alſo better adapted for an acute ſmelling, having a larger convulated ſurface on which the membrana Scheideriana is ſpread, and this is to be obſerved in moſt quadrupeds, who have the oſſa ſpongioſa commonly large, and theſe two divided into a great number of exceſſively fine thin lamellæ. The elephant, which has a head pretty large in proportion to its body, has the greateſt part of it taken up with the cavity of the noſe and frontal ſinuſſes, which laſt extend almoſt over their whole head, and leaves but a ſmall cavity for their brains. A very nice ſenſe of ſmelling was not ſo abſolutely neceſſary for man, who has judgment and experience to direct him in the choice of his food; whereas brutes, who have only their ſenſes, muſt have theſe of neceſſity acute, ſome having one ſenſe in greater perfection than others, according to their different way of life. We not only conclude *a priori* from the large expanded membrana Scheideriana that their ſenſe of ſmelling is very acute, but we find it ſo by cows, and horſes, diſtinguiſhing ſo readily betwixt noxious and wholeſome herbs, which they do principally by this ſenſe.

The external ear in different quadrupeds is differently framed, but always calculated to the creature's manner of life: in ſhape it commonly reſembles the oblique ſection of a cone from near the apex to the baſis. Hares and ſuch other animals as are daily expoſed to inſults from beaſts of prey, have large ears directed backwards, their eyes warning them of any danger before; rapacious animals, on the other hand, have their ears placed directly forwards, as we ſee in the lion, cat, &c. The ſlow hounds and other animals that are deſigned to hear moſt diſtinctly the ſounds coming from below, have their hears hanging downwards. Man again, who muſt equally hear ſounds coming from all quarters, but eſpecially ſuch as are ſent from about his own height, has his external ear placed in a vertical manner, ſomewhat turned forward. In ſhort, where-ever we ſee a ſpeciality in the make of this organ in any creature, we ſhall with very little reflection diſcover this form to be more convenient for that creature than another. There are ſome differences to be obſerved in the ſtructure of the internal ear, in different animals; but we know ſo very little of the uſe of the particular parts of that organ in the human ſubject, that it is altogether impoſſible to aſſign reaſons for theſe variations in other creatures.

All quadrupeds have at the internal canthus of the eye, a ſtrong firm membrane with a cartilaginous edge, which may be made to cover ſome part of their eye, and this is greater or leſs in different animals, as their eyes are more or leſs expoſed to dangers in ſearching after their food: this membrana nictitans, as it is called, is not very large in the dog: cows and horſes have it ſo large as to cover one half of the eye like a curtain, and at the ſame time is tranſparent enough to allow abundance of the rays of light to paſs through it; fiſhes have a cuticle always over their eyes, as they are ever in danger in that inconſtant element. In this then we may alſo obſerve a ſort of gradation.

All quadrupeds have a ſeventh muſcle belonging to the eye, called ſuſpenſorius. It ſurrounds almoſt the whole optic nerve, and is fixed into the ſclerotic coat as the others are; its uſe is to ſuſtain the weight of the globule of the eye, and prevent the optic nerve being too much ſtretched, without obliging the four ſtraight muſcles to be in a continual contraction, which would be inconvenient. At the ſame time this muſcle may be brought to aſſiſt any of the other four, by cauſing one particular portion of it to act at a time.

The next thing to be remarked, is the figure of the pupil, which is different in different animals, but always exactly accommodated to the creature's way of life. Man has it circular for obvious reaſons: an ox has it tranverſe, to take in a larger view of his food; cats again have this ſomewhat perpendicular, (but can alter it pretty much) for a ſimilar reaſon, and ſo of the reſt: the pupil of different animals varies in wideneſs according as the internal organs of viſion are more or leſs acute; thus cats and owls who ſeek their prey in the night, or in dark places (and conſequently muſt have their eyes ſo formed as that a few rays of light may make a lively impreſſion on the retina) have their pupils in day time contracted into a very narrow ſpace, as a great number of rays would oppreſs their nice organs, while in the night they dilate conſiderably. In the ſame way when the retina is inflamed, a great number of rays of light would occaſion a painful ſenſation, therefore the pupil is contracted: on the contrary in dying people, or in a beginning amauroſis, it is greatly dilated, as the eyes on ſuch occaſions are very difficultly affected, and as it were inſenſible.

The poſterior part of the choroid coat, which is called tapetum, is of different colours in different creatures. Oxen feeding moſtly on graſs have this membrane of a green colour, that it may reflect upon the retina all the rays of light which come from objects of that colour, while other rays are obſcured: thus the animal ſees its food better than other objects. Cats and owls have their tapetum of a whitiſh colour, and for the ſame reaſons have the pupil very dilatable, and their organs of viſion acute; and we ſhall find that all animals ſee more or leſs diſtinctly in the dark, according as their tapetum approaches nearer to a white or black colour. Thus dogs who have it of a greyiſh colour diſtinguiſh objects better in the night than man, whoſe tapetum is dark brown, and who we believe ſee worſt in the dark of any creature: it being originally deſigned that he ſhould reſt from all kinds of employment in the night time. The difference then of the colour of the tapetum, as indeed the fabric of any other part in different creatures, always depends on ſome particular advantage accruing to the animal in its peculiar manner of life from this ſingularity.

We ſhall now proceed to the brain, which we remark in the firſt place is proportionally much ſmaller in all quadrupeds than the human. The reaſon of which may be, that as thoſe creatures for the moſt part ſeek their food with their heads in a depending poſture, this ſituation would make it very inconvenient for the brain itſelf to ſend its animal ſpirits (or its influence and energy, let that be what it will) through the nerves, ſo that it was neceſſary they ſhould be ſupplied from ſomewhere elſe; and conſequently there was no reaſon for the brain itſelf being of a great bulk. As a confirmation of this theory, we find that the intercoſtal and eight pair of nerves, which ſerve the vital organs in the human body, take their origin from the encephalon, which in quadrupeds come moſtly from the theca vertebrarum. Again, there was no ſuch occaſion for ſo great a quantity of brains in thoſe animals as in man; ſeeing in them all its energy is employed in their progreſſion; while man has a great waſte of ſpirits in the exerciſe of his reaſon and intellectual faculties. And beſides all this, a great bulky brain would be inconvenient to theſe creatures, in ſo far as it would add conſiderably to the weight of the head, which having the advantage of a long lever to act with, would require a much greater force to ſupport it, than now it does; for the heads of the greateſt part of quadrupeds are not near ſo heavy as they would at ſight ſeem to be, from the ſinus frontales being produced a great way upwards to enlarge the organs of ſmelling.

In the brain of ſheep, which by its firm texture is the beſt ſubject of any for ſearching into the ſtructure of this part, we evidently ſee, that the name of the ſigmoid cavities was very properly applied by the ancients to the lateral ventricles of the brain, which are really of a greater extent than they are ordinarily painted by the anatomiſts, reaching farther backwards and forwards again under the ſubſtance of the brain.

The nates and teſtes deſerves this name much better here than in the human body with reſpect to each other. They are here alſo of different colours, the nates being of the colour of the cortical, and the teſtes of the medullary ſubſtance of the brain: whereas in man they are both of one colour. The reaſon of theſe differences, and others of the like nature to be met with, we ſhall not pretend to determine.

The ſtructure of the brain differing but very little in all quadrupeds, it will be needleſs to examine it further than the laſt mentioned animal.

The next ſpecies of quadrupeds we propoſed to conſider was the ruminant kind, of which we have an example in a cow; and accordingly ſhall take the fœtus of the animal in utero, that we may firſt remark ſome things that are peculiar to it in that ſtate, and afterwards proceed to examine its viſcera as a ruminant animal; firſt then as a fœtus.

The form of a cow's uterus differs from the human, in having pretty large cornua. It is not eaſy to determine, whether the uterus grows thicker or thinner in the time of geſtation. The membranes it is plain (by ſtretching the parts) muſt be made thinner; but then it is as evident, that the veſſels are at that time enlarged, upon which principally the thickneſs of any part depends; ſo there ſeems to be as much gained the one way, as loſt the other. The os uteri is entirely ſhut up by a glutinous mucilaginous ſubſtance, that is common to the females of all creatures when with young; by this the external air is excluded, which would ſoon make the liquors corrupt, it alſo prevents the inflammation of the membranes, and the hazard of abortion. By this means alſo the lips of the womb are kept from growing together, which otherwiſe they would certainly at this time do. There are mucous glands placed here to ſcreen this gluten, which on the breaking of the membranes with the contained waters make a ſapo that lubricates and waſhes the parts, and makes them eaſily yield. The firſt of the proper involcura of the fœtus is the chorion.

It is not a general involucrum of the fœtus in the mother; for it covers only a ſmall part of the amnios: it is moſtly lodged in the cornua uteri. In mares, bitches, and cats, it ſurrounds the the amnios, being every where interpoſed betwixt it and the chorion. In ſheep and goats it is the ſame as in this animal; and in ſwine and rabbits it covers ſtill leſs of the amnios. This ſac is probably formed by the dilation of urachus, which is connected at its other end to the fundus of the bladder, through which it receives its contents; and the membrane is doubled at the extremity of the canal to hinder the return of the urine back into the bladder. Its veſſels are exceſſively fine and few, and we cannot force an injected liquor farther than the beginning of this coat. This membrane is ſo far analogous to the cuticula, as not to be liable to corruption, or eaſily irritated by acrid liquors.

There is a ſmall round fleſhy body that ſwims in the urine of this creature, mares, &c. called cuticula, which is the hypomenes of the ancients. Several idle opinions and whims have been entertained as to its uſe; but that ſeems to be ſtill unknown, or how it is generated or nouriſhed; for it has no connection with the fœtus or placentulæ.

We come now to conſider the creature as a ruminant animal. There are no dentes inciſores in the upper jaw, but the gums are pretty hard, their tongue rough; and they ſupply this defect by wrapping their tongue round a tuft of graſs, ſo, preſſing it againſt the upper jaw keep it ſtretched, and cut it with the teeth of the under jaw; then, without chewing, throw it down into the œſophagus, which in theſe creatures conſiſts of a double row of ſpiral fibres decuſſating one another. All animals which ruminate muſt have more ventricles than one; ſome have two, ſome three; our preſent ſubject, the cow, has four. The food is carried directly down into the firſt, which lies upon the left ſide and is the largeſt of all; it is called γαϛηρ, *ventriculus*, and κοιλια, by way of eminence. It is what is called by the general name of paunch by the vulgar. There are no rugæ upon its internal ſurface; the food, by the force of its muſcular coat, and the liquors poured in here, is ſufficiently macerated, after which it is forced up hence by the œſophagus into the mouth, and there it is made very ſmall by maſtication; this is what is properly called chewing the cud, or rumination; after this it is ſent down by the gullet into the ſecond, for the œſophagus opens indifferently into both; however the creature has a power to direct it into which it will. The ſecond ſtomach, which is the anterior and ſmalleſt, is called κεκρυφαλος *reticulum*, the *bonnet* or *king's hood*. It conſiſts of a a great number of cells on its internal ſurface of a regular pentagonal figure, like to a honey-comb. Here the food is farther macerated, from which it is protruded into the third, called εχινος, or *omaſum, vulgo*, the *manyplus*; becauſe the internal ſurface riſes up into a great many plicæ or folds, and *ſtratum ſuper ſtratum*, according to the length of this ſtomach. Some of theſe plicæ are further produced into the ſtomach than others, i. e. firſt two long ones on each ſide, and within theſe, two ſhorter in the middle, &c. There are ſeveral glands in this ſtomach which is next to the κοιλια in bigneſs, and from this it paſſes into the fourth, whoſe names are ηνυστρον, *abomaſum*, *caille*, or the *red*, which is the name it commonly has becauſe of its colour. Caille ſignifies curdled; and hence the French have given that as a name to this fourth ſtomach; becauſe any milk that is taken down by young calves from the long remora it makes here, turns acid; and by the remains of the milk before taken down, aſſiſting, it is curdled. It is this fourth ſtomach with the milk curdled in it, that is commonly taken for earning of milk (as they call it); but after the bile and pancreatic juice enter, this coagulation is not to be found, which ſhews the uſe of theſe liquors. There are other creatures that uſe the ſame food, that have not ſuch a mechaniſm in their digeſtive organs; horſes, aſſes, &c. have but one ſtomach where graſs is macerated, and a liquor for their nouriſhment extracted, and the remainder ſent out by the anus very little altered. From this different ſtructure of the ſtomach in theſe creatures, a ruminant animal will be ſerved with one third leſs food than another of equal bulk; graziers are ſufficiently acquainted with this. The reaſon is, that ruminating animals have many and ſtrong digeſtive organs; all their food is fully prepared and almoſt converted into chyle; but a horſe's ſtomach is not fitted for this, ſo that they require a much greater qnantity of food to extract the ſame nouriſhment.

The guts of theſe creatures are of a conſiderable length in proportion to the bulk of the animal's body; and this confirms what we ſaid formerly on the ſubject of the inteſtines of a dog, viz. that the length and capacity of the guts were different in different animals according to the nature of their food.

The liver is not ſplit into ſo many lobes in this creature as either in a man or dog, which depends on the ſmall motion this creature enjoys in its ſpine, which made ſuch a diviſion needleſs.

Their veſica urinaria is of a pyramidal ſhape, and has ſcarce any muſcular fibres. It is very large and membranaceous; for the urine of theſe creatures, not being ſo acrid as that of carnivorous animals, there was no ſuch occaſion for expelling it ſo ſoon.

This creature is provided with a looſe pendulous ſcrotum, and conſequently with veſiculæ ſeminales. The female organs differ from thoſe of a bitch, moſtly as to the form of cornuti uteri, which are here converted in form of a ſnail. In this and all uniparous animals they contain only part of the ſecundines; but in bitches and other multiparous animals they run ſtreight up in the abdomen, and contain the fœtus themſelves.

As the Oſteology of the Quadrupeds, compared with the Myology, Angiology, Splancbnology and Neurology, is of ſo little conſequence towards forwarding a knowledge of the human ſubject by analogy; and as it would occupy ſo great a ſpace, and afford ſo little entertainment, we have purpoſely omitted it. The Plate of the Skeleton of the Monkey was introduced in this Work, in order to give an idea of the great comparative affinity it bears to the human Skeleton, and was intended to be deſcribea in this place; but for the reaſons aſſigned, we ſhall explain it under the Article SKELETON.

SECT. II.

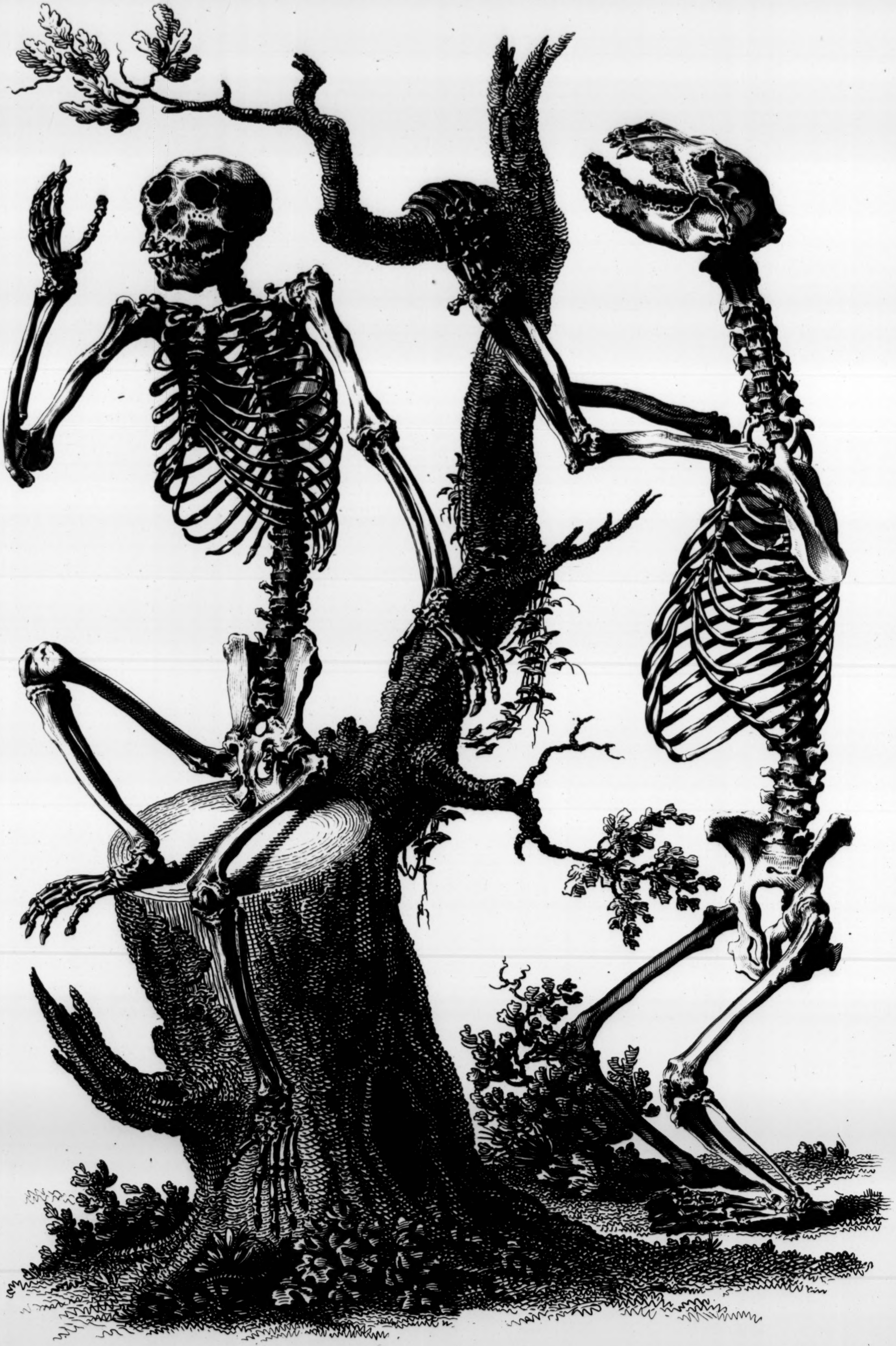
ANATOMY OF BIRDS.

The next claſs of animals we come to conſider, are the feathered kind; which are divided into the granivorous and carnivorous. But before we go on to conſider the ſpecialties in the viſcera of each kind, we muſt obſerve what both ſpecies agree in.

Fowls have a particular covering of feathers different from all other creatures, but exactly well ſuited to their manner of life; for it not only protects them from the injuries of the weather, but ſerves them in their progreſſion through that thin aerial element, they are for the moſt part employed in; and as ſome fowls live much in the water, their feathers being continually beſmeared with an oily liquor, keeps the water from ſoaking into their ſkins, and ſo prevents the bad effects which it would infallibly otherways produce.

Fowls have the ſtrongeſt muſcles in their whole body inſerted into their wings; whence by the way we may obſerve, that it is

Skeleton of a Bear & Monkey.
See Comparative Anatomy.



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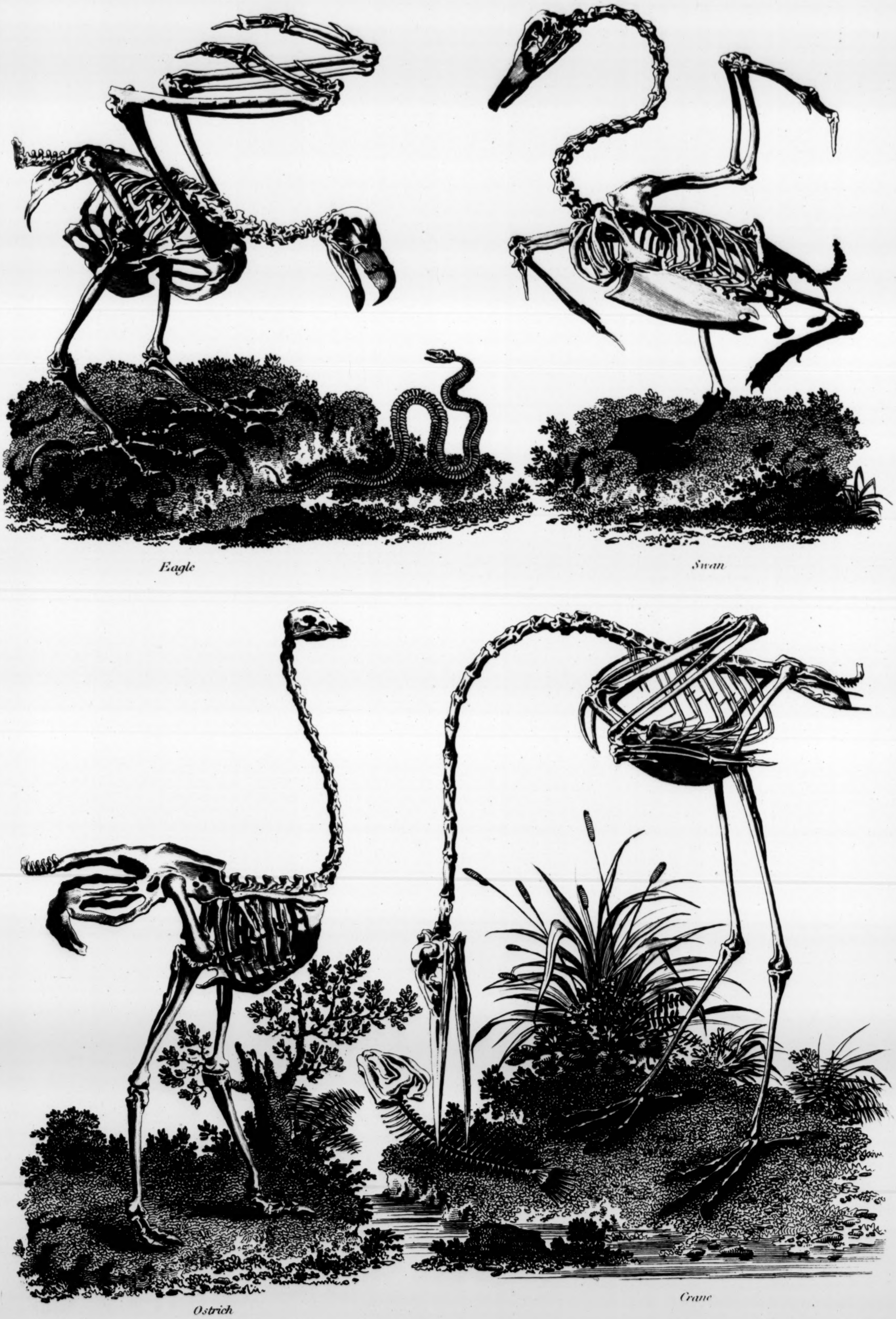
Skeleton of an Eagle, Swan, Ostrich and Crane, See the System of Comparitive Anatomy. Section 2.


Eagle
Swan
Ostrich
Crane

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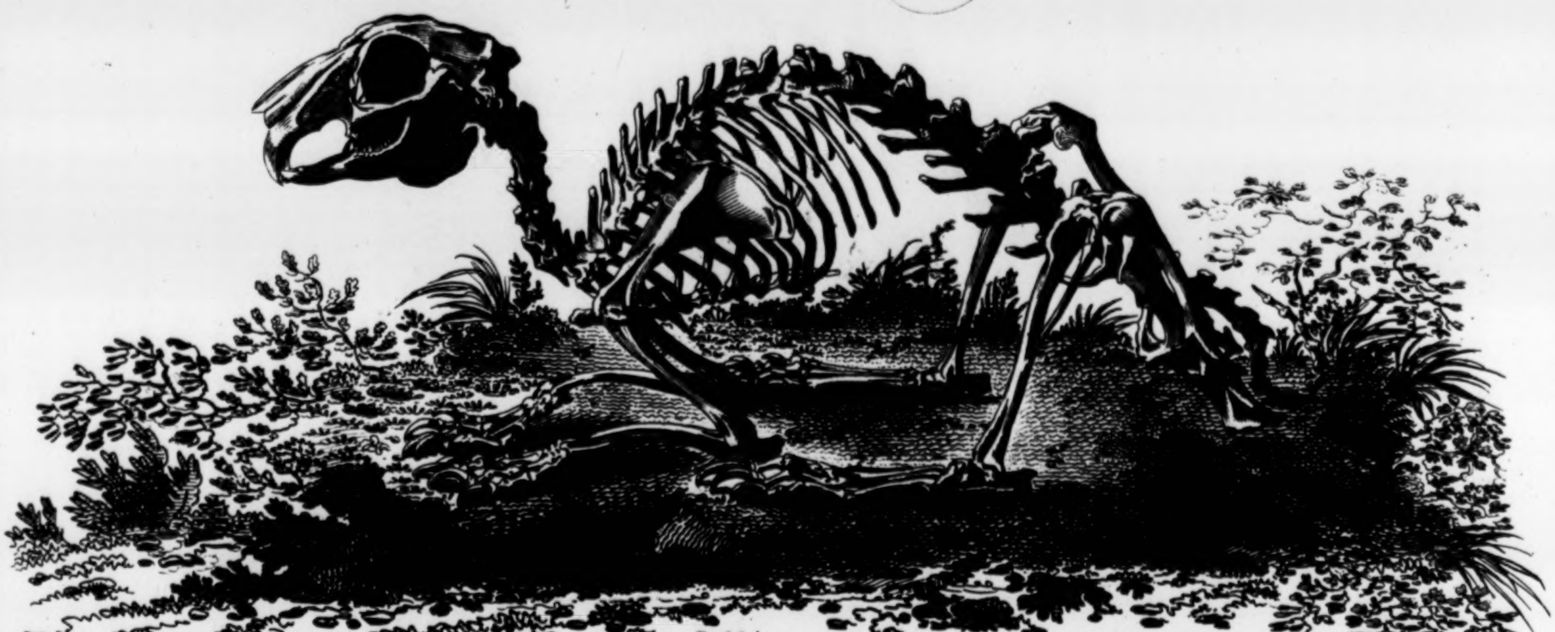
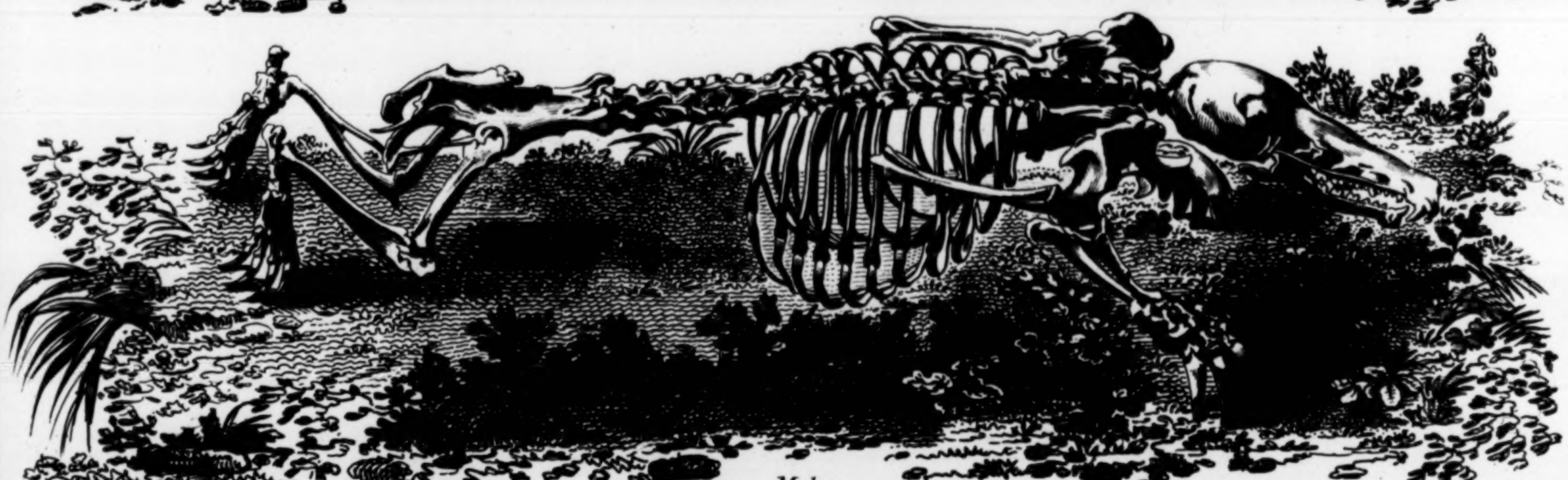
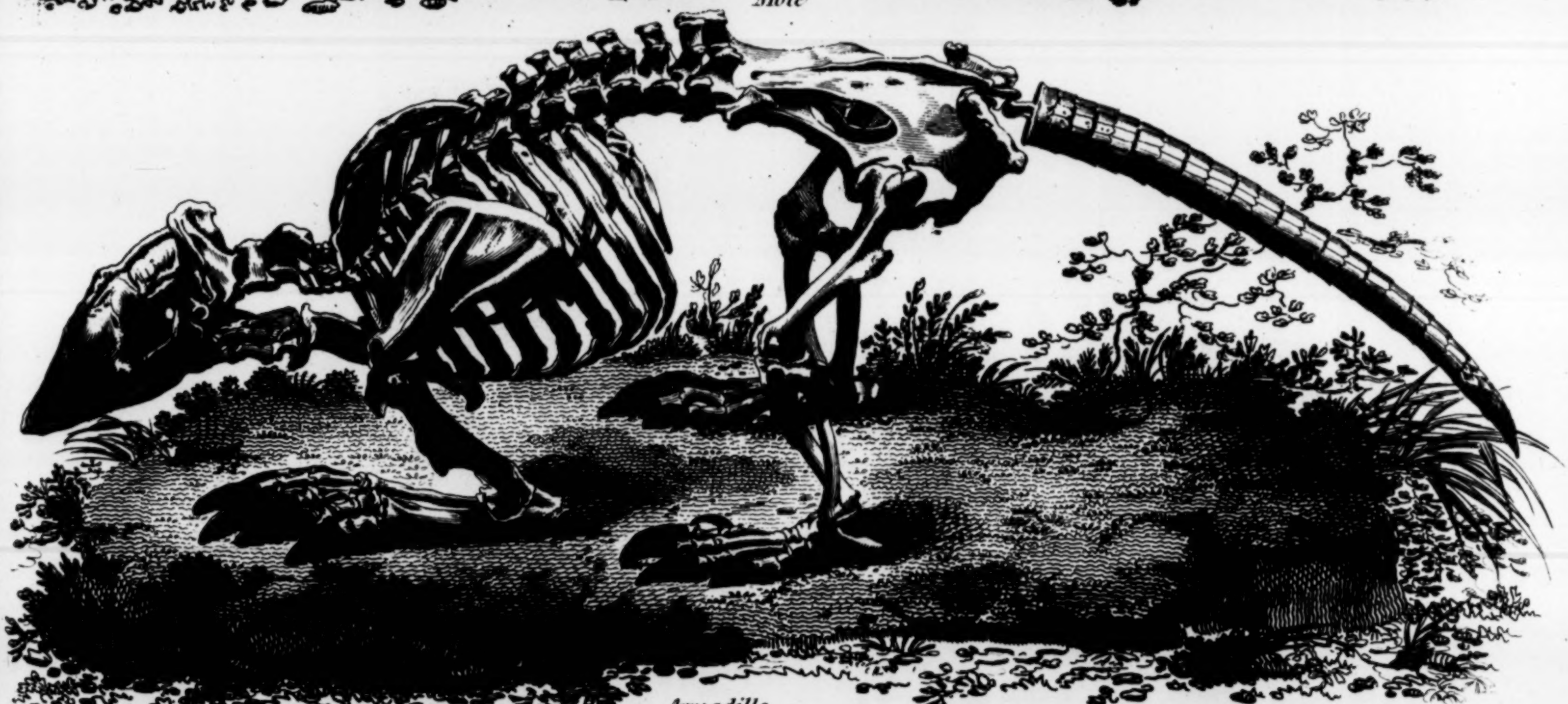
Skeleton of a Rabbit, Mole, Armadillo and Cameleon, See the System of Comparative Anatomy. Section 1.



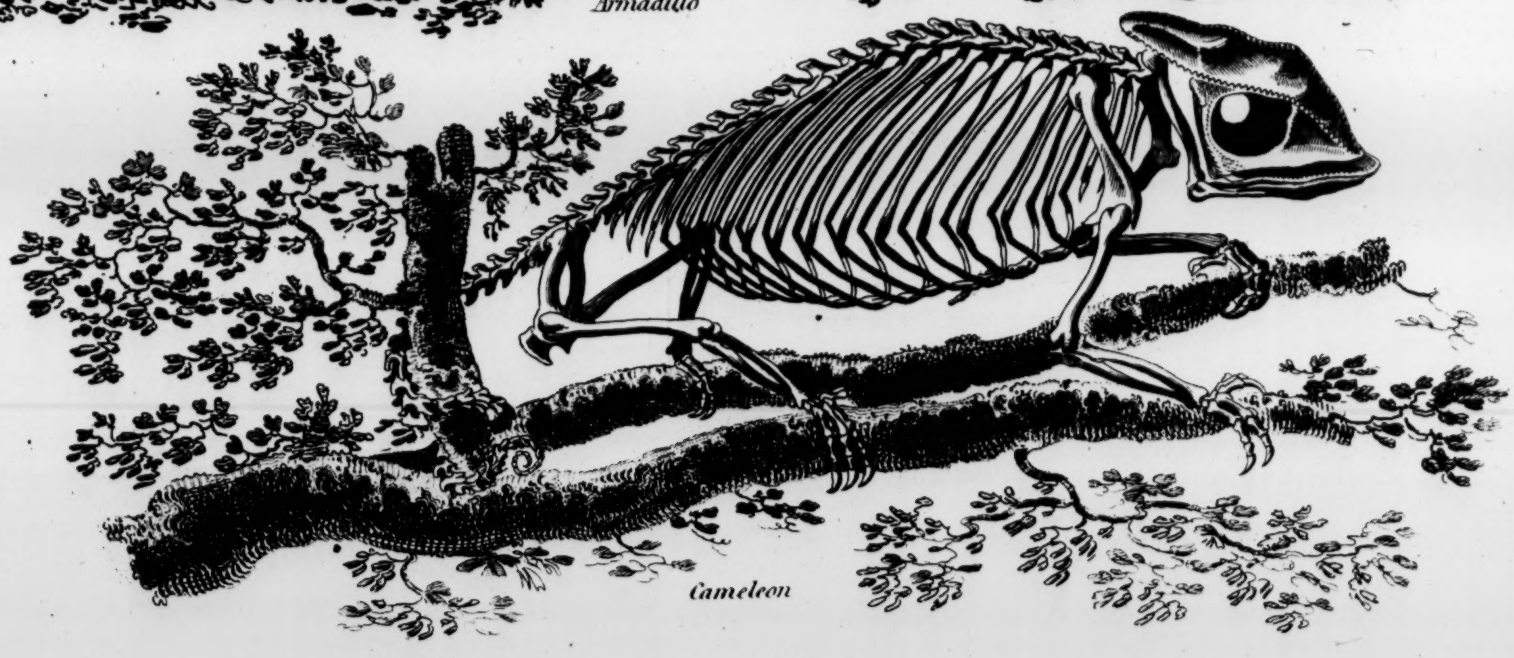
Rabbit



Mole



Armadillo



Cameleon

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Lodge sculp

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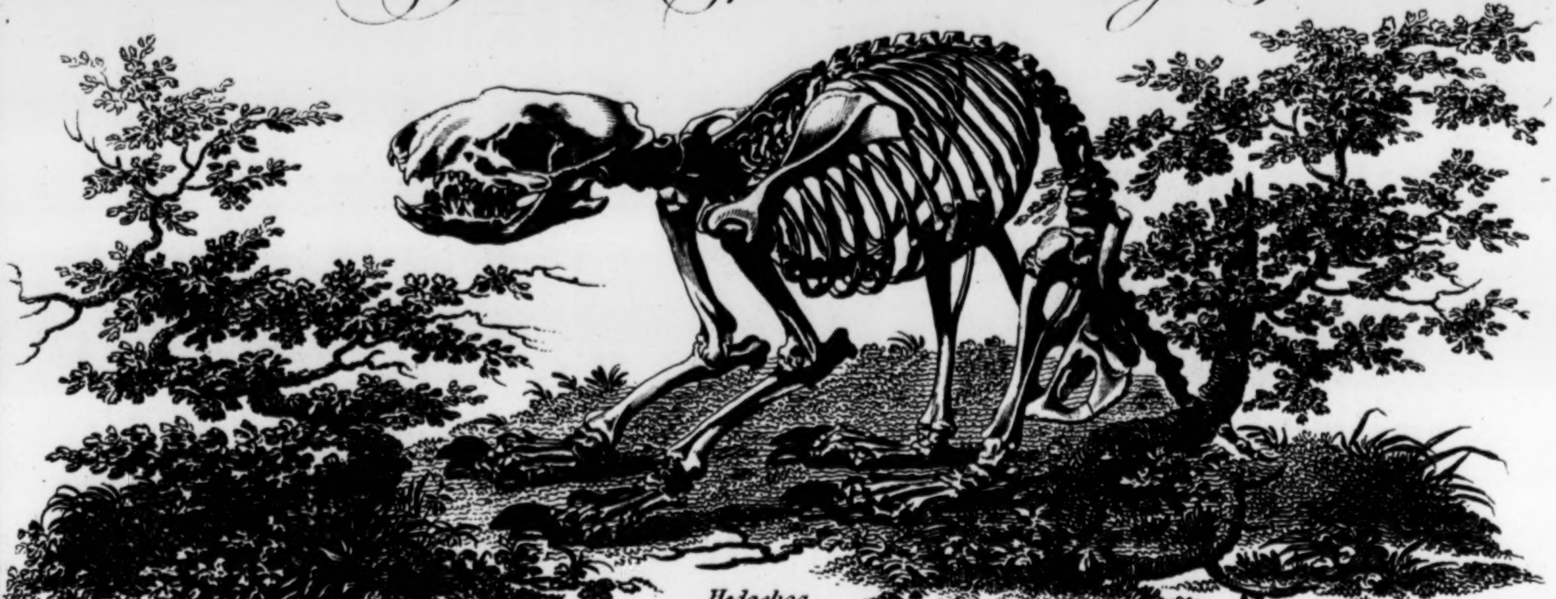
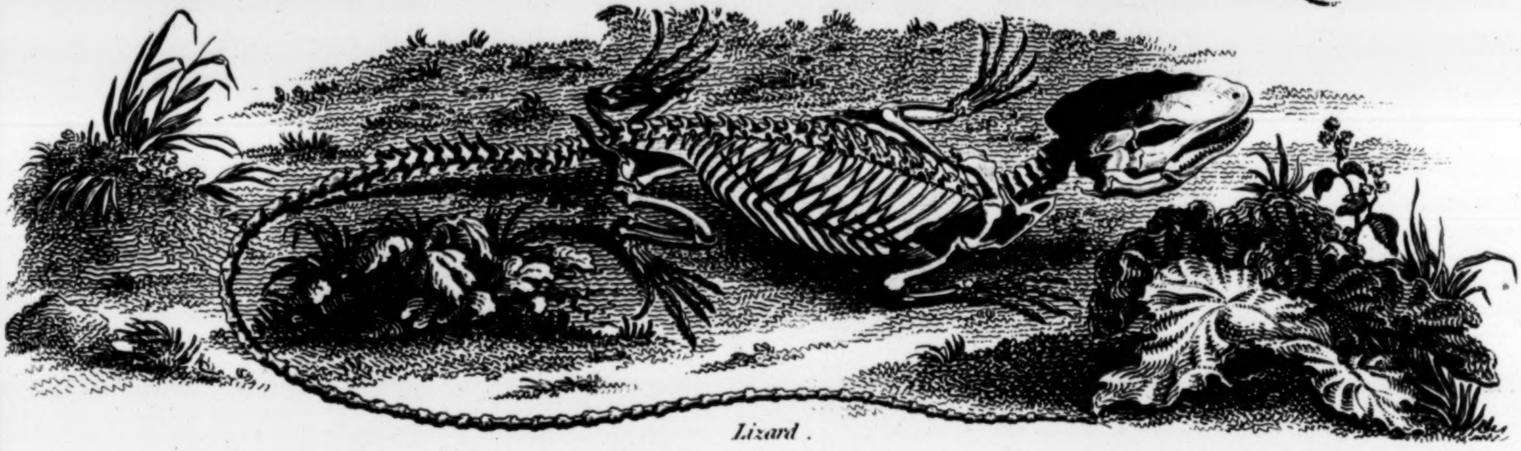
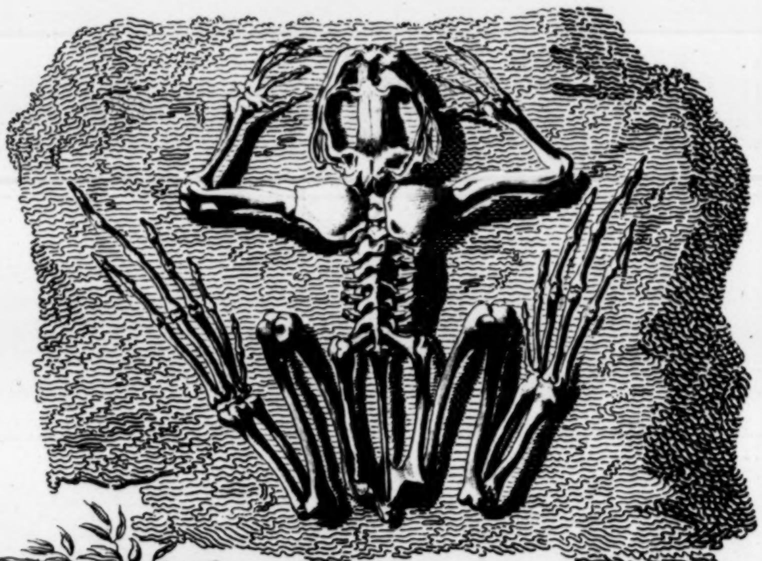
Skeleton of an Hedgehog, Lizard, Bat, Frog, Crocodile and Dog.
See the System of Comparative Anatomy.



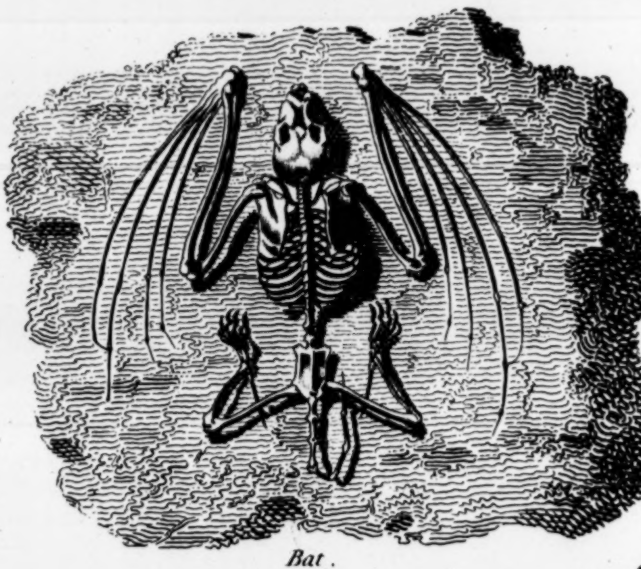
Hedgehog.



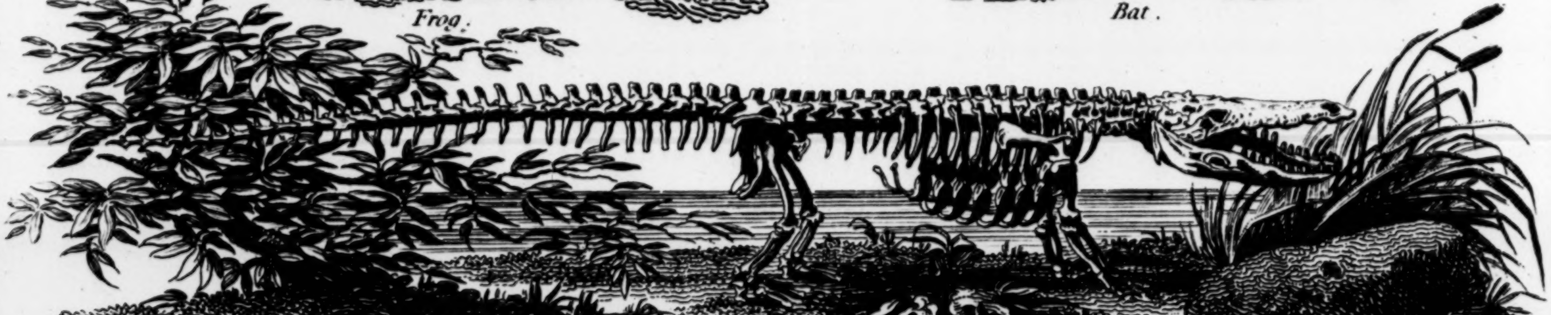
Lizard.



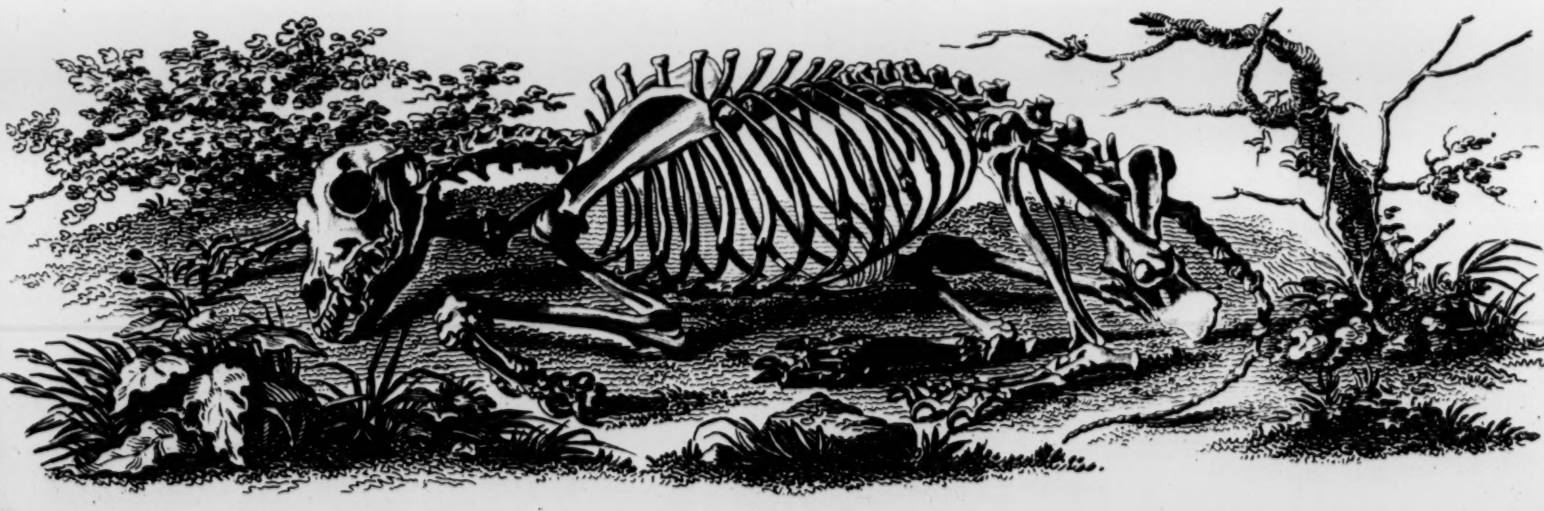
Frog.



Bat.



Crocodile.



Dog.

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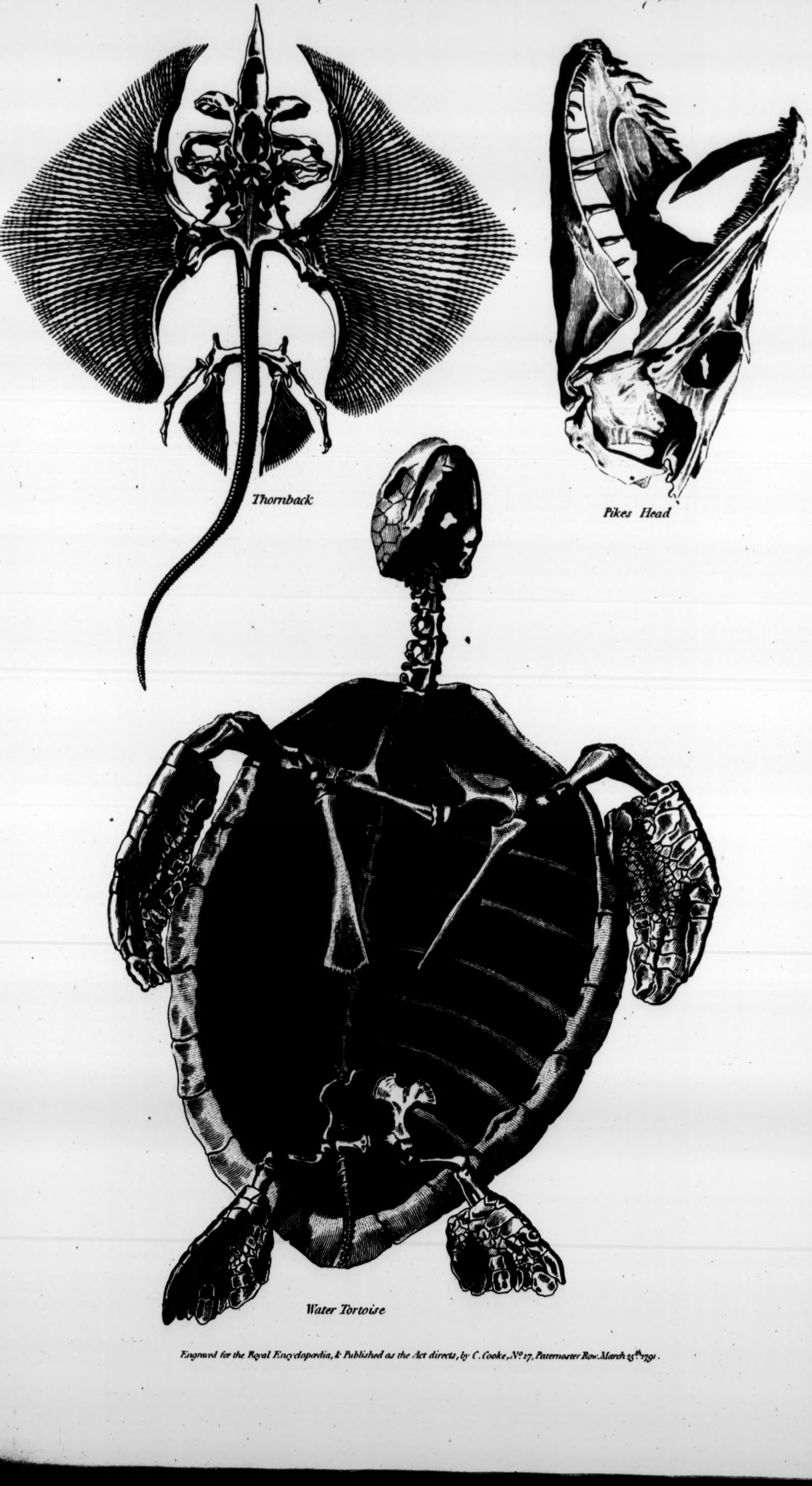
Plate 5.

Skeleton of a Thornback, Bones of the Head of a Pike, Skeleton of a Water Tortoise. See System of Comparative Anatomy.



Thornback

Pikes Head

Water Tortoise

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BRITISH 18 MR 63 MUSEUM

altogether impoſſible for man to buoy himſelf up into the air like birds, even though he had proper machines in place of wings, unleſs he were likewiſe provided with muſcles ſtrong enough for moving them, which he has not. In the next place, their wings are not placed in the middle of their bodies, but a good deal further forwards; whence it would at firſt view appear that their heads would be erect, and their poſterior parts moſt depending, when raiſed in the air: but by ſtretching out their heads, which act upon the lever of a long neck, they alter their centre of gravity pretty much, and alſo by filling the ſacs or bladders in the inſide their abdomen with air, and expanding their tails, they came to make the poſterior part of their bodies conſiderably higher; and thus they fly with their bodies nearly in an horizontal ſituation.

Dr. Hunter has made ſome curious diſcoveries relative to theſe internal receptacles of air in the bodies of birds. Some of them are lodged in the fleſhy parts, and ſome in the hollow bones; but all of them communicate with the lungs. He informs us, that the air cells which are found in the ſoft parts have no communication with the cellular membrane which is common to birds as well as other animals. Some of them communicate immediately with each other, but all of them by the intervention of the lungs as a common centre. Some of them are placed in cavities, as the abdomen; others in the interſtices of parts, as about the breaſt. The bones which receive air are of two kinds; ſome of them divided into innumerable cells; others hollowed out into one large canal. They may be diſtinguiſhed from ſuch as do not receive air by having leſs ſpecific gravity; by being leſs vaſcular; by containing little oil; by having no marrow nor blood in their cells; by having leſs hardneſs and firmneſs than others; and by the paſſage for the air being perceivable.

The mechaniſm by which the lungs are fitted for conveying air to theſe cavities is, their being attached to the diaphragm, and connected alſo to the ribs and ſides of the vertebræ. The diaphragm is perforated in ſeveral places by pretty large holes, allowing a free paſſage of air into the abdomen. To each of theſe holes is attached a diſtinct membranous bag, thin and tranſparent. The lungs open at their interior part into membranous cells, which lie upon the ſides of the pericardium, and communicate with the cells of the ſternum. The ſuperior parts of the lungs open into cells of a looſe net work, through which the trachea and œſophagus paſs. When theſe cells are diſtended with air, it indicates paſſion, as in the caſe of the turkey-cock, pouting-pigeon, &c.

Theſe cells communicate with others in the axilla, and under the large pectoral muſcle; and thoſe with the cavity of the os humeri, by means of ſmall openings in the hollow ſurface near the head of that bone. Laſtly, The poſterior edges of the lungs have openings into the cells of the vertebræ, ribs, os ſacrum, and other bones of the pelvis, from which the air finds a paſſage to the cavity of the thigh bone.

Concerning the uſe of theſe cavities the doctor conjectures, that they are a kind of appendage to the lungs; and that like the bags continued through the bellies of amphibious animals, they ſerve as a kind of reſervoirs of air. They aſſiſt birds during their flight, which muſt be apt to render frequent reſpiration difficult. He farther inſinuates, that this conſtruction of the organs of reſpiration may aſſiſt birds in ſinging; which, he thinks may be inferrred from the long continuance of ſong between the breathings of a canary bird. On trying the trachea of a cock, the animal breathed through a canula introduced into his belly; another through the os humeri, when cut acroſs; and a hawk through the os femoris. In all theſe caſes the animals ſoon died. In the firſt, the doctor aſcribes the death to an inflammation of the bowels; but in the laſt, he owns it was owing to difficult breathing. What took place, however, was ſufficient to ſhow that the animals really did breathe through the bone.

The largeneſs of the wings in different fowls varies, according to the occaſions of the creature. Thus birds of prey, who muſt fly a conſiderable way to provide their food, have large ſtrong wings; whereas domeſtic birds, who find their nouriſhment almoſt every where, have very ſhort but ſmall wings. The poſterior extremities are ſo ſituated as to make us at firſt think they would be in continual hazard of falling down forwards when they walk; but this is prevented by their holding up their heads and necks; and when they have occaſion for climbing up a ſteep place, they ſtretch out their head and necks forwards. Thus we may obſerve a gooſe, entering a barn door, where generally there is an aſcending ſtep, to ſtretch out its neck, which before was raiſed, and incline its body forwards; this is laughed at by the common people, who aſcribe it to a piece of folly in the gooſe, as if afraid of knocking its head againſt the top of the door.

Carnivorous animals are provided with ſtrong crooked claws for the catching their prey; water fowls uſe them for ſwimming; and principally for this purpoſe have a ſtrong firm membrane interpoſed betwixt the toes. There is a beautiful mechaniſm to be obſerved in the toes of fowls, which is of conſiderable uſe to them; for their toes are naturally drawn together or bended when the foot is bended; this perhaps proceeds from the tendons of the toes paſſing over in them what is analogous to our heels, and when the foot is bended muſt conſequently be much ſtretched; and ſince they are inſerted into the toes, muſt of neceſſity bend them when the foot is bended; and when the foot is extended, the flexors of the toes are again relaxed, and they are therefore expanded. This is of great uſe to water fowls; for had there been no ſuch contrivance as this, they muſt have loſt as much time when they pulled their legs in, as they had gained by the former ſtroke; but as the parts are now framed, whenever the creature draws in its foot, the toes are at the ſame time bended and contracted into leſs ſpace; ſo that the reſiſtance made againſt the water is not near ſo great as before: on the contrary, when they ſtretch their foot their toes are extended, the membrane betwixt them expanded, and conſequently a greater reſiſtance made to the water. Again, ſuch fowls as live moſtly in the air, or have occaſion to ſuſtain themſelves on branches of trees in windy weather, and even in the night time when aſleep, while all their muſcles are ſuppoſed to be in a ſtate of relaxation; ſuch have no more to do but lean down the weight of their bodies, and their toes continue bended without any muſcles being in action; and whenever they would diſentangle themſelves, they raiſe up their bodies, by which their foot, and conſequently their toes, are extended.

Carnivorous fowls have their beaks long, ſharp, and crooked; domeſtic fowls, ſuch as the hen kind, &c. have ſtrong ſhort beaks, commodiouſly fitted to dig up and break their food; water fowls again have long or very broad ſcoop like beaks, which is moſt convenient for them. The ſternum of fowls is much larger proportionally than the human, and has a ridge riſing in its middle for the more commodious origin of the muſcles that move the wings. It is alſo leſs moveable than ours; for had it been very moveable, a great deal of the force employed for moving the wings would at every contraction of the muſcles have been loſt, or elſe ſome other muſcles muſt have come in play to keep firm the ſternum; but this additional weight would have been inconvenient for their progreſſion.

What other things are moſt remarkable in the ſtructure of birds, we ſhall conſider in that common domeſtic animal, the cock or hen, and afterwards obſerve their difference from a carnivorous fowl.

ANATOMY OF A COCK.

THE œſophagus of this creature runs down its neck ſomewhat inclined to the right ſide, and terminates in a pretty large membranous ſac, which is the ingluvies or crop where the food is macerated and diſſolved by a liquor, ſeparated by the glands, which are eaſily obſerved every where on the external ſurface of this bag. The effect of this maceration may be very well obſerved in pigeons, who are ſometimes in danger of being ſuffocated by the peaſe, &c. they feed upon, ſwelling to ſuch an immenſe bulk in their ingluvies, that they can neither get upwards nor downwards. If it be a favourite fowl, it might be preſerved by opening the ſac, taking out the peaſe, and ſewing up the wound.

The food getting out of this ſac goes down by the remaining part of the œſophagus into the ventriculus ſuccenturiatus or infundibulum peyeri, which is a continuation of the gullet with more numerous glands, which ſeparate a liquor to dilute the food ſtill more, which at length gets into the true ſtomach or gizzard, which conſiſts of two very ſtrong muſcles covered externally with a tendinous aponeuroſis, and lined on the inſide by a very thick firm membrane, which we evidently diſcover to be a production of the cuticula.

This might have been proved in ſome meaſure *a priori*, from taking notice that this membrane, which in chicks is only a thin ſlight pellicle, by degrees turns thicker and ſtronger, the more attrition it ſuffers: but there is no other animal ſubſtance, ſo far as we know, which grows more hard and thick by being ſubjected to attrition, excepting the cuticula. Hence may be drawn ſome kind of proof of what hath been affirmed concerning the tunica villoſa of the ſtomach, and inteſtines in the human body, viz. that it was only a continuation of epidermis. Nay, all the hollow parts of the body, even arteries, veins, &c. ſeem to be lined with a production of this membrane, or one analogous to it.

The uſe of this internal coat of the ſtomach of fowls is to defend the more tender parts of that viſcus from the hard grains and little ſtones thoſe creatures take down.

The digeſtion of theſe animals is performed, partly at leaſt, by attrition, as is evinced by many experiments. We ſee them daily take down conſiderable numbers of the moſt ſolid rugged little flints they find, and theſe can ſerve for no other purpoſe than to help the trituration of their aliments. After theſe pebbles by becoming ſmooth are unfit for this office, they are thrown up by the mouth; hence fowls that are long confined, though ever ſo well fed, turn lean for want of theſe ſtones to help their digeſtion; but this has been put beyond all diſpute by a perſon, who gave ſpecies of metal to an oſtrich, convex on one ſide, and concave on the other, but carved on both; and opening the creature's body ſome time after, it was found that the carving on the convex ſide was all obliterated, while the engraved character remained the ſame as before on the concave ſide, which was not ſubjected to the ſtomach's preſſure. This could not have happened had digeſtion been performed by a menſtruum, or any other way whatſoever, but may be eaſily ſolved by allowing a ſimple mechanical preſſure to take place.

The duodenum begins pretty near the ſame place, at which the œſophagus enters; yet notwithſtanding the vicinity of theſe two tubes, the aliments are in no danger of getting out before they are perfectly digeſted, by reaſon of a protuberance or ſeptum medium betwixt the orifices; and in thoſe creatures who have ſuch a ſtrong muſcular ſtomach, it is a matter of great indifference, whether the entry of the œſophagus or pylorus, be higheſt, provided that the entry of the œſophagus does not allow the food to regurgitate, ſince the force of the ſtomach can eaſily protrude it towards the duodenum. This gut is moſtly in the right ſide, and hangs pendulous in their abdomen, having its two extremities fixed to the liver. The ductus communis choledochus enters near its termination, where it mounts up again to be fixed to the liver; and leſt, by the contraction of the inteſtines, the bile ſhould paſs over without being intimately blended with the chyle, that duct enters downwards contrary to the courſe of the food, and contrary to what is obſerved in any of the animals we have mentioned yet. But ſtill the general intention is kept in view, in allowing theſe juices the faireſt chance of being intimately blended with the food.

The ſmall guts are proportionally larger than thoſe of carnivorous birds, for the general cauſe already aſſigned. At the end of the ilium they have two large inteſtina cæca, one on each ſide, which ſerve as reſervoirs to the fæces; which after ſome remora there regurgitate into what ſoon becomes the rectum, which, together with the excretories of urine, and organs of generation, empties itſelf into the common cloaca. The ſmall inteſtines are connected by a long looſe meſentery, which has little or no fat accompanying the blood veſſels, there being no hazard of the blood's being ſtopped. There are no lacteal veſſels, glandulæ vagæ or pancreas aſſellii to be obſerved here. The meſaraic veins are proportionally very large, if you either compare them with the correſponding arteries, or conſider them with reſpect to the guts themſelves. The want of lacteals, &c. is ſupplied by theſe veins. As a proof of theſe having a communication with the guts, in larger fowls the guts can be diſtended by blowing in at the meſeraic vein; and from this difference of ſtructure, the uſe of the glandulæ vagæ, &c. can eaſily be aſſigned, viz. the chyle in theſe animals, that have lacteals, being to be mixed with the blood in a conſiderable quantity at a time, leſt its particles ſhould attract one another too ſtrongly, and ſo hinder this mixture; it was therefore neceſſary it ſhould be well diluted by the humores inquilini, which bear a very great proportion to the quantity of pure chyle; ſince the lymph from the inferior extremities, abdominal viſcera, neck, &c. are poured into it. Here there was no hazard of any ſuch inconveniency by the chyle being mixed with the blood in ſmall proportion from the immenſe number of the ſmall extremities of the meſeraic veins.

The pancreas in the creature lies betwixt the two folds of the duodenum, and ſends two or three ducts into this gut pretty near the biliary.

The ſpleen is here of a round globular figure, ſituated between the liver and ſtomach, and betwixt theſe and the back bone it enjoys the ſame properties as in other animals, viz. large blood-veſſels, &c. All its blood is ſent into the vena portarum, and has a perpetual conquaſſation. It has no excretory as far as we know. Their liver is divided into two equal lobes by a pellucid membrane, running according to the length of their body; and hence we may obſerve, that it is not proper to that bowel to lie on the right ſide, which is ſtill more confirmed by what we obſerve in fiſhes, where it almoſt lies in the left-ſide.

The ſhape of their gall-bladder is not much different from that of quadrupeds, but is thought to be longer in proportion to the ſize of the animal, and is farther removed from the liver; though in fiſhes it is ſtill further removed, not being at all contiguous; and in them the ductus hepaticus and cyſticus do not unite till juſt at the entry into the gut. In theſe animals, viz. fiſhes, there ſeems to be no way of the bile getting into the gall bladder but by regurgitation.

The principal difference to be remarked in their heart, is the want of the valvulæ tricuſpedes, and their place being ſupplied by one fleſhy flap.

The lungs are not looſe within the cavity of the thorax, but fixed to the bone all the way; neither are they divided into lobes, as in thoſe animals that have a large motion in their ſpine. They are two red ſpongy bodies covered with a membrane that is pervious, and communicates with the large veſicles or air bags that are diſperſed over their whole abdomen, which veſicles ſerve two very conſiderable uſes; the one is to render their bodies ſpecifically light, when they have a mind to aſcend and buoy themſelves up when flying, by diſtending their lungs with air, and alſo ſtraiten their trachea arteria, and ſo return the air.

Secondly, they ſupply the place of a muſcular diaphragm and ſtrong abdominal muſcles; producing the ſame effects on the ſeveral contained viſcera, as theſe muſcles would have done without the inconveniency of their additional weight; and conducing as much to the excluſion of the egg and fæces.

The trachea arteria, near where it divides, is very much contracted, and their voice is principally owing to this coarction. If you liſten attentively to a cock crowing, you will be ſenſible that the noiſe does not proceed from their throat, but deeper; nay this very pipe, when taken out of their body and cut off a little, after its diviſion, and blown into, will make a ſqueaking noiſe, ſomething like the voice of theſe creatures. On each ſide, a little higher than this contraction, there is a muſcle ariſing from their ſternum, which dilates the trachea. The cartilages of which the pipe is compoſed in this animal, go quite round it; whereas in men and quadrupeds, they are diſcontinued for about one-fourth on the back part, and the intermediate ſpace filled up by a membrane. Neither is the trachea ſo firmly attached to their vertebræ as in the other creatures we have examined. This ſtructure we ſhall find of great ſervice to them, if we conſider, that had the ſame ſtructure obtained in them as in us, their breath would have been in hazard of being ſtopped at every flexion or twiſting of their neck, which they are frequently obliged to. This we may be ſenſible of by bending our necks conſiderably on one ſide, upon which we ſhall find a great ſtraitneſs and difficulty of breathing.

In place of a muſcular diaphragm, this creature has nothing but a thin membrane connected to the pericardium, which ſeparates the thorax and abdomen. But beſides this, the whole abdomen and thorax are divided by a longitudinal membrane or mediaſtinum connected to the lungs, pericardium, liver, ſtomach, and to the fat lying over their ſtomach and guts, which is analagous to an omentum, and ſupplies its place.

The kidnies lie in the hollow, excavated in the ſide of the back bone, from which there is ſent out a blueiſh coloured canal, running along by the ſide of the vas deferens, and terminating directly into the common cloaca. This is the ureter, which opens by a peculiar aperture of its own, and not at the penis. This creature having no veſica urinaria, it was thought by ſome they never paſſed any urine, but that it went to the nouriſhment of the feathers, but this is falſe; for that whitiſh ſubſtance that you ſee their greeniſh fæces covered with, and which turns afterwards chalky, is their urine. Let us next conſider the organs of generation in both ſexes, and firſt thoſe of the male.

The teſticles are ſituated one on each ſide of the back bone, and are proportionally very large, to the creature's bulk. From theſe run out the vaſa ſeminifera, at firſt ſtreight, but after they recede farther from the body of the teſticle, they acquire an undulated or convoluted form, as the epididymis in man. Theſe convolutions partly ſupply the want of veſiculæ ſeminales, their coition being at the ſame time very ſhort; theſe terminate in the penis, of which this creature has two, one on each ſide of the common cloaca pointing directly outwards, and are very ſmall and very ſhort, hardly ſo big as a millet ſeed; whence they have eſcaped the notice of anatomiſts, who have often denied their exiſtence. This is what is chiefly remarkable in the organs of the male.

The racemus vitellorum being analogous to the ovaria in the human ſubject, are attached by a proper membrane to the back bone. This is very fine and thick, and continued down to the uterus. Its orifice is averſe with reſpect to the ovaria, yet notwithſtanding, by the force of the orgaſmus venereus, it turns round and graſps the vitellus, which, in its paſſage through this duct called the *infundibulum*, receives a thick gelatinous liquor, ſecreted by certain glands. This, with what it receives in the uterus, compoſe the white of the egg. By this tube then it is carried into the uterus.

The uterus is a large bag, placed at the end of the infundibulum, full of wrinkles on its inſide; here the egg is completed, receiving its laſt involucrum, and the ſhell is at laſt puſhed out at an opening in the ſide of the common cloaca. From the teſtes in the male being ſo very large, in proportion to the body of the creature, there muſt neceſſarily be a great quantity of ſemen ſecerned; hence the animal is ſalacious, and becomes capable of impregnating ſo many females. The want of the veſiculæ ſeminales is in ſome meaſure ſupplied by the convolutions of the vaſa deferentia, and by the ſmall diſtance between the ſecerning and excretory organs. The two penes contribute alſo very much to their ſhort coition, at which time the opening of the uterus into the cloaca is very much dilated, that the effect of the ſemen on the vitelli may be the greater.

A hen will of herſelf indeed lay eggs, but theſe are not impregnated, and yet appear entirely complete, except that the ſmall ſpot, which comes afterwards to be the rudiments of the chick, is not here to be obſerved. After having obſerved the contents of the abdomen and thorax, we next proceed to examine the parts about the neck and head.

Theſe creatures, as was obſerved of fowls in general, have no teeth, which would have been needleſs, as they ſwallow their food intire; but their tongue is made pretty firm, leſt it ſhould be hurt by the ſharp points of the grain they feed on. It is of a triangular figure and pointed before; and as by the depending poſture, their meat is in hazard of falling out of their mouths; to prevent this, there are ſeveral ſmall pointed papillæ ſtanding out upon their tongue and palate, with their points inclined backwards, allowing an eaſy paſſage to the food, but hindering its return.

We have here no velum palatinum, uvula, or epiglottis, and in place of two large holes opening into the noſe, there is only a long narrow rima ſupplied with pretty ſtrong muſcles, and ſuch another ſupplies the place of a glottis. The creature has a power of ſhutting both at pleaſure; and the nature of their food ſeems not only to exempt them from the hazard of its getting into the noſe or trachea, but its ſharp points would hurt an uvula or epiglottis, if they had any. Hence we ſee with what difficulty they ſwallow dough or other ſort of food that can be eaſily moulded into any form.

Their brain is covered with the common membranes, but its external ſurface is not formed into ſo many gyriæ or convolutions as ours. Its anterior part is quite ſolid, of a cineritious colour, and ſo far has a reſemblance of the corpora ſtriata, as to give riſe to the olfactory nerves.

The whole of it appears to us as imperfect, and we can ſcarce determine whether there be any thing analogous to a third or fourth ventricle; neither the corpus calloſum, fornix, nates, or teſtes, &c. can be obſerved here; which parts therefore cannot be imagined as abſolutely neceſſary for the functions of life, ſince we find theſe creatures perform them ſufficiently well. We may perhaps think theſe ſerve a particular uſe in man, who is a rational creature, but then quadrupeds enjoy them in common with man. Theſe protuberances, &c. ſeem rather to depend on the different diſpoſition of the ſeveral parts, being variouſly connected, and meeting in different directions in different places, than their being abſolutely neceſſary for any particular uſe; and the uſes that have been aſſigned to different parts of the brain by authors, ſeem to have no foundation but in the author's fancy.

Their organ of ſmelling is very large and well provided with nerves; hence they have this ſenſation very acute. Ravens and other birds of prey give a ſure proof of this by their being able to find out their prey, though concealed from their ſight, and at a conſiderable diſtance.

Thoſe birds that grope for their food in the waters, mud, &c. have large nerves which run quite to the end of their bills, by which they find out and diſtinguiſh their food.

The anterior part of their eyes (inſtead of having the ſclerotic coat continued, ſo as to make near a ſphere as in us) turns all of a ſudden flat; ſo that here the ſclerotic makes but half a ſphere; and and the cornea riſes up afterwards, being a portion of a very ſmall and diſtinct ſphere; ſo that in theſe creatures there is a much greater difference betwixt the ſclerotic and cornea than in us.

Their eyes do not jut out of their heads as in man and quadrupeds. As moſt of theſe creatures are continually employed in hedges and thickets, therefore that their eyes might be ſecured from theſe injuries, as well as from too much light when flying in the face of the ſun, there is a very elegant mechaniſm in their eyes, which is a membrane riſing from the internal canthus of the eye, which at pleaſure, like a curtain, can be made to cover the whole eye, and this by means of a proper muſcle that riſes from the ſclerotic coat, and paſſing round the optic nerves, runs through the muſculus oculi attollens (by which however the optic nerves are not compreſſed) and palpebra to be inſerted into the edge of this membrane. Whenever this muſcle ceaſes to act, the membrane by its own elaſticity again diſcovers the eye. This covering is neither pellucid nor opaque, both which would have been equally inconvenient, but being ſomewhat tranſparent, allows as many rays to enter as to make any object juſt viſible, and is ſufficient to direct them in their progreſſion. By means of this membrane it is that the eagle is ſaid to look at the ſun. Quadrupeds, as we mentioned before, have a membrana nictitans; but then it only can cover that part of the eye which is never covered by their eye-lids.

Beſides, all fowls have another particularity, whoſe uſe is not ſo well underſtood; and that is a pretty long black triangular purſe riſing from the bottom of their eye juſt at the entry of the optic nerve, and ſtretched out into their vitreous humour, and one would imagine it gave ſome threads to the cryſtalline. To this the French (who probably were the firſt who took notice of it in their diſſections before the Royal Academy) give the name of *bourſe noire*. This may poſſibly ſerve to ſuffocate ſome of the rays of light, that they may ſee objects more diſtinctly without hurting their eyes.

It has a connection with the vitreous, and ſeems to be joined alſo to the cryſtalline humour. If we ſuppoſe it to have a power of contraction (which may be as well allowed as that of the iris) it may ſo alter the poſition of the vitreous and cryſtalline humours, that the rays from any body may not fall perpendicularly upon the cryſtalline; and this ſeems to be neceſſary in them, ſince they cannot change the figure of the anterior part of their eye ſo much as we can do; and as this animal is expoſed often to too great a number of rays of light, ſo they having no tapetum, have the bottom of their eye wholly black on the retina; and in conſequence of this fowls ſee very ill in the dark.

They have no external ear, but in place thereof a tuft of very fine feathers covering the meatus auditorius, which eaſily allow the rays of ſound to paſs them, and likewiſe prevent duſt, or any inſect from getting in. An external ear would have been inconvenient in their paſſing through thickets and in flying, &c.

A liquor is ſeparated in the external part of the ear or meatus auditorius to lubricate the paſſage, and further prevent the entrance of any inſects, &c. The membrana tympani is convex externally, and no muſcles are fixed to the bones of their ear, which are rather of a cartilaginous conſiſtence; any tremulous motions impreſſed on the air are communicated in theſe creatures, merely by the ſpring and elaſticity of theſe bones; ſo probably the membrane is not ſo diſtended as in the human ear, where this is done by muſcles. The cochlea and ſemicircular canals are very diſtinct and eaſily prepared.

ANATOMY OF A CARNIVOROUS FOWL.

WE come next to the birds of prey, and for an example ſhall take a ſtenhill. The principal difference to be obſerved in them, is in their chylopoietic viſcera, which may be accounted for from their different way of life.

They have alſo a ventriculus ſuccenturiatus plentifully ſtored with glands, ſituated immediately above their ſtomach, which we ſee here is evidently membranous, otherwiſe than in the granivorous kind; and this difference, which is almoſt the only one we ſhall find betwixt the two different ſpecies of fowls, is eaſily accounted for from the nature of their food, which requires leſs attrition, being eaſier of digeſtion than that of the other kind; nevertheleſs it ſeems requiſite it ſhould be ſtronger than the human, to compenſate the want of abdominal muſcles, which are here very thin.

The ſame mechaniſm obtains in this creature's duodenum, that we have hitherto obſerved. As being a carnivorous animal, its guts are proportionally ſhorter than thoſe of the granivorous kind, for the reaſon firſt given, viz. its food being more liable to corrupt, therefore not proper to be long detained in the body, and for that reaſon it has no inteſtina cæca, of which the other ſpecies of fowls have a pair. The difference in their wings, backs, and claws are obvious, and have been already in ſome meaſure obſerved.

SECT. III.

ANATOMY OF FISHES.

AQUATIC animals are generally divided into ſuch as have lungs, and ſuch as want them. The firſt ſpecies differ very inconſiderably from an ox or any other quadruped, and are not eaſily procured; ſo that all we have to ſay on fiſhes, ſhall be taken from that ſpecies, which is not provided with reſpiratory organs.

Of theſe we may firſt obſerve, that they have a very ſtrong thick cuticle compoſed evidently of a great number of ſcales laid one on another like the tiles of houſes: this among other arguments ſerves to prove the human epidermis to be of a ſquamous ſtructure. In the next place theſe creatures have neither anterior nor poſterior extremities, as quadrupeds and fowls: for their progreſſion is performed in a different way from either of theſe ſpecies of animals; for this purpoſe they are provided with machines properly conſiſting of a great number of elaſtic beams, connected to one another by firm membranes, and with a tail of the ſame texture; their ſpine is very moveable towards the poſterior part, and the ſtrongeſt muſcles of their bodies are inſerted there.

The perpendicular fins ſituated on the ſuperior part of their body keep them in equilibrium, hindering the belly from turning uppermoſt, which it would readily do, becauſe of the air bag in the abdomen rendering their belly ſpecifically lighter than their back, but by the reſiſtance theſe fins meet with when inclined to either ſide, they are kept with their backs always uppermoſt. The beſt account of this matter we have in the treatiſe by *Borelli de motu Animalium*, Part I. chap. 23.

It may be next obſerved, that theſe creatures have nothing that can be called a neck, ſeeing they ſeek their food in an horizontal way, and can move their bodies either upwards or downwards as they have occaſion by the contraction or dilation of their air bag; a long neck, as it would hinder their progreſſion, would be very diſadvantageous in the element they live in.

Theſe creatures are not provided with teeth proper for breaking their aliment into ſmaller morſels; as the food they uſe is generally ſmall fiſhes or other animals that need no trituration in the mouth, but ſpontaneouſly corrupt, and gradually diſſolve into a liquid chyle. Their teeth ſerve to graſp their prey and hinder the creatures they have once catched from eſcaping again. For the ſame purpoſe the internal cartilaginous baſis of the bronchi, and the two round bodies ſituated in the poſterior part of the jaws, have a great number of tenter-hooks fixed into them in ſuch a manner, as that any thing can eaſily get down, but is hindered to get backwards. The water that is neceſſarily taken in along with their food in too great quantities to be received into their jaws in deglutition, paſſes betwixt the interſtices of the bronchi, and the flap that covers them. The compreſſion of the water on the bronchi is of conſiderable uſe to the creature.

The œſophagus in theſe creatures is very ſhort, and ſcarcely diſtinguiſhed from their ſtomach, ſeeing their food lies almoſt equally in both. The ſtomach is of an oblong figure. There are commonly found ſmall fiſhes in the ſtomach of large ones, ſtill retaining their natural form, but when touched they melt down into a jelly. From this and the great quantity of liquors poured into their ſtomachs, we may conclude that digeſtion is ſolely brought about in them, by the diſſolving power of a menſtruum, and that no trituration happens here.

The guts in theſe animals are very ſhort, making only three turns, the laſt of which ends in the common cloaca for the fœces, urine and ſemen, ſituated about the middle of the inferior part of their bodies, and are connected to the back-bone by a membrane analogous to a myſentery. No lacteals have been yet obſerved, and it is probable, their aliment is taken in by the meſeraic veins.

Their liver is very large, of a whitiſh colour, and lies almoſt in the left ſide wholly, and contains a great deal of fat. The gall-bladder is ſituated a conſiderable way from the liver, and ſends out a canal, the cyſtic duct, which joins with the hepatic duct juſt at the entry into the gut; ſome fibres are ſtretched from the liver to the gall-bladder, but none have hitherto diſcovered any cavity in theſe cords; ſo that in this animal it ſhould ſeem impoſſible that the bile can be carried into the gall-bladder in the ordinary way, and conſequently muſt either be ſecerned on the ſides of that ſac, or regurgitate into it from the canalis choledochus.

The ſpleen is placed near the back bone, and at a place where it is ſubjected to an alternate preſſure from the conſtriction and dilatation of the air bag, which is ſituated contiguous to it. Since in all animals, we find the ſpleen attached to ſomewhat that may give it a conquaſſation, as in the human ſubject and quadrupeds, it is contiguous to the diaphragm; in fowls it is placed betwixt the back bone, the liver and ſtomach; in fiſhes it lies on the ſaccus aerius; and ſince we find it ſo well ſerved with blood veſſels, and all its blood returning into the liver, we muſt not conclude the ſpleen to be an inutile pondus, only to ſerve as a balance to the animal pro equilibrio, but particularly deſigned for preparing the blood to the liver.

The only organs of generation in this animal are two menſtruous bags ſituated in the abdomen uniting near the podex. Theſe in the male are filled with a whitiſh firm ſubſtance called the milt, and in the female with an infinite number of little ova cluſtered together, of a reddiſh yellow colour called the roe. Both theſe at ſpawning time we find very much diſtended; whereas, at another time, the male organs can ſcarce be diſtinguiſhed from the female, nor is there any proper inſtrument in the male for throwing the ſeed into the organs of the female, as in other creatures. We ſhall not take upon us to determine the way whereby the female ſperm is impregnated; but we find, that the ſpawn of frogs conſiſts in the ſmall ſpecks wrapt up in a whitiſh glutinous liquor; theſe ſpecks are the rudiments of the young frogs, which are nouriſhed in that liquor, till they are able to go in ſearch of their food. In the ſame way the ova of fiſhes are thrown out and depoſited in the ſand, the male being for the moſt part ready to impregnate them, and they are incubated by the heat of the ſun. It it curious enough to remark with what care they ſeek for a proper place to depoſite their ova, by ſwimming to the ſhallow, where they can better enjoy the ſun's rays, and ſhun the large jaws of other fiſhes. The river fiſhes again ſpawn in ſome creek, free from the hazard of the impetuous ſtream. But whether this mixture be brought about in fiſhes, by a ſimple application of the genitals to each other; or if both of them throw out their liquors at the ſame time in one place, and thus bring about the deſired mixture, it is not eaſy to determine; the latter ſeems moſt probable. Theſe creatures are ſo ſhy that we cannot poſſibly get to obſerve their way of copulation, and are conſequently but little acquainted with their natural hiſtory.

After raiſing up the black peritoneum, there comes in view an oblong white membranous bag, in which there is nothing contained but air. This is the ſwimming bladder: it lies cloſe to the back-bone, and has a pretty ſtrong muſcular coat, whereby it can contract itſelf. By contracting this bag, they can make the muſcles ſpecifically heavier than water, and ſo readily fall to the bottom; whereas the muſcular fibres ceaſing to act, they become ſpecifically lighter than water, and ſo ſwim above. According to the different degrees of contraction and dilatation of this bladder, they can keep higher or lower in the water at pleaſure. Hence flounders, ſoles, raia, and ſuch other fiſhes as want this ſac, are found always groveling at the bottom of the water: it is owing to this that dead fiſhes (unleſs this membrane has been previouſly broke) are found ſwimming a-top, the muſcular fibres then ceaſing to act, and that with their bellies uppermoſt; for the back-bone cannot yield, and the diſtended ſac is protruded into the abdomen, and the back is conſequently heavieſt at its upper part according to their poſture. There is here placed a glandular ſubſtance containing a good quantity of red blood, and all the red blood in their body is contiguous to this air bag, excepting the guts. From the anterior part of the bag, go out two proceſſes or appendices.

At the ſuperior part of this bag there are other red coloured bodies, of a glandular nature, which are connected with the kidneys. From them the ureters go down to their inſertion in the veſica urinaria, which lies in the lower part of the abdomen, and the urethra is there produced, which terminates in the podex.

Theſe laſt mentioned parts have not hitherto been obſerved in ſome ſpecies of fiſhes, whence authors too haſtily denied them in all. Theſe creatures have a membranous diaphragm which forms a ſac, in which the heart is contained. It is very tenſe, and almoſt perpendicular to the vertebræ.

The heart is of a triangular form with its baſe downwards, and its apex uppermoſt, which ſituation it has becauſe of the branchiæ. It has but one auricle and one ventricle, becauſe they want lungs: and one great artery. The ſize of the auricle and ventricle are much the ſame; the artery ſends out numberleſs branches to the branchiæ or gills.

The branchiæ lie in two large ſlits at each ſide of their heads, and ſeem to be all they have that bears any analogy to lungs.

Over theſe gills there is a large flap, allowing a communication externally, by which the water they are obliged to take into their mouths with their food finds an exit, without paſſing into their ſtomach; it is owing to theſe flaps coming ſo far down, that the heart is ſaid commonly to be ſituated in their heads.

Their brains are formed pretty much in the ſame way as that of fowls, only we may obſerve that the poſterior lobes bear a greater proportion to the anterior.

Their organ of ſmelling is large, and they have a power of contracting and dilating the entry into their noſe as they have occaſion. It ſeems to be moſtly by their acute ſmell that they diſcover their food; for their tongue ſeems not to have been deſigned for a very nice ſenſation, being of a pretty firm cartilaginous ſubſtance; and common experiment evinces, that their ſight is not of ſo much uſe to them as their ſmell in ſearching for their nouriſhment. If you throw a freſh worm into the water, a fiſh ſhall diſtinguiſh it at a conſiderable diſtance; and that this is not done by the eye, is plain from obſerving, that after the ſame worm has been a conſiderable time in the water and loſt its ſmell, no fiſhes will come near it: but if you take out the bait and make ſeveral little inciſions into it, ſo as to let out more of the odoriferous effluvia, it ſhall have the ſame effect as formerly. Now it is certain, had the creatures diſcovered this bait with their eyes, they would have come equally to it in both caſes: in conſequence of their ſmell being the principal means they have of diſcovering their food, we may frequently obſerve their allowing themſelves to be carried down with the ſtream, that they may aſcend again leiſurely againſt the current of the water; thus the odorous particles ſwimming in that medium, being applied more forcibly to their ſmelling organs, produce a ſtronger ſenſation.

The optic nerves in theſe animals are not confounded with one another in their middle progreſs betwixt their origin and the orbit, but the one paſſes over the other without any communication; ſo that the nerve that comes from the left ſide of the brain goes diſtinctly to the right eye; and *vice verſa*.

The lens cryſtallina is here a compleat ſphere; whereas in men and all other terreſtrial animals it conſiſts of two portions of unequal ſpheres laid on one another: to account for this, it muſt be conſidered that theſe creatures have got no aqueous humour, as the rays that come to their eyes are conveyed through a medium of the ſame denſity with that humour in other animals, and conſequently would have gone on in a ſtraight line without any refraction till they came to the lens, although they had been provided with an aqueous humour; thus then the rays impinging upon their lens have hitherto ſuffered no refraction; that they might therefore be ſufficiently refracted and meet in a point on the retina, it was neceſſary the lens ſhould be made more convex than it is in other creatures who have the rays conſiderably refracted in their paſſage from the air through the aqueous humour.

As fiſhes are continually expoſed to injuries in the uncertain element they live in, and as they are in perpetual danger of becoming a prey to the larger ones, it was neceſſary their eyes ſhould never be ſhut, and in conſequence of this they are not provided with palpebræ; but then, as in the current itſelf, the eye muſt be expoſed to ſeveral injuries, there was a neceſſity it ſhould be ſufficiently defended, which in effect it is by a firm pellucid membrane, that ſeems to be a continuation of the cuticula, being ſtretched over here. The epidermis is very proper for this purpoſe, as being inſenſible and deſtitute of veſſels, and conſequently not liable to obſtructions, or by that means of becoming opake.

Whether fiſhes have a ſenſe of hearing or not is very uncertain: all that has the appearance of an organ of hearing in theſe creatures is a bone, about the bulk of one half of a common bean, of a particular ſtructure, being very brittle and compoſed of a great many different ſegments laid at one another's ſides, and ſituated in a particular form at the ſide of the brain; is then the idea of ſound communicated to them by means of this bone? or does their running away, as ſtamping hard on the ground or crying loud, depend upon ſome other kind of ſenſation? This may poſſibly be produced in them, by a tremulous motion communicated to their bodies by the circumambient water, which is put in agitation from the like concuſſions happening in the air or neighbouring ground.

I could wiſh to have treated more copiouſly on a ſubject of ſuch great importance; but as the limits of this work would not admit of it, I have collected and added that which I conſidered moſt inſtructive to the Student, and entertaining to the Reader.

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No. 4, LAMBETH.

Comparative *Degree*, in grammar, is an inflexion between poſitive and ſuperlative degrees; whoſe effect is, to ſet a thing above or beneath the level of another.

COMPARISON, in a general ſenſe, the conſideration of the relation between two perſons or things, when oppoſed and ſet againſt each other, by which we judge of their agreement or difference.

Comparison, in rhetoric, is a figure, or rather place, in ſpeech, whereby two things are conſidered with regard to ſome third, which is common to them both.

Thus, Cicer. Topic. *Catoni licuit ſequi bellum civile, igitur & Ciceroni licebit.* It was allowed Cato to engage in the civil wars, therefore it may be allowed Cicero: where, to engage in the civil wars, is common to both. To this example, we may add that of Shakeſpeare:

> "She never told her love,
> But let concealment, like a worm in th' bud,
> Feed on her damaſk cheek: ſhe pin'd in thought,
> And ſat, like Patience, on a monument,
> Smiling at Grief."

There are three kinds of compariſon; the firſt *à majori*, i. e. from the major to the minor, as that of Cicero againſt Antony, *Quid feceris domi tuæ, cum alienæ tam ſis inſolens?* Or that of Terence, *Quem feret, ſi parentem non fert ſuum?* From the ſame place, Ovid endeavours to appeaſe Cæſar.

> *Cur ego poſſe negem leniri Cæſaris iram,*
> *Cum videam mites hoſtibus eſſe Deos?*
> Why ſhould I fear great Cæſar's wrath t' appeaſe,
> When to their envious foes the gods ſpeak peace?

The ſecond, *à minori*, i. e. from the minor to the major: thus Cicero, *Majores noſtri ſæpe mercatoribus, ac naviculatoribus injurioſiùs tractatis, bella geſſerunt; vos tot civium Romanorum millibus uno nuntio atque uno tempore necatis, quo tandem animo eſſe debetis?*

The third *à pari*; as when we contend, that what obtains in one thing, ought to obtain in another of the ſame kind: thus, It was a law, that he who killed his father ſhould be ſewed up in a ſack, and thrown into a river; therefore, he who killed his mother deſerves the ſame puniſhment.

> *Capto tuam, pudet heu! ſed capto, Maxime, cœnam:*
> *Tu capis alterius; jam ſumus ergo pares.*
> *Mane ſalutatum venio, tu diceris iſſe,*
> *Ante ſalutatum: jam ſumus ergo pares, &c.* Mart. lib. ii.

COMPARTIMENT, or Compartment, a deſign compoſed of ſeveral different figures, diſpoſed with ſymmetry; to adorn a parterre, a ceiling, pannel of joinery, or the like.

Compartments, in gardening, are beds, plats, borders, and walks, laid out according to the form of the ground, and depend more on a good fancy, than on any ſet of rules, for their conſtruction.

COMPARTITION, in architecture, the uſeful and graceful diſtribution of the whole ground plot of an edifice, into rooms of office, and of reception, or entertainment. Compartition makes one of the great diviſions of the art of building.

COMPASS. The mariners, or nautical compaſs, is an inſtrument uſed by pilots, to direct the courſe of their ſhips.

It conſiſts of a box which includes a magnetical needle, that always turns to the north; allowing for a little declination, which is various in various places, and even at various times, in the ſame place; for the deſcription and uſe of which ſee Syſtem of Navigation.

Compass is alſo an inſtrument of conſiderable uſe in ſurveying land, dialling, &c. For its deſcription and uſe, ſee Geometry and Surveying.

Compass *Dials*, are ſmall dials, fitted in boxes, for the pocket, to ſhew the hour of the day by direction of the needle.

COMPASSES, or *Pair of* Compasses, a mathematical inſtrument uſed for the deſcribing of circles, meaſuring lines, &c.

Compasses, *Cylindrical and Spherical*, uſed in taking the diameter, thickneſs, or caliber of round, or cylindric bodies; ſuch as cannons, pipes, &c. They conſiſt of four branches joined in a centre; two of them circular, and two flat, a little bent at the ends.

There are alſo ſpherical compaſſes, differing in nothing from the common ones, but that their legs are arched; ſerving to take the diameters of round bodies, &c.

Compasses, *Elliptic*. Their uſe is to draw ellipſes, or ovals of any kind.

Compasses, *Spring* or *Dividers*, are made of hardened ſteel, the head arched: which, by its ſpring, opens the compaſſes; the opening being directed by a circular ſcrew, faſtened to one leg, and let through the other, worked with a nut.

COMPASSION, Commisseration, in ethics, a mixed paſſion, compounded of love and ſorrow, and excited by the ſight or recital of diſtreſs.

COMPATIBLE, ſomething that may ſuit, or conſiſt with another.

COMPENDIUM, an abſtract, epitome, or reduction of a large matter into a little compaſs.

COMPENSATION, an action whereby any thing is admitted as an equivalent to another.

Compensation, in the civil law, is a kind of right, whereby a debtor purſued by his creditor, for the payment of a debt, demands that the debt may be compenſated with what is owing him by the creditor. Compenſation is equivalent to payment.

COMPETENCE, or Competency, in a general ſenſe, ſuch a quantity of any thing as is ſufficient.

Competence, in law, the right or authority of a judge, whereby he takes cognizance of any thing.

COMPETITION, in a general ſenſe, is the ſame with rivalſhip, or when two or more perſons contend for the ſame thing.

COMPITALIA, or Compitalitia, feaſts held among the ancients in honour of the *lares*.

The word comes from *compitum*, a croſs-way; becauſe the feaſt was held in the meeting of ſeveral roads.

They were re-eſtabliſhed, after a long neglect, by Tarquin the Proud, on occaſion of an anſwer of the oracle, *That they ſhould ſacrifice heads for heads*, i. e. that for the health and proſperity of each family, children were to be ſacrificed; but Brutus, after expelling the kings, in lieu of thoſe barbarous victims, ſubſtituted the heads of garlic and poppy; thus ſatisfying the oracle, which had enjoined *capita*, heads, at an eaſier rate.

COMPLAINANT, in law, a plaintiff, or one who prefers a complaint againſt another, to be relieved by juſtice or equity.

COMPLEMENT, in aſtronomy, is uſed for the diſtance of a ſtar, from the zenith; or the arch comprehended between the place of a ſtar above the horizon, and the zenith.

Complement *of the Courſe*, in navigation, is the number of points the courſe wants of 90 degrees, or eight points; viz. of a quarter of the compaſs.

Complement *of the Curtin*, in fortification, that part of the anterior ſide of the curtin, which makes the demigorge.

Complement *of the Line of Defence*, is the remainder of the line of defence, after you have taken away the angle of the flank.

Complement, in geometry, is what remains of a quadrant of a circle, or of ninety degrees, after any certain arch has been retrenched from it.

Complement *of Life*, in the doctrine of annuities, is the number of years which a given life wants of 86. Thus 56 is the complement of 30, 36 of 50, &c.

Mr. de Moivre ſuppoſes an equal decrement of life, through all its ſtages till the age of 86, which he conſidered as the utmoſt probable extent of life. Thus, if there be 56 perſons alive at 30 years of age, it is ſuppoſed that one will die every year, till, in 56 years, they will be all dead. The ſame will happen to 46 at 40, in 46 years, and thus for all ages. See Syſtem of Annuities.

COMPLEX, a term ordinarily uſed as ſynonymous with compound; though, ſtrictly ſpeaking, there is ſome difference between them.

Complex is properly applied where a thing conſiſts of divers parts, not really diſtinct from one another; but only imaginarily, or in our conception.

Complex *Syllogiſm*, is that in which the middle term is not connected with the whole ſubject, or the whole predicate in two diſtinct propoſitions, but is intermingled and compared with them by parts, e. gr. The ſun is a ſenſeleſs being, the Perſians worſhipped the ſun; therefore the Perſians worſhipped a ſenſeleſs being.

Complex *Term*, in logic, is that which requires more than one word to ſignify one thing; or where one word implies ſeveral things.

Some terms are complex in words, but not in ſenſe, ſuch is the ſecond emperor of Rome; for it excites in our mind only the idea of one man, viz. Auguſtus.

Some terms are complex in ſenſe, but not in words; ſo when we ſay an army, a foreſt, we mean a multitude of men, or trees.

There are other terms which are complex both in words and ſenſe; ſo when we ſay, a fierce dog, or a pious man, it excites an idea, not only of thoſe two creatures, but of their peculiar characters alſo.

Among the terms that are complex in ſenſe, but not in words, we may reckon thoſe ſimple terms which contain a primary and a ſecondary idea in them; as when we hear our neighbour ſpeak that which is not true, we ſay to him, This is not true, or this is falſe, we only convey to him the naked idea of his error; this is the primary idea: but if we ſay it is a lye, the word *lye* carries alſo a ſecondary idea in it, for it implies both the falſehood of the ſpeech, and our reproach and cenſure of the ſpeaker. On the other hand, if we ſay it is a miſtake, this carries alſo a ſecondary idea with it; for it not only refers to the falſehood of his ſpeech, but includes our tenderneſs and civility to him at the ſame time. Another inſtance may be this; when we uſe the word *inceſt*, *adultery*, and *murder*, we convey to another not only the primary idea of thoſe actions, but we include alſo the ſecondary idea of their unlawfulneſs, and our abhorrence of them.

COMPLEXIO, Complexion, in metaphyſics, the union, or coalition of ſeveral things different from each other; either really, or only in our conception.

COMPLEXION, among phyſicians, the temperament, habitude, and natural diſpoſition, of the body; but more often the colour of the face and ſkin. See Colour *of the Human Species*.

COMPLEXUS, in anatomy, a pair of muſcles, for a deſcription of which ſee System Part III. Sect. 12. For the repreſentation ſee Plate II. *Fig.* 2.

COMPLICATION, in general, denotes the blending, or rather interweaving, of ſeveral different things together: thus a perſon afflicted with ſeveral diſorders at the ſame time, is ſaid to labour under a complication of diſorders.

COMPOSING *Stick*, an inſtrument uſed by printers. See Printing.

COMPONE, or Componed, in heraldry. A bordure compone, is that formed or compoſed of a row of angular parts, or chequers of two colours.

COMPOSITE, in general, denotes ſomething compounded, or made up of ſeveral others united together; thus,

Composite *Numbers*, are ſuch as can be meaſured exactly by a number exceeding unity; as 6 by 2 or 3, or 10 by 5, &c. ſo that 4 is the loweſt compoſite number. Compoſite numbers, between themſelves, are thoſe which have ſome common meaſure beſides unity; as 12 and 15, as being both meaſured by 3.

Composite *Order*, in architecture, the laſt of the five orders of columns; ſo called becauſe its capital is compoſed out of thoſe of the other columns, borrowing a quarter round from the Tuſcan and Doric, a row of leaves from the Corinthian, and volutes from the Ionic. Its corniche has ſimple modillions or dentils. It is alſo called the Roman or Italic order, as having been invented by the Romans. By moſt authors it is ranked after the Corinthian, either as being the next richeſt, or the laſt invented. See Syſtem of Architecture, Plate VI.

COMPOSITION, in a general ſenſe, the uniting or putting together ſeveral things, ſo as to form one whole, called a compound.

Composition *of Ideas*, an act of the mind, whereby it unites ſeveral ſimple ideas into one conception or complex idea.

Composition, in grammar, the joining of two words together; or prefixing a particle to another word, to augment, diminiſh, or change its ſignification.

Composition, in logic, a method of reaſoning, whereby we proceed from ſome general ſelf-evident truth, to other particular and ſingular ones.

Composition, in muſic, is the art of inventing and writing airs; of accompanying them with a ſuitable harmony; in ſhort, of forming a complete piece of muſic in all its parts.

Under compoſition are comprehended the rules, 1. Of *melody*, or the art of making a ſingle part, i. e. of contriving and diſpoſing the ſimple ſounds, ſo as that their ſucceſſion and progreſs may be agreeable. 2. Of *harmony*, or the art of diſpoſing and concerting ſeveral ſingle parts ſo together, that they make one agreeable whole.

It may be here obſerved, that melody being chiefly the buſineſs of the imagination, the rules of compoſition ſerve only to preſcribe certain limits to it; beyond which, the imagination, in ſearching out the variety and beauty of airs, ought not to go: but harmony being the work of judgment, its rules are more certain, extenſive, and more difficult of practice.

Composition, in literature, the art of forming and arranging ſentiments, and cloathing them with language ſuitable to the nature of the ſubject or diſcourſe.

Composition, in chymiſtry, is the union and combination of ſeveral ſubſtances of different natures, from which a compound body reſults.

Composition, in pharmacy, the art or act of mixing divers ingredients together into a medicine, ſo as they may aſſiſt each other's virtues, ſupply each other's defects, or correct any ill qualities thereof.

Composition, in commerce, a contract between an inſolvent debtor and his creditors, whereby the latter accept of a part of the debt in compoſition for the whole, and give a general acquittance accordingly.

COMPOST, in agriculture, a compound, or mixture of earths, dungs, &c. applied by way of manure. See Syſtem, Sect. II.

COMPOUND, in a general ſenſe, an appellation given to whatever is compoſed or made up of different things; thus we ſay, a compound word, compound ſound, compound taſte, &c. compound differs from complex, and ſtands oppoſed to ſimple.

Compound *Intereſt*, called alſo *intereſt upon intereſt*, is that which is reckoned not only upon the principal, but upon the intereſt itſelf forborne; which hereby becomes a ſort of ſecondary principal.

Compound *Motion*, that motion which is effected by ſeveral conſpiring powers.

Compound, (ſubſtantive), the reſult or effect of a compoſition of different things; or a maſs formed by the union of many ingredients.

COMPREHENSION, the act or quality of compriſing or containing; a ſummary, compendium, or abſtract; capacity, or the power of the mind to admit ſeveral ideas at once.

COMPRESSION, the act of preſſing, or ſqueezing ſomething, ſo as to ſet its parts nearer to each other, and make it poſſeſs leſs ſpace.

Compreſſion properly differs from condenſation, in that the latter is performed by the action of cold, the former by ſome external violence.

COMPROMISE, a treaty, or contract, whereby two contending parties eſtabliſh one or more arbitrators, to judge of and terminate their differences in an amicable manner.

COMPTING, or Counting House, an office in the king's houſehold, under the direction of the lord ſteward; ſo called, becauſe the accompts for all expences of the king's houſhold are there taken. Alſo an office in which merchants and capital tradeſmens accounts are kept.

COMPTROL, or Comtrole, is properly, a double regiſter, kept of acts, iſſues, &c. of the officers or commiſſioners in the revenue, army, &c. in order to perceive the true ſtate thereof, and to certify the truth.

COMPTROLLER, an officer eſtabliſhed to comptrol, or overlook public accounts, and to certify, on occaſion, whether things have been comptrolled and examined, or not.

COMPUNCTION, in theology, an inward grief in the mind for having offended God.

The word comes from *compungere*, of *pungere*, to prick.

COMPUTATION, the manner of accounting and eſtimating time, weights, meaſures, and money.

COMUS, in mythology, the god of jollity or feſtivity.

CONARION, or Conoides, a name for the pineal gland. See Syſtem of Anatomy, Part VI. Sect. II.

CONCATENATION, a term chiefly uſed in ſpeaking of the mutual dependence of ſecond cauſes upon each other.

CONCAVE, an appellation uſed in ſpeaking of the inner ſurface of hollow bodies, but more eſpecially of ſpherical ones.

Concave *Glaſſes*, ſuch as are ground hollow, and are uſually of a ſpherical figure, though they may be of any other, as parabolical, &c. All objects ſeen through concave glaſſes, appear erect and diminiſhed.

CONCENTRATION, in general, ſignifies the bringing things nearer a centre. Hence the particles of ſalt, in ſea-water, are ſaid to be concentrated; that is, brought nearer each other, by evaporating the watery part.

CONCENTRIC, in mathematics, ſomething that has the ſame common centre with another: it ſtands in oppoſition to eccentric.

CONCEPTION, among phyſicians, &c. denotes the firſt formation of an embryo in the womb of its parent, who, from that time, becomes pregnant.

CONCERT, or Concerto, a number or company of muſicians, playing or ſinging the ſame ſong, or piece of muſic, together.

CONCESSION, in general, ſignifies either the act of granting or yielding any thing, or the thing itſelf which is ſo granted or yielded.

CONCHA, in conchology, a genus of bivalve ſhells, the animal inhabiting which is called tethys. This is a very comprehenſive genus, compriſing the oyſter, chama, muſcle, heart-ſhell, pecten, ſolen, &c.

Conchæ *Anomiæ*, in natural hiſtory, the name of a foſſile ſhell fiſh, found in great abundance, and in a great variety of ſpecies, (but not known in any of them living) on the ſhores or in the ſeas of our own or other countries. In Glouceſterſhire, and ſome other of our counties, theſe are found very frequently on the ploughed land in other places. They are a ſort of bivalve ſhell, the valves of which are of unequal extent, both of them convex, and the head or beak of the longer valve crooked, and falling over the head of the other.

The great general diſtinction of this numerous claſs of bodies, is into thoſe which are of a ſmooth ſurface, and thoſe which are of a ſtraited or rough one.

Others alſo of the ſame claſs, or of one very nearly allied to it, are found in many of our inland counties, ſome very long from the cardo, or hinge, to the margin; and others very ſhort, and very long the contrary way. They are found indifferently in all ſorts of ſtrata, in earth, in ſtone, in ſand, and among gravel.

Concha *Spectrorum*, the ſpectre ſhell, a name given by authors to a ſpecies of voluta, from ſome odd figures deſcribed on its ſurface, repreſenting rough draughts of terrible phantoms. It is an elegant ſhell, of a middle ſize, and is of a white ground, and the figures are reddiſh; theſe form three large and broad bands, ſurrounding the ſhell at top and bottom, and in the middle; and between theſe there are ſeveral ſeries of ſmall ſpots. It is a ſcarce ſhell, and uſually ſells at a large price.

Concha *Veneris*, in conchology, the name by which ſeveral ſpecies of chama are called.

The powder of theſe ſhells muſt be owned to poſſeſs an abſorbent drying quality; but that on account of their beauty, or any other circumſtance, their powder is preferable to that of other ſhells, is by no means probable.

CONCHOID, or Conchilis, in geometry, a curve line which always approaches nearer a ſtrait line, to which it is inclined, but never meets it.

The following Syſtem of CONCHOLOGY *is arranged and methodized according to the Linnæan Syſtem, by*

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SYSTEM OF CONCHOLOGY.

Before we proceed to the arrangement of this part of natural hiſtory, we think it neceſſary to premiſe, that we ſhall treat as largely as poſſible of each genus. With reſpect to the ſpecies included in each genus, we ſhall mention thoſe that poſſeſs extraordinary properties; as the ſpecies are ſo numerous, it would exceed the limits of our Work to enter into a minute deſcription of them in general.

The ſcientifical arrangement of ſhells in the cabinets of naturaliſts, eſſentially depends on aſcertaining preciſely their reſpective generic characters, as the moſt effectual means of avoiding incoherence, confuſion and diſorder. This ſhall be our main object throughout the following Syſtem, in the courſe of which, particular attention will be paid to ſuch parts and ſubjects as ſerve, according to our beſt judgment, to explain the Syſtem adopted by the celebrated Linnæus.

With reſpect to the plates that will illuſtrate this Syſtem of Conchology, it is proper to obſerve, that we ſhall give one of every Genus. In thoſe that are remarkable, we ſhall adopt the ſame plan as in the plates of Ornithology, and give as many as we think neceſſary to explain and embelliſh the Syſtem; each ſhell will have its name and genus engraved on the plate, it is needleſs therefore to refer to them here, as the writing on the plate will fully anſwer that purpoſe.

We perceive that in all other Dictionaries, they have introduced repreſentations of quadrupeds, birds, fiſhes, inſects, &c. but without aſcertaining, or arraigning their reſpective claſſes, orders, genera, and ſpecies, which muſt therefore create an incoherent jumble. Nor have they in their deſcriptions, ſufficiently attended to theſe regulations. But admitting theſe important objects had been obſerved by the Editors of the reſpective Dictionaries, they could not have anſwered the purpoſe of thoſe Readers who wiſh to purſue the ſtudy of Natural Hiſtory ſcientifically;. becauſe their deſcriptions are given in an abſtracted and not in a connected point of view, which renders it impoſſible to collect the ſcattered rays of this Science, ſo as to attain a competent knowledge of it. The object of Dictionaries ſhould be to convey general information. How then can this be effected, if the Sciences are thus diſſected, and ſcattered through ſuch a labyrinth of unconnected matter? It ſtrikes us very forcibly, that through want of method and ſyſtem, the ſame inconveniencies muſt attend every other Science beſides Natural Hiſtory.

This imperfection we ſhall totally obviate by a ſtrict adherence to the immortal Linnæus, and to thoſe who have followed and improved his Syſtems.

Plan of Regulations in the future
SYSTEMS of NATURAL HISTORY.

It is intended in all diviſion of Natural Hiſtory, to be copious on the generic characters, and conciſe on the ſpecific, by which means we ſhall be able to deſcribe the reſpective kingdoms of nature, and give our Readers a thorough knowledge of claſſification of this entertaining ſcience; and thereby exhibit a full diſplay of all that conſtitutes the diſtinctions and diviſions which regulates the Syſtem of Naturaliſts. Thoſe who wiſh to purſue the ſtudy of Natural Hiſtory, further than the knowledge of arrangement and claſſification, we ſhall refer to ſuch authors as are moſt eſteemed in each reſpective diviſion.

All our Syſtems in Natural Hiſtory, as well as the ſciences in general, will be ſo formed, as to admit of being detached from the work at the pleaſure of the ſubſcriber, who will thereby have an opportunity of ſeparating them from the alphabetical arrangement, and binding them together, ſo as to compriſe a complete circle of ſcience.

As Natural Hiſtory is become ſo faſhionable a ſtudy, not only amongſt the ſuperior ranks of people, but ſo eagerly ſought after by the commonalty, Mr. Cooke has engaged different artiſts to delineate every genus throughout each kingdom of nature, by which means the knowledge of claſſification will be conſiderably facilitated, as in many inſtances, the pen is inadequate to furniſh thoſe true and ſtrict ideas of animal nature, as the pencil is capable of deſcribing. Natural Hiſtories without figures of the objects, are at beſt imperfect; for at one view figures impreſs the idea of the body much ſtronger than the moſt finiſhed or accurate deſcription, as they of courſe muſt ſtrike the mind, and aid the knowledge of the ſtudy.

As this plan of giving a particular deſcription and repreſentation alſo of each genus throughout the whole *of the animal and vegetable kingdoms, has never been attempted before in any Dictionary of Arts and Sciences, or any collective work whatever, we truſt it will ſtamp a value on the preſent undertaking.*

INTRODUCTION.

THIS diviſion of Natural Hiſtory, called CONCHOLOGY, comprehends the ſtudy of all animals that are teſtaceous, or have ſhell coverings; not only thoſe of the ſea, but alſo thoſe of rivers and land.

Teſtaceous animals are ſuch as have a ſtone-like calcareous covering or habitation, in which the whole animal, otherwiſe quite naked or fleſhy (for each part or limb is not particularly covered with this ſtony cruſt) lives included, as in a houſe. They are formed of two diſtinct parts: the one which is the animal, is ſoft or fleſhy; the other, which is the ſhell or habitation, is hard, of a ſtony conſiſtence, and covers the animal to which it is connected or attached by muſcles.

Cruſtaceous animals, as lobſters, crabs, &c. are not naked, but have every particular limb or part ſeparately covered with the cruſt, which conſequently is formed into many joints, inſomuch that the whole animal ſeems as it were loricated, or in a coat of mail.

All ſhell animals are exanguious, that is, they have not blood like quadrupeds, birds, fiſhes, or reptiles, and therefore properly appertain to the fifth claſs of animals or inſects; they are alſo deſtitute of any bones; thoſe fulcra or props to the muſcles of the animal ſtructure, being exterior in theſe creatures in their ſhells, and not interior as all bones of other animals are placed. However, they are endowed with the principal parts, as the mouth, lungs, heart, &c. beſides other parts ſuitable to their nature of life. The full deſcriptions of the animals themſelves, or any anatomical diſquiſitions, are not the ſcope of our preſent deſign. It is rather too abſtruſe and unentertaining: but for thoſe curious particulars we refer our readers to Dr. Liſter; Adanſon in his hiſtory of the Senegal Shells; and Argenville in his Zoömorphoſe, each of which authors have inveſtigated them ſcientifically.

Whether the methodical ſyſtem, or arrangement of teſtaceous animals ſhould be formed from the animals themſelves, or from their habitations or ſhells, is a ſubject of great debate among naturaliſts. The former method ſeems moſt ſcientifical; but the latter from the ſhells, is univerſally followed.

The vaſt number of ſpecies hitherto diſcovered, and the numerous collections made, exhibit only the ſhells or habitations, the animals themſelves being ſcarcely known or deſcribed. Of the ſhells ſo frequently diſcovered, few are fiſhed up living; the greater number are found on ſhores, dead and empty. Accurate deſcriptions of animals, whoſe parts are not eaſily ſeen, and anatomical reſearches are not in the capacity of every one to make; nor are the particular parts and their reſpective functions ſo eaſily cognizable to any, but expert, aſſiduous, and philoſophical enquirers. How then can it be poſſible to arrange a numerous ſet of animals by characters or parts, with which it is difficult, if poſſible, to become acquainted, in the far greater number of ſpecies collected or diſcovered?

Scientifical reſearches with regard to the arrangement of animals are to be held in the ſame light, as chymical ones with regard to foſſils: they are the extreme diſquiſitions to aſcertain the ſpecies, when the more obvious and eaſy character are vague or wanting.

Thus all ranks of animals are arranged into ſyſtems by obvious and external, not by ſcientifical, characters; even animals of bulk which are in daily uſe. Quadrupeds are methodized by their teeth, horns, hoofs, and hides, or coverings. Birds by their plumage, beaks and claws. Reptiles and inſects by like particulars. The very fiſhes, though of a different element, undergo arrangement by their fins, and the vegetables are diſtinguiſhed by their flowers and fruits. All theſe arrangements are on the principles of external and obvious characters. It cannot, therefore, with propriety be required to arrange, by ſcientifical or difficult characters, a ſet of animals who chiefly live in the depths of the ſea, have hardly a progreſſive motion, and are procured for the greater part with difficulty.

The naturaliſt muſt know, that different colours and forms of appearances in the different ſtages of growth, run equally with teſtaceous animals through all the orders of nature. Thus for example: the horned quadrupeds have their horns only at ſtated growths; the birds a ſtated colouring of plumage. Some inſects yet more remarkable, crawl one part of their lives on the terreſtrial, or cut the watery, before they ſport in the airy element. Theſe are far greater changes than any we know of teſtaceous animals; and therefore the abſolute neceſſity to ſcrutinize or define the creature by the different ſtages of its growth, can never, it is preſumed, be demanded from them, more than from any other order of animals.

Shells in their different growths vary exceedingly, even ſo much in ſome as to appear different ſpecies. All orders of animals vary in like manner in their different ſexes, as well as in their different ſtages of life. Thus for example: the tadpole ſeems a different ſpecies from the frog, the caterpillar from the butterfly; the flaming bird when young is quite white, but when of a certain age of a beautiful ſcarlet; the cornigerous quadrupeds that ſhed their horns, alſo run through ſeveral ſtages before their horns are complete. With theſe changes we are acquainted, becauſe they are always obvious to us, and are wrought on animals that breathe in the ſame element with us. It is otherwiſe with the animals of the deep, the knowledge of which we acquire only by accident, and it is even impoſſible for us to follow them in their various growths and changes by the moſt aſſiduous obſervations.

Hence it may be inferred, that the arrangement of teſtaceous animals ſhould be made only from their ſhells, as the moſt obvious and ſtrong characters, and not from the fiſh. We do not reject all aſſiſtance from the fiſhes to aid the ſyſtem, the knowledge of which will undoubtedly be of help, but then they are merely ſecondary and not primary characters. We do not adhere to this opinion from the ſole difficulty of human powers, ever attaining complete obſervations on theſe animals of the deep, but alſo for the following reaſons.

Though ſhells are of ſuch different appearances in their different growths, there is a certain axiom by which the accurate and judicious naturaliſt will always be capable of diſtinguiſhing the ſpecies by the ſhells alone, though he has many of the ſame kind before him: for every ſpecies has one or more particular ſpecific character, either in work, colour, or ſubſtance, &c. which it retains through all its various ſtages and forms, and therefore is always to be diſtinguiſhed and known by it.

The term *Conchology* applied to this branch of natural hiſtory by all authors, is quite applicable to its arrangement by the ſhells and not by the fiſh.

Properties peculiar to Shell Fiſh.

Shell fiſh poſſeſs the power of extending their habitations, repairing the breaches to which they are liable, and being endowed with a kind of viſcous humour iſſuing at the pleaſure of the animal, are fortified againſt the many accidents to which they are liable, not only from the brittle frame of ſome of their dwellings, but the violence of tempeſts hurling them with vehemence againſt the craggy rocks.

All ſhell-like opercula are of a calcareous nature, and diſſolve in acids. It is therefore, that when put in vinegar or other acids, they move briſkly to and fro for ſome time, by the ebullition; from which particular, among the common people fond of curioſities, they have obtained the name of creeping ſtones.

Shells, like all other creatures, poſſeſs that brilliancy of colour which conſtitutes their excellence in the prime part of their exiſtence; for in an advanced ſtate their colours become faint, and when old the ſhells become almoſt white, thicken in ſubſtance, and grow weighty, are generally with a limy ſubſtance, and the external ſubſtance inhabited by numerous ſerpulæ which haſten their animal diſſolution. In their prime ſtate, many are enrobed with an elegant epidermis, which not only ſerves as a mantle, but preſerves in the higheſt perfection all their brilliancy and glow of colouring.

Thoſe ſhells which poſſeſs this epidermis, being always the moſt beautiful, are conſequently moſt preferable in collections. If the ſhell fiſh known to us, comprizing thoſe only which inhabit the different ſhores, are infinite in number; what idea can we entertain of the quantity of thoſe which inhabit the unfathomable depths of the ocean, not to be explored by man?

Uſes of Shells and their Fiſh.

The uſes of ſhells are more numerous and important, than is generally conceived.

The inhabitants of climes, far remote from us, avail themſelves of this beautiful though neglected part of natural hiſtory. The Indians embelliſh their cabinets with the pearly and ſilvery mouths of ſome ſhells, and ornament their perſons with others. The Bullæ or tuns are appropriated to the uſe of drinking veſſels; the chamæ, and particularly the chamagigas of Linnæus, which attain to a ſtupendous magnitude, to that of buckets for containing water. The Buccinum is an excellent ſubſtitute for the trumpet; by breaking off or making a hole near the apex, an inſtrument is formed, which by blowing through the orifice produces tones powerfully ſonorous. Some ſpecies of the Buccinum are of exquiſite flavour, and vended in the public markets at ſtated ſeaſons. As to oyſters, cockles, and muſcles, they are in general uſe throughout Europe, and may be accommodated to various purpoſes of the culinary art.

The uncultivated inhabitants of many Indian iſlands from experience of the nutritive qualities of ſhell fiſh, uſe them as their principal food when other proviſions are ſcarce; to which perhaps they may have been at firſt induced from obſerving them fall a prey to other animals.

The beautiful Tyrian purple, which to this day adorns the veſtments of princes, is derived from the Murex. Bivalves furniſh pearls of different ſizes and brilliant qualities for female ornaments, toys, &c. and a ſpecies of them are of excellent uſe as manure, provided a ſufficient quantity can be procured on the ſpot of land.

The peculiar qualities of each genus, and the ſingular endowments they reſpectively poſſeſs, muſt afford the higheſt entertainment to the curious obſerver, who cannot contemplate their variety, beauties, and uſes, without admiration and wonder.

The oyſter is not only uſeful to man as a dainty food; but the ſhell being levigated into a ſubtile powder is employed as an abſorbent in heart burns, and ſimilar complaints.

The pectines are by ſome deemed as delicious food, as the oſtrea or oyſter; and though they exactly reſemble each other in the generic character of the hinge, the inhabitants differ; and, therefore, Linnæus has made a proper diſtinction.

Enemies to Shell Fiſh.

Shell fiſh have many enemies of different kinds of animals. The tortoiſe, and other marine animals, devour them with avidity. The bivalves frequently fall a ſacrifice to voracious birds, which ſeize upon them with their talons, mount with them into the air, and by precipitating them on the rocks, break the ſhell, and thus obtain a delicious prey.

The pea crab is an enemy to ſhell fiſh in general, and particularly to the muſſel, into which it takes an opportunity of crawling, when the animal opens its ſhell at the influx of the tide, and preys upon the creature till it has totally devoured it; the ſhell opens wide, the crab makes its exit, and proceeds in queſt of other prey.

The race of monkies are extremely fond of extracting the fiſh from bivalves, and that in a moſt extraordinary manner. When the tide is out, the monkey repairs to the ſands in ſearch of ſuch as may be left there, and as the valves through want of water muſt of courſe be open, this ſubtle animal places a ſtone in each of them, which preventing the cloſure of the ſhell, it is at full liberty of picking the fiſh out by degrees with its fingers.

Thus we find ſhell fiſh is not only the food of man, but numbers of other animals. They conſtitute the chief food of turtles, whoſe ſtrength enables them to macerate with eaſe the moſt rugged ſhells. The ſmaller ſhell fiſh fall a prey to every other ſpecies of the rapacious kind.

Nor are ſhell fiſh only expoſed to the voracity of many other animals, but they frequently fall a prey to each other. The pholades, ſerpulæ, and other ſhell fiſh of bivalves, by making a ſmall round hole, the deſtroying animal through that aperture extracts the ſtrength and life of its victim.

The ſerpulæ not only deſtroy the pectines and oſtreæ, but cauſe a phoſphorous light to iſſue from their victims as long as life remains, and even as long as any moiſture ouzes from their bodies.

Anomiæ are deſtructive to bivalves in a very ſingular manner, placing the orifice downwards, affixing themſelves to the ſhells, they extract through the cavities of the ſcale of the oſtreæ, all the animal's ſtrength, though for want of freſh prey, they ſometimes fall themſelves a ſacrifice to want.

Star fiſh deſtroy the young brood of oyſters in vaſt abundance. Univalves fall likewiſe a prey to crabs, which extract the animals from the ſhells by main force; and ſuch is the ſtrength of the turtle, that it macerates the moſt ſolid ſhell fiſh with as much eaſe as a dog does a cruſt. With reſpect to the deſtructive qualities of ſhell fiſh, it muſt be obſerved, that two ſpecies only are known to be injurious to the human race. Theſe are the pholades and teredo-navalis, which do great damage to the keels of ſhips by adhering; but then to place this injury in a contraſted point of view, it muſt further be obſerved that ſhell fiſh conſidered in general, contribute moſt eſſentially to the neceſſities, nutriments, and even luxuries of mankind in the different quarters of the globe.

Directions for Collecting Shells.

We think it neceſſary to lay down ſome rules to enable even the collectors as well as the ſtudious, to be aiding or aſſiſting to the ſtudy.

Dr. Woodward judiciouſly obſerves, that aſſuredly, the man who ſhould ſpend his whole life in amaſſing together ſtone, timber and other materials for building, without ever aiming at the making an uſe, or raiſing any fabrick out of them, might well be reputed very fantaſtic and extravagant. And a like cenſure would be his due, who ſhould be perpetually heaping up of natural curioſities, without deſign of building a ſtructure of philoſophy out of them, or advancing ſome propoſitions that might turn to the benefit and advantage of the world. This is in reality the true and only end of collections, of obſervations, and natural hiſtory, and they are of no manner of uſe or value without it. Now, as collections are the materials, it behoves every collector to make obſervations, or to give what accounts his capacity or leiſure permits him, that others, who ſhall have more ſcience and leiſure to purſue the deſign, may find land marks and notices ſufficient to conduct themſelves by in that uſeful a purſuit.

Few conchologiſts have duly attended to this view; and what few curious obſervations have been made, are ſcattered or diſperſed through many tedious volumes. Our views in this Syſtem is to remedy theſe inattentions, as far as poſſible; we ſhall ſtrive to give ſome inſtructions to obtain ſuch ſcientifical ends.

With reſpect to collecting, it is always neceſſary, if poſſible, to get them alive, or with the animals in them. It not only inſtructs us in the natural hiſtory of the very animals, a part extremely uſeful to a thorough knowledge of ſhells; but it alſo preſerves the ſhell in its perfect nature and beauty; for only live ſhells bear the full glow of their colours. When any ſhells with their fiſh are collected, they ſhould not be immediately killed, but kept for a few days in their native ſea water (not longer, for the fiſh waſting or dying in the ſhells, muſt neceſſarily hurt them) to make obſervations if poſſible of their motions, ways of life, &c.

The collector ſhould be cautious in picking his ſhells, for ſometimes though found with the fiſh in them alive they are ſo worn with age and pierced through with worms, or other accidents, as to render them yellow, livid and imperfect.

After violent ſtorms live ſhells may be picked up on the ſea beaches or ſhores, as the great agitation of the water, during thoſe hurricanes, raiſes and brings them from their native beds. But then they muſt be collected as ſoon after the ſtorm as poſſible, the ſun fading their colours, and ſpoiling their beauty.

As for ſhells that have lain ſome time on the ſhores, known by the name of ***Dead Shells*** among collectors, they are ſeldom of good colour, by being expoſed to the ſun; and are alſo often imperfect, from being rolled *to* and *fro*, and by that means worn and broken. Of the ſhells that adhere to rocks, bottoms of ſhips, &c. always chuſe thoſe that lie under water.

SYSTEM OF CONCHOLOGY.

Land and river ſhells are more eaſible obtainable; and the collector needs no other inſtructions, but only to be judicious in his choice.

The river ſhells in general are obſerved not to be of a pleaſing colour, or to have any great variety of colour; therefore, in that point, they are leſs curious than the land or ſea ſhells.

The collector of ſhells ſhould have the following objects always in view. Firſt the order, the genus of that order, and the ſpecies of that genus; or if of a new diſcovered ſpecies, genus or order. Secondly, if in its rough or native ſtate to note its appearance, as likewiſe how it appears when poliſhed; and thirdly its country, if ſcarce or plenty, and the ſoils, or what places of reſort it has, with what other ſhells or fiſh it is found, or whatever anſwerable notices can be procured.

A good deſcription and figure muſt follow; the deſcription ſhould include all the obvious or viſible particulars of the ſubject; as ſize, colour, and other circumſtances. It is a very difficult matter to frame a good or accurate deſcription of a body. It depends on the call of ideas, the force of language, and the choice of compariſons. But we need not explain it further here, as it touches on the ſcience of rhetoric and pure writing. The difficulty of making intelligent and good deſcriptions, has cauſed the productions of many writers in natural hiſtory, to be looked upon with indifference.

Plainneſs and conciſeneſs have been our aim, and it is our deſire not to omit any thing material nor to inſert any thing ſuperfluous.

Preſerving and cleaning Shells.

We ſhall now proceed to the preſervation of them. As ſhells are of a calcareous nature, all acids ſhould be avoided as much as poſſible; and even when you kill the fiſh, as continued boiling them may detriment the ſhells, I would adviſe only to give them a quick dip in ſtrong boiling water, which alone will kill the fiſh; but give them time to diſcharge the heat acquired by dipping, that they may not immediately paſs from one extreme of heat to another, as by ſudden change they would ſuffer injury after the heat is gone off: you may put them into cold water, the fiſh then becomes condenſed, or ſomewhat ſolid, it is afterwards eaſily picked out of its ſhells by pins, or ſuch ſharp inſtruments.

In cleaning or preſerving ſhells for cabinets, let them not be touched much with aqua fortis, or by any other acid, as oil of vitriol, ſpirit of ſalt, or even vinegar; nor be boiled, expoſed to the heat of the fire, or ſun, for they greatly ſpoil them.

Many ſhells are fiſhed up extremely beautiful, and poliſhed ſo perfectly, that art cannot better it. Theſe need only be ranged in their reſpective claſſes: ſuch are the cowries, tuns, ſome buccina, the volutes, and the olives.

Others, on the contrary, come out of the ſea ſlimy, and even ſometimes covered with filth, corraline matter, moſs, &c. and have a pellicle or epidermis; ſuch are the tellens, muſſel, ſnails, &c. For theſe, firſt ſteep them a day in hot water, to ſoften the filth or cruſt, then bruſh them very much (but the bruſhes ſhould not be too hard); if that does not compleat the cleaning, I would adviſe to rub or bruſh them again with tripoli or emery; or a weak acid, or with a ſtronger one, much diluted with water; always taking care to dip them every minute in clear cold water. Strong ſoap may alſo be uſed with a rag or piece of woollen or linen, with which rub them; and when ſufficiently cleanſed this way, a fine bruſh, with fine emery, will finiſh the whole. But all theſe proceſſes muſt be judiciouſly managed according to the attendant circumſtances, which it is impoſſible to regulate in writing.

The ſcientific collectors, or naturaliſts, are always deſirous of having the ſhells in their rough ſtate, or juſt as they are fiſhed. This method, though extremely uſeful, is not to be abſolutely followed; not only becauſe their beauties would be loſt, but alſo on account that the ſpecies differing in colours could never be truly defined. However, as a medium, I would adviſe all collectors to have ſome ſhells of each genus in their rough ſtate, while the others ſhould diſplay their beauties by all the accompliſhments of art: and a more eaſy medium may be kept in bivalves, by one ſhell or valve being rough, while the other is poliſhed.

Numbers of ſhells have an outer ſkin, or pellicle, different from the ſhell itſelf, called the epidermis. In regard to Natural Hiſtory, it is really of uſe to know the nature, colour, &c. of this epidermis, as it often characteriſes ſome ſpecies, as much as any other part. We therefore would recommend a due notice or obſervation on it; and alſo to preſerve ſome ſpecimens covered with it: to enrich your cabinet with ſpecimens for knowledge, as well as for beauty.

The epidermis, by its thickneſs, hinders a ſhell ſometimes of being poliſhed. In that caſe it muſt be wholly taken off with an acid diluted with water; then it is to be bruſhed with a bruſh charged with emery, putty, or tripoli, till it becomes poliſhed, or gloſſy; but if inſtead of a thick epidermis, it is a mere pellicle, it is ſufficient to ſteep it in hot water, and then pick it, or ſlightly file it off. Vinegar or a weak acid, is alſo good; and, indeed, much better than aqua fortis.

When the epidermis is ſo very craſs, or groſs, that acids diluted, and even pure aqua fortis, does not do; ſtrong emery, with ſtrong bruſhes, ſeal's ſkin, or pumice-ſtone, is ſometimes employed: if that does not do, the only way left, is to ſteep it in a cup of pure aqua fortis, in the following manner: Firſt ſtop, or cover the mouth, or opening of the ſhell with wax, that the acid may not penetrate to, or touch the inſide of it; and care muſt be taken, from minute to minute, to plunge it in cold water, and every time to examine what effects the acid has had. It is alſo neceſſary to cover with wax all the fine points, or delicate parts of the ſhell, to hinder the acid from corroding or hurting them: after which the whole ſhell is poliſhed with fine emery, and paſſed over with gum water, or whites of eggs.

A ſhell of a ſmooth ſurface, or that is not very rugged, worked, or ſet with ſpikes, proceſſes, &c. and which naturally has ſome ſlight politure, though dull or deadiſh, ſhould only be rubbed with chamois leather by the hand; it will then become bright or gloſſy, eſpecially if a little fine tripoli is uſed: indeed powder of emery ſhould not be often uſed. However all theſe operations muſt be uſed and adapted to their circumſtances, otherwiſe they deſtroy or hurt the colours, and the fine workings on the ſhell.

When the ſhells are poliſhed enough, and quite dry, paſs them over by a fine pencil with gum arabic water, which glows the colours without hurting them, or even giving them any ſmell as varniſh does. Whites of eggs are alſo good, as more glaring, though ſubject to turn yellow in time.

The laſt and leaſt work to be uſed for ſhells, is working or rubbing them quite down, ſo as to take off intirely their true and native coat. This is done by working them like agates, or other ſtones, or wheels ſmeared with emery. This work often quite ſpoils them, and very great care muſt be taken: however, they may be poliſhed by hard bruſhes of boars briſtles, with a turning machine.

Patience and judgment can only overcome working of ſhells that are warped, rugged, bumped, thorny, &c. A bruſh or a feather can only be uſed to convey the aqua fortis on the parts required to be wrought on, and then it muſt be from minute to minute, ſteeped in clean water, to hinder the acid from corroding it too much; afterwards, like other ſhells, they are to be poliſhed, or paſſed over with tripoly or emery: even then, all parts cannot be clean alike, and gum-water or whites of eggs muſt be uſed to thoſe leſs cleaned parts, to render them vivid; elſe they would ſhew but dull.

The rubbing down of ſhells reproduces new ones, as they are called, and thus the volute, called by ſome the purple or violet tip, and by the French the onyx, has a brown epidermis, which being taken off, diſcover the ground colour to be a dull yellow. This when worked down beneath the cruſt, or ſurface, is of a pure white, with the tip of a fine violet colour.

The common Cowry, in like manner, is worked down to a fine violet.

The Nautilus, like many trochi, ſnails, and other ſhells, works down to a fine mother of pearl; but, if only cleaned, it is ſullied white, with large fallow or yellowiſh rays.

The Sea-Ears alſo work down to mother of pearl, whereas, when only poliſhed, they are finely clouded brown, white, green, &c.

Many of the Limpets, when worked down, wear a very different appearance to what they do when only poliſhed.

Several other ſuch examples may be we brought: but we neither applaud this, nor many other proceſſes and frauds, that are daily practiſed on ſhells, which deſtroy their true or natural appearance.

The Dutch are much famed for theſe practices; they even colour and file the ſhells to ſuch a degree as to alter them quite: all theſe particulars are to be avoided by the judicious collector.

We now proceed to the Syſtem or method of arrangement, and ſhall divide all teſtaceous animals into three general orders:

1. *Multivalves or ſhells that are made up of many valves or pieces.*
2. *Bivalves, that is, double ſhells or ſuch as are compoſed of two pieces or parts.*
3. *Univalves, that is, ſingle ſhells, or ſuch as are compoſed of one piece or part.*

ORDER I.

MULTIVALVES.

This order comprehends three genera.

GENUS I. CHITON.

Character of the Genus.

The animal is a Doris which is covered with ſeveral ſhells arranged longitudinally lying on its back.

The Bristly Chiton. — The ſhell is compoſed of eight valves ſtriated; the body rather ſharpened into a point, and of an oval form.

The White Chiton. — This is the largeſt of the genus. The ſhell is above three inches in length; its colour pure white.

The Ash Coloured Chiton. — The ſhell oval octovalve, rather flat, and of a cinerous tinge. This ſpecies was found on the ſhore at Margate. They are found crawling among the rocks; the valves are united together by a cartilage, which empowers the animal to fold itſelf up.

GENUS II. LEPAS.

Character of the Genus.

The animal is a Triton. The ſhell is multivalve, formed of an unequal number of valves, and fixed to a baſe.

Lepas Balanus, or Sea Acorn.—Theſe ſea ſhells fix on all kinds of bodies, even upon fiſhes of the whale kind. Collected ſometimes into cluſters; they afford great variety both of ſhapes and colours. They have different names given them, the moſt curious of which are, the tulip or little bell, the turban, the ſtriped acorn, and the melon rib.

When the animal chuſes to come out of its ſhell, it puts forth its head, opens four triangular valves, which are faſtened to its mouth, from which it projects a kind of plume, by means whereof it procures its food, and when it returns into it's ſhell, the ſame folders ſhut it up again.

The Bell Lepas.—The ſhell conic, wrinkled, obtuſe, of a purpliſh colour, is found in the European ſeas affixed to wrecks, &c.

The Crowned Shaped Lepas.—The ſhell nearly round, compoſed of ſix lobes, furrowed, fixed; inhabits the Mediterranean and Indian ſeas.

The Tortoise Shell Lepas.—The ſhell plane, convex, fixed with ſix rays hollowed and ſtriated. It dwells in narrow ſeas, often upon turtles, in the gulph of Venice.

The Mitre Lepas.—The ſhell compreſsly erect, irregularly ſtriated, found in the Indian ſeas, affixed to rocks, &c.

Lepas Anatifera, *commonly called* **Barnacles.**—The ſhell compreſſed, of five valves, ſmooth, reſting upon the inteſtines. They hang affixed in cluſters to wrecks and ſhips arriving from long voyages. This is a policeps.

It is rather curious to remark that our old Engliſh hiſtorians and naturaliſts have given the idea of a bird to the Tentacula, or ſhells of an adheſive quality. They aſcribed the origin of the barnacle gooſe to theſe ſhells.

The account given of theſe ſhells by the ſage Gerard, is ſo curious, that we ſhall here tranſcribe it.

“ But what our eyes have ſeen, and our hands have touched,
“ we ſhall declare. There is a ſmall iſland in Lancaſhire, called
“ the Pile of Foulders, wherein are found the broken pieces of
“ old and bruiſed ſhips, ſome whereof have been caſt thither by
“ ſhipwracke, and alſo the trunks and bodies with the branches
“ of old and rotten trees, caſt up there likewiſe; whereon is found
“ a certain ſpume or froth that in time breedeth unto certain
“ ſhells, in ſhape like thoſe of the muſcle, but ſharper pointed
“ and of a whitiſh colour; wherein is contained a thing in form
“ like a lace of ſilke finely woven, as it were together of a whitiſh
“ colour, one end whereof is faſtened unto the inſide of the ſhell,
“ even as the fiſh of oiſters and muſckles are: the other end is made
“ faſt unto the belly of rude maſſe or lumpe, which in time
“ cometh to the ſhape and form of a bird: when it is perfectly
“ formed, the ſhell gapeth open, and the firſt thing that appeareth
“ is the aforeſaid lace or ſtring; next come the legs of the bird
“ hanging out, and as it groweth greater it openeth the ſhell by
“ degrees, till at length it is all come forth and hangeth only by
“ the bill: in a ſhort ſpace after it cometh to full maturitie, and
“ falleth into the ſea, where it gathereth feathers, and groweth
“ to a fowle bigger than a mallard, and leſſer than a gooſe, having
“ blacke legs and bill or beake, and feathers blacke and white ſpotted
“ in ſuch a manner as is our magpie, called in ſome places a
“ Pie Annet, which the people of Lancaſhire call by no other
“ name than a tree gooſe; which place aforeſaid, and all thoſe
“ parts adjoining, do ſo much abound therewith, that one of the
“ beſt is bought for three pence. For the truth hereof, if any
“ doubt, may it pleaſe them to repaire unto me, and I ſhall ſatisfy
“ them by the teſtimony of good witneſſes.” See Gerard's Herbal, pages 1587, 1588.

GENUS III. PHOLAS.

Character of the Genus.

The animal is an Aſcidia. The ſhell is bivalve, divaricated with ſome leſſer ones. The hinge bent backwards, connected by a cartilage.

This ſhell is well known in the provinces of Aunis and Poitou in France. The fiſh contained in the ſhell perforates clay and ſpungy ſtones, by the help of a fleſhy part ſhaped like a lozenge, and of a liquor whoſe property is to corrode ſtones. It makes its entrance when very ſmall, ſettles its habitation, grows, lives, and dies thus, and impriſoned in a hole ſmaller at the aperture than within; the only way to bring it out, is to break the ſtones. Theſe creatures are often found together to the number of twenty. A long thick tube parted into two partitions, ſerves the animal as an outlet for its excrements, and to take in its food. When the pholas has taken in too much water, it rejects it with violence; ſome ſpecies of them lodge in wood which is found in the ſea. The greateſt ſingularity in this ſhell is, that it contains a phoſphorous liquor of great brilliance during the night, which liquor keeps its property wherever it happens to fall, on the ground, upon clothes, upon the hands, and even the mouths of thoſe who eat pholades. It however gradually dies away by evaporation, and its brightneſs revives upon the body's being put into water. The animal is equally luminous inwardly as outwardly, but loſes its luſtre when dried or decayed, which it recovers by being moiſtened. The foſſil pholades, go by the name of pholadites, and are but of late diſcovery.

The White Pholas, or Dail.—The ſhell oblong, muricated on all parts with ſtriæ placed croſs-ways. It is an inhabitant of the ſea rocks of Europe and America.

The Tiny Pholas.—The ſhell oblong, rounded, ſtriated archways. It is an inmate of America. On the back of the ſhell there are ſingle acceſſary valves.

ORDER II.

BIVALVES.

This Order comprehends fourteen genera.

GENUS IV. MYA.

Character of the Genus.

The animal an Aſcidia. The ſhell is bivalve, gaping at one extremity. The hinge has a tooth, in moſt of them ſolid, thick, broad, hollow, and not inſerted into the oppoſite ſhell.

The Tongue Shaped Mya.—The ſhell about four inches in length, in breadth one and an half, in ſhape like a tongue. It is an inhabitant of the Indies.

The Painters Mya.—With an oval brittle ſhell; breadth a little above two inches, length one; inhabits rivers. Uſed to put water colours in; whence the name. Otters feed on this and the other freſh water ſhells.

This ſhell is noted for producing quantities of pearl. There have been regular fiſheries for the ſake of this precious article in ſeveral of our rivers. Sixteen have been found within one ſhell. They are the diſeaſe of the fiſh, analogous to the ſtone in the human body. On being ſqueezed, they will eject the pearl, and often caſt it ſpontaneouſly in the ſand of the ſtream.

The Conway was noted for them in the days of Cambden. A notion alſo prevails, that Sir Richard Wynne, of Gwydir, chamberlain to Catharine, queen to Charles II. preſented her majeſty with a pearl (taken in this river) which is to this day honoured with a place in the regal crown. They are called by the Welſh Cregin Diluw, or deluge ſhells, as if left there by the flood.

The Irt in Cumberland was alſo productive of them. The famous circumnavigator, Sir John Hawkins, had a patent for fiſhing that river. He had obſerved pearls plentiful in the ſtraits of Magellan, and flattered himſelf with being inriched by procuring them within his own iſland.

In the laſt century, ſeveral of great ſize were gotten in the rivers of the county of Tyrone and Donegal, in Ireland. One that weighed 36 carats was valued at forty pounds, but being foul, loſt much of its worth. Other ſingle pearls were ſold for four pounds ten ſhillings and even for ten pounds. The laſt was ſold a ſecond time to lady Glenlealy, who put it into a necklace, and refuſed eighty pounds for it from the Ducheſs of Ormond.

Suetonius reports, that Cæſar was induced to undertake his Britiſh expedition for the ſake of our pearls; and that they were ſo large that it was neceſſary to uſe the hand to try the weight of a ſingle one. We imagine that Cæſar only heard this by report; and that the cryſtalline balls in old leaſes, called mineral pearl, were miſtaken for them.

We believe that Cæſar was diſappointed of his hope: yet we are told that he brought home a buckler made with Britiſh pearl, which he dedicated to, and hung up in the temple of Venus Genetrix: a proper offering to the Goddeſs of Beauty, who ſprung from the ſea. We cannot omit mentioning, that notwithſtanding the claſſics honor our pearl with their notice, yet they report them to have been ſmall and ill coloured; an imputation that in general they are ſtill liable to. Pliny ſays, that a red ſmall kind was found about the Thracian Boſphorus, in a ſhell called Mya, but does not give it any mark to aſcertain the ſpecies.

GENUS V.

SOLEN, RAZOR SHEATH, OR KNIFE HANDLE SHELL.

Character of the Genus.

The animal an Aſcidia, the ſhell bivalve, oblong, gaping on both ſides, denominated from its ſhell.

The hinge is a tooth ſhaped like an awl, bent often double, not inſerted in the oppoſite ſhell, the back run at the ſides ſomewhat worn away, and has an horny cartilaginous hinge.

The Knife Handle Solen.—The ſhell oval, oblong, and ſomewhat arched. It is found in the ſands on the coaſts of Amboina.

The Green Solen.—The ſhell of unequal valves, of an oblong oval form, white within, outwardly greeniſh. There is a callus on both ſhells, like a worn out tooth. It is an inhabitant of Java.

The Pod Solen.—With a ſtrait ſhell, equally broad, compreſſed; a double tooth at the hinge receiving another oppoſite; and on one ſide another tooth, ſharp pointed and directed downwards. Colour, olive; breadth uſually five or ſix inches, ſometimes nine.

The Sheath Solen.—With a ſhell nearly cylindrical, one end marginated, the hinge conſiſting of a ſingle tooth in each ſhell marked much like the former, uſually about five or ſix inches broad.

The Scymeter Solen.—With a ſhell bending like a ſcymeter, the hinges like thoſe of the pod ſolen, coloured and marked in the ſame manner. Breadth about four or five inches. The three laſt ſpecies lurk in the ſand near low-water mark, in a perpendicular direction; and when in want of food, elevate one end a little above the ſurface, and protrude their bodies far out of the ſhell. At approach of danger, they dart deep into the ſand, ſometimes at leaſt two feet. Their place is known by a ſmall dimple on the ſurface. Sometimes they are dug out of the ſand with a ſhovel; at other times are taken by a bearded dart ſuddenly ſtruck into them. They were uſed as a food by the antients. *Athenæus* (from *Sophron*) ſpeaks of them as great delicacies, and particularly grateful to widows.

Theſe are often uſed as a food at preſent, and brought up to table fried in eggs.

GENUS VI. TELLINA.

Character of the Genus.

The animal is a Tethys; the ſhell bivalve, bent from the forepart to the other ſide. A hinge; three teeth; the lateral ones of the other ſhell ſmooth.

The Leaf-Shaped Telline.—The ſhell oval, the pubes rugged. It inhabits the Indian ocean.

Tellina Triafasciata.—The ſhell oval delicately triradiated with ſanguineous coloured rays. Inhabits the Norwegian ocean.

The Reticulated Telline.—The ſhell lentiform, flattened, reticulated. Is found in India.

N. B. Linnæus, by the word lentiform, means that the ſhell is ſhaped like the leaf of the water lentil, commonly called duck weed.

GENUS VII.

The COCKLE or HEART SHELL.

Character of the Genus.

The animal is a Tethys; the ſhell bivalve, nearly equilateral, even valved. The hinge with two teeth in the middle alternate; thoſe of the ſides remote and inſerted.

The Ribbed Cockle.—The ſhell gibbous or protuberant, with equal valves, the ribs raiſed up, carinated, concave, and membranaceous. It dwells in the African ſea.

The Venus Heart Cockle.—The ſhell heart-ſhaped, the valves carinated with teeth; the nates approach to each other. It inhabits the ocean of Aſia.

The Aculeated Cockle.—The ſhell ſomething in ſhape of a heart with convex furrows ſet in a line. It bears great affinity to the following, of which it is perhaps a variety, viz. the cardium echinatum of Linnæus. It dwells in the ſouthern part of the European ocean.

Cardium Ciliare.—The ſhell heart ſhaped, the ribs elevated in a triangular form; the extremity armed with ciliated ſpines. It is an inmate of the Mediterranean.

The Rugged Cockle.—The ſhell antiquated with twenty diſtant furrows, the intervening ſpaces rugged. It inhabits the Mediterranean and Southern ſeas of Europe.

GENUS VIII. MACTRA.

Character of the Genus.

The animal is a Tethys. The ſhell bivalve, of unequal ſides; the hinge with a middle tooth folded up with an additional ſocket, the ſide ones remote and inſerted.

The Simple Mactra.—The ſhell nearly tranſparent; ſmooth; the inſide of a purpliſh colour. It inhabits the Eaſtern ocean.

The Solid Mactra.—The ſhell opaque, rather ſmooth, and nearly antiquated. It inhabits the European ocean.

GENUS IX. THE WEDGE SHELL.

Character of the Genus.

The animal a Tethys. The ſhell bivalve; the fore rim very obtuſe. The hinge with two teeth, and a ſingle one on the rim far removed beneath the anus.

Donax Pubescence.—The ſhell oval, beautifully marked with longitudinal arcuated purpliſh ſtriæ; the ſent ſpinous.

The Donax, with Marks resembling writing upon it.—The ſhell oval, compreſſed, ſmooth, ſeemingly written upon in purple undulated lines, the borders crenulated. It inhabits the Mediterranean.

The Donax, marked with Chinese-like Characters.—The ſhell oval, oblong, two inches wide, of a high poliſh, and generally of a pale orange colour. Inhabits the Indian ocean.

Donax Porcellana.—The ſhell in form nearly ſimilar to the preceding, beautifully marked with branchiform purpliſh rays. Inhabits the Indian ſeas.

This ſhell is the link which connects the Donax and the Venus. Linnæus ſeems to have taken great care of the gradation from one genus to another.

GENUS X. VENUS.

Character of the Genus.

The animal a Tethys. The ſhell bivalve, the lips leaning on the forepart of the rim. The hinge has three teeth, all cloſe to each other on their ſides, diverging at the top.—The womb and anus are diſtinct.

Venus Dione.—The ſhell ſubcordated, furrowed tranſverſly, the pubes ſpiny. Inhabits the American ocean.

This ſhell often reveals to indiſcreet and profane eyes the image of an object, the poſſeſſion of which is only reſerved to the favourites of Hymen and of Love. We ſhall not give a deſcription of this ſhell as Linnæus does, as we conſider it fit only for the peruſal of a profligate Aretin, or a Rocheſter.

The plaited Venus. The ſhell lentiform. The rim has three deep notches, and appears as if cut off. The ſhell has three foldings or plaits on both valves, which are very thin. The colour is brown. Inhabits the South Seas.

Theſe ſhells for the moſt part dwell in the ſands. When the weather is calm, and there blows only a gentle breeze, the Venuſes are ſeen to riſe to the ſurface of the water, to open one of the valves of their ſhell, to turn it to the wind, acting as their ſail, the other part as the ſhip. A flotilla thus rides before the wind. Upon the ſmalleſt danger that occurs, at the approach of a veſſel, of a fiſh, or of a ſtorm, all the Venuſes cloſe their ſhells, and ſink to the bottom. They are found in America, at St. Domingo, in the Mediterranean Sea, and in the Indies.

GENUS XI. SPONDYLE.

Character of the Genus.

The animal a Tethys. The ſhell unequivalve, of a hard conſiſtency. The hinge has two teeth, but backwards, with a ſmall aperture between.

This genus receives the name of ſpondylus from the under valve turning towards the hinge, and forming a kind of knuckle. The ſhells of this genus ſtrongly reſemble in form the oyſter, but differ widely from them by the teeth at the hinge, and the valves being ſpinous.

The stilt Spondyle. The ſhell nearly in form of an ear, armed with long ſpines. The upper valve at the hinge appears mutilated, as if ſhaved off. Inhabits the Mediterranean Sea.

The yellow Spondyle. The under valve very hollow, ſomewhat boat-ſhaped; has a broad thin rim turned backwards, the upper valve rimmed alſo, and leſs in proportion to the other; the whole ſhell thin, and nearly tranſparent. Inhabits the South Seas.

GENUS XII. THE CHAME, or GAPING COCKLE.

Character of the Genus.

The animal a Tethys. The ſhell bivalve rather coarſe. The hinge callous and protuberant, obliquely inſerted in an oblique pit hole. The womb ſhut, and without nymphs.

The Giant Chame.—The ſhell folded, with ſcales formed like arches; the anus gaping and crenulated. There are ſhells of 532 pounds weight, and therefore they are the largeſt of all teſtaceous productions. Inhabits the Aſiatic ſea.

The Horse Hoof Chame.—The ſhell folded, motled beautifully with purple. The anus bent back, cloſed and armed with teeth. Inhabits the ſeas of Aſia.

The Asses Hoof Chame.—The ſhell ſmaller than the former; the anus more contracted, and ſimilar in ſhape to an aſs's hoof, beautifully adorned with purpuraceous brown marks.

GENUS XIII. ARK SHELL.

Character of the Genus.

The animal a Tethys; the ſhell bivalve, equivalve; the hinge with a number of teeth ſharp, alternate; inſerted all along the rim.

Arca Tortuosa.—The ſhell is parallelipiped, ſtriated, the valvula being obliquely carinated, the nates bent back, the border perfectly whole. Inhabits the Indian ocean.

Arca Noæ, Noah's Ark.—The ſhell oblong, ſtriated; the nates bent in, and very diſtant, the rim quite entire and gaping. Inhabits the Red ſea, the Mediterranean, and the Indian ocean.

Arca Pectunculus.—The ſhell lenticular, nearly in the ſhape of an ear, furrowed with ridges in the form of pantiles. The nates bent inwards, the rim plaited. Inhabits the American ſea.

GENUS XIV. OSTREA.—OYSTER.

Character of the Genus.

The animal a Tethys; ſhell bivalve, unequivalve, in ſome degree reſembling ears; the hinge void of teeth, with a deep oval hole, and tranſverſe ſtreaks on the ſide. There is no womb, nor anus.

The Sole Pecten. The ſhell equivalve, nearly orbicular, of a poliſhed brown colour on the upper valve, and white on the under one, from whence Linnæus has given it the name of the ſole pecten.

Ostrea Radula.—The ſhell nearly equivalve; the ſtriæ placed croſs ways and crenulated; the ears equal. Inhabits the Indian ocean.

The ducal Mantle Pecten.—The ſhell equivalve, with twelve convex rays, ſtriated, rugged, and ſcaled. Inhabits the South Seas and Indian ocean.

The knotted Pecten.—The ſhell unequivalve with nine rays, knotty, and bladder like. Inhabits the African and Indian ocean.

The ancients ſay, that the ſpecies called Pecten or Scollop, have the power of removing themſelves from place to place by vaſt ſprings or leaps. The fiſh was uſed by the Greeks and Romans as a food, and when dreſſed with pepper, &c. was taken medicinally. The Pecten or Scollop, is commonly worn by pilgrims on their hats or the crape of their coats, as a mark that they had croſſed the ſea in their way to the Holy Land.

The Rasp Oyster.—The ſhell equivalve, protuberant, with twenty two rays, imbricated with ſcales, one of the rims rounded, the ears worn away. Inhabits the Southern ocean.

The Hammer Oyster.—The ſhell equivalve of three lobes, the lobes lying tranſverſely. Inhabits the ſeas of Aſia and is precious.

The Leaf Oyster.—The ſhell unequivalve, oval, obtuſely folded on the ſides, paraſitic, inhabits Jamaica; the hinge is a lacuna, hereby it differs from paraſitic muſcles.

The Ham-shaped Oyster.—The ſhell equivalve, rather oval. Hence the hinge, which is ſomewhat round, is often furrowed; the ſhell has the appearance of a ham, the colour of rotten wood, often that of ruſt.

The Rect-angular Oyster.—The ſhell equivalve, the hinge for the moſt part furrowed. Inhabits the Indies.

Ostrea Edulis, the eatable Oyster.—For the following very entertaining deſcription of this ſpecies, we are indebted to the ingenious Mr. Barbut in his elegant and accurate exemplification of the genera vermium of Linnæus.

This ſea fiſh occupies in the ſcale of nature, one of the degrees the moſt remote from perfection; deſtitute of defenſive weapons and progreſſive motion, without art or induſtry, it is reduced to meer vegetation in perpetual impriſonment, though it ever opens regularly to enjoy the elements neceſſary to its preſervation. The animal figure and the ſprings of its organization are ſcarce diſcernable through the coarſe and ſhapeleſs maſs; a ligament placed at the ſummit of the ſhell, ſerves as an arm to its operations. Oyſters are reputed to be hermaphrodites; the ſpawn which they caſt in May, adheres to the rocks and other matters at the bottom of the ſea; and in the ſpace of 24 hours is provided with ſhells, in which are contained other oyſters that never leave the ſpot on which they were fixed, till the greedy fiſherman takes them from the element. Common oyſters ſhould be freſh, tender, and moiſt. The moſt eſteemed are thoſe caught at the mouth of rivers, and in clear water. Preference is given to thoſe that are edged with ſmall brown fringe, or beard, which epicures call fecundated oyſters, but that thoſe are females is a miſtake. The want of freſh water renders oyſters hard, bitter, and unpalatable; mud and ſea-weeds deſtroy them in their birth; muſſels, ſcollops, crabs, and ſea-ſtars are formidable enemies to the oyſter. There are found in Spain red and ruſſet coloured oyſters; in Illyria brown coloured with the fleſh black; and in the Red Sea of the colour of the Iris. Oyſters of the mangle-tree are of two ſorts; thoſe of St. Domingo are delicate, adhering to the ſtumps of the trees that dip in the water. The negro drivers cut them off with a bill, and they are ſerved upon the table with the roots.

Britain ſtill keeps its ſuperiority in oyſters over other countries. Stews or layers of oyſters are formed in places which nature never allotted as habitations for them. Thoſe near Colcheſter have been long famous; at preſent there are others that at leaſt rival the former near the mouth of the Thames. The oyſters or their ſpats, are brought to convenient places, where they improve in taſte and ſize. It is an error to ſuppoſe, that the fine green obſerved in oyſters taken from artificial beds is owing to copperas, it being notorious how deſtructive the ſubſtance or ſolution of it is to all fiſh. We cannot give a better account of the cauſe, or of the whole treatment of oyſters, than what is preſerved in the learned Biſhop Sprat's Hiſtory of the Royal Society, from page 307 to 309.

In the month of May the oyſters caſt their ſpawn, (which the dredgers call their ſpats); it is like to a drop of candle, and about the bigneſs of a halfpenny.

The ſpat cleaves to ſtones, old oyſter ſhells, pieces of wood, and ſuch like things, at the bottom of the ſea, which they call cultch. It is probably conjectured, that the ſpat in twenty four hours begin to have a ſhell.

In the month of May, the dredgers (by the law of the admiralty court) have liberty to catch all manner of oyſters, of what ſize ſoever.

When they have taken them, with a knife they gently raiſe the ſmall brood from the cultch, and then they throw the cultch in again, to preſerve the ground for the future, unleſs they be ſo newly ſpat that they cannot be ſafely ſevered from the cultch; in that caſe they are permitted to take the ſtone or ſhell, &c. that the ſpat is upon, one ſhell having many times twenty ſpats.

After the month of May, it is a felony to carry away the cultch, and puniſhable to take any other oyſter, unleſs it be thoſe of ſize, about the bigneſs of an half crown piece, or when the two ſhells being ſhut, a ſhilling will rattle between them.

The places where theſe oyſters are chiefly caught, are called the Pont Burnham, Malden, and Colne waters; the latter taking its name from the river Colne, which paſſeth by Colne Cheſter, gives the name to that town, and runs into a creek of the ſea, at a place called the Hythe, being the ſuburbs of the town.

This brood and other oyſters they carry to the creeks of the ſea, at Brickel Sea, Merſey, Langno, Fringrego, Wivenho, Toleſbury, and Saltcoaſe, and there throw them into the channel; which they call their beds or layers, where they grow and fatten, and in two or three years the ſmalleſt brood will be oyſters of the ſize aforeſaid.

The reaſon of the ſcarcity of oyſters, and conſequently of their dearneſs, is, becauſe they are of late years bought up by the Dutch.

The oyſters are ſick after they have ſpat; but in June and July they begin to mend, and in Auguſt they are perfectly well: the male oyſter is black-ſick, having a black ſubſtance in the fin; the female white-ſick (as they term it) having a milky ſubſtance in the fin. They are ſalt in the pits, ſalter in the layers, but ſalter at ſea.

To this we beg leave to join a ſort of preſent ſtate of this article, borrowed from the 84th page of the Hiſtory of Rocheſter, in 12mo, publiſhed in 1776.

Great part of the inhabitants of Stroud are ſupported by the fiſheries, of which the oyſter is moſt conſiderable. This is conducted by a company of free dredgers, eſtabliſhed by preſcription, but ſubject to the authority and government of the mayor and citizens of Rocheſter. In 1729, an act of parliament was obtained, for the better management of this fiſhery, and for confining the juriſdiction of the ſaid mayor and citizens, and free dredgers. The mayor holds a court of admiralty every year, to make ſuch regulations as ſhall be neceſſary for the well conducting this valuable branch of fiſhery. Seven years apprenticeſhip entitles a perſon to the freedom of this company. All perſons catching oyſters, not members of the fiſhery, are liable to a penalty. The company frequently buy brood, or ſpat, from other parts, which they lay in this river, where they ſoon grow to maturity. Great quantities of theſe oyſters are ſent to London, to Holland, and the adjacent countries.

GENUS XV. ANOMIA.

Character of the Genus.

The animal, as to its body, is a ligula emarginated, ciliated, the briſtles being fixed to the upper valve. The arms lineary, longer than the body, open, ſtretched out, alternate on the valve, ciliated on both ſides, the hairs affixed to both valves. The ſhell is unequivalve, one valve being rather flat, the other more protuberant at the baſe. The hinge is without teeth; a ſmall lineary ſcar appears prominent with a tooth inwardly on the ſide, but that of the flat valve on the very rim. Two bony radii for the baſe of the animal.

Anomia Ephippium.—The ſhell nearly rounded, folded in wrinkles, the flat ones being perforated. Inhabits the Mediterranean. The ſhell is white, of the ſize of the palm of the hand within, of a very bright ſilvery colour.

The Amber Anomia.—The ſhell nearly round, yellow and ſmooth, one of them convex and protuberant.

GENUS XVI. MUSSEL.

Character of the Genus.

The animal an Aſcidia. The ſhell is bivalve, rough, often faſtened with biſſus. The hinge has no teeth; but is marked with a line in ſhape of an awl, ſunk deep and longitudinal.

The ingenious gentleman laſt mentioned, thus deſcribes the peculiar properties of this genus.

Some of the ſpecies of this genus inhabit the ſeas, others the rivers and ponds; both often open and ſhut, come out of their ſhells, return into them, bury themſelves in the ſands or in the clay of rivers; have a progreſſive motion, faſten themſelves where they pleaſe, breathe, and ſome even flutter about on the ſurface of the waters. They are all androgynous, have a peculiar conformation, diſeaſes and enemies. When muſſels chooſe to walk, they open, contrive to raiſe themſelves on the ſharp edge of their ſhell, put forth a fleſhy ſubſtance, ſuſceptible of extention, which ſerves them as a leg to drag themſelves along. In ponds we may obſerve the furrows that muſſels; make by walking thus. This leg ſerves as a reel to the ſea muſſels, it is a kind of tuft, from which hang the threads whereby they faſten themſelves on different bodies, or to each other: they are ſo many cables that hold them at anchor and ſhelter them from the motion of the billows and of ſtorms. Muſſels breathe the water as the fiſhes do. If they lie in ſhallow water, a ſmall circular motion is ſeen above the heel of the ſhell. A few moments after, they caſt out the water by one ſingle ſtroke at the other end of the ſhell. The parts of generation are two oviaries and two ſeminal veſſels. Each ovary and veſſel has its proper duct. It is through thoſe four channels that the eggs and the ſeed of the muſſel are conveyed to the anus, where thoſe two principles unite at their iſſue, which anſwers the purpoſe of generation. Muſſels lay their eggs in the ſpring; there being none found in them in the winter. The diſeaſes of muſſels are the moſs, and the ſcab. The roots of moſs intruding into the ſhell, the water ſoaks in through thoſe apertures, and gradually diſſolves it.

The ſcab is a kind of tubercules ariſing from the diſſolution of the ſhell. Small ſhell fiſh fix in the muſſels and ſuck them out. There are river muſſels which yield tolerable fine pearls. Muſſels are not very wholeſome food, being hard of digeſtion.

The Pearl Bearing Mussel. — The ſhell compreſſed and flat, nearly orbicular, the baſe tranſverſe, imbricated with dentated coats. Inhabits the Indian oceans.

The Stone-Eating Mussel. — The ſhell cylindric, the extremities both ways being rounded. It penetrates and eats away marble, corals, &c. Inhabits the European and Indian ſeas. The Indian ſhell is ſofter and nearly tough like leather, but the European is more brittle.

The Eatable Mussel. — The ſhell rather ſmooth, of a purple colour, the valves on the fore part nearly carinated, on the hinder bent back, the nates formed into a ſharp point. Inhabits the European and Indian ſeas. Between the tropics it is largeſt, ſmalleſt within the polar circle, as other teſtacea are. It puts forth threads by way of fin. When the epidermis is taken off, it is of a deep blue colour.

Abundance of ſmall pearls, called ſeed pearls, were till of late procured from this ſpecies of muſſels for medical purpoſes; but they are now diſuſed, ſince crab-claws and the like have been diſcovered to be as efficacious and a much cheaper abſorbent. This ſpecies are found in immenſe beds. They are a rich food, but noxious to many conſtitutions; and cauſe ſwellings, blotches, &c. The fineſt muſſels are thoſe called Hambleton Hookers, found in a village in Lancaſhire. They are taken out of the ſea and placed in the river Wier, within reach of the tide, where they grow very fat and delicious.

The pea crab is at certain ſeaſons a companion and inhabitant with this ſpecies of the muſſel, called by Linnæus Mytilus edulis, and commonly ſold under the name of lord-a-lee muſſel: its abode is under the lip, and care ſhould be taken to lift up the lip and take the crab out; if one ſhould be there, it is deemed poiſonous, and ill conſequences have often enſued from this neglect. In order to guard againſt the ill conſequences attending eating muſſels, they ſhould be well waſhed, and if laid a day or two in ſalt and water, far the better. When required to be dreſt for table, let them be put into an iron or tin ſaucepan, (by no means into a copper one) throw in with them a ſilver ſpoon; when you apprehend they are ſufficiently done, take out the ſpoon; if it is black, throw the muſſels away, they then ſhould not be eaten. If on the contrary, it comes out white as when put in, the muſſels may be ſafely eaten. It is a doubt with many whether this noxious quality ariſes from any thing inherent in the mud, or from the communication of the pea crab.

The River Mussel. — This ſpecies is an amphibious bivalve, found in the mud during the day. At night by means of its long muſcular foot, it forms a groove in the mud or ſand, and bringing its ſhell on the edge, puſhes its foot forward, and fixing at its utmoſt ſtretch to the ſand, draws its ſhell after it, and thus makes a path for itſelf, wandering in the dewy night on the ſhores, and returning in the morning to its native element.

Whether it performs this migration in ſearch of food, has not been determined, though it is ſuppoſed the dew-worm may be its favourite prey.

The Sea Mussel. — This ſpecies poſſeſſes the ſingular quality of ſpinning numberleſs threads, by means of which it reſiſts the impulſe of the waves. There is a groove which reaching from the root of the tongue to its extremity, divides it lengthways into two equal parts.

In this groove are a great number of ſmall muſſels that open and ſhut. It contains alſo a viſcous liquor, which is the matter of the threads emitted by the muſſel. Theſe threads by the aſſiſtance of the tongue are ſtretched out to a certain diſtance, affixed to any ſubſtance, and thereby ſecure the ſtation of the animal as ſo many cables. The newly ſpun threads are the whiteſt and moſt tranſparent, but the liquor of which they are formed, ſoon conſolidates and becomes a cylindric thread. Theſe threads or buſſuſes are generally two inches in length.

GENUS XVII.

PINNA MARINA or SEA-WING.

Character of the Genus.

The animal is a ſnail. The ſhell bivalve, brittle, upright, laying aſide the flaxen beard. The hinge toothleſs, the valves growing into one.

This bivalve ſhell fixes by the help of its filaments upon rocks at the depth of 20 or 30 feet under water; in order to ſhelter itſelf from the toſſing of the waves and tempeſts. The ſea wing affords pearls of various hues. The animal is confined to its ſhell by four ſtrong muſcles, the valves of its houſe ſcarce open at all, and when they gape a little the polipus draws nigh to devour the inhabitant.

The threads of the Pinnæ Marinæ are more curious than thoſe of the ſea muſſel, and appropriated to more curious works. They not only ſecure the ſtation of the animal and protect it from the agitation of the waves, but being very numerous and united, form a kind of tuft or ſkain, weighing about three ounces.

The inſtrument that prepares and moulds them, reſembles in the eſſential properties of it, that of other ſhell fiſh of this kind; except that it is much larger, and the groove that divides it lengthways is much narrower, at the root of it there is a membraneous bag, compoſed of ſeveral fleſhy layers from whence the tuſt reſults.

The Muricated Pinna. — The ſhell ſtriated with ſcales concave, oval, and ſharp. Its enemy is the ſepia octopodia, its protectors the pinnotheres crab.

Pinna Pennacea, or Wing-like Pinna. — The ſhell tranſparent, gaping, reſembling a wing.

The ingenious Mr. Barbut concludes his account of bivalve ſhells with the following pertinent and entertaining remarks and obſervations.

All bivalve ſhells lined with mother-of-pearl, ſuch as the ſwallow, the hammer, grey pintada, and other ſpecies of oyſters, produce pearls. They are alſo found in muſſels of the north end of Lorrain; but no ſhell affords finer pearls than the pearl oyſter, fiſhed for in the Eaſtern ſeas, in the iſle of Tobago, in the Perſic gulph, and upon the coaſts of Arabia.

Skilful divers have gone down in baſkets to the depth of above 60 feet. Provided with an iron implement, they looſen the oyſters from the rocks to which they adhere, and when their baſkets are full they pull a cord, to give notice to the people in the boat to hoiſt them up. They tell you there is as ſtrong a day light at the bottom of the ſea as upon dry land. What they dread moſt is the meeting with ſharks, or other voracious fiſhes. Thoſe oyſters as ſoon as brought up out of the ſea, are expoſed to the ſun, and the moment they gape, the pearls are looſened from them. They fiſh alſo for pearls in the gulph of Mexico, on the coaſts of the Mediterranean, of the ocean in Scotland, and other places; but thoſe Weſtern pearls are not of equal value with the forementioned.

There are ſome likewiſe found, though very ſeldom, in the very body of the oyſter, which has made thoſe ſubſtances to be looked upon as a kind of bezoar. They are diſtinguiſhed into two ſpecies, the eaſtern and the weſtern; the former are the fineſt. They are naturally white, when the oyſters labour under no diſeaſe. Thoſe that are yellowiſh, or lead coloured, or greeniſh, or of a black caſt, owe their colour, either to diſtemper in the oyſter, or to a ſlimy bottom, or laſtly, to the oyſters being accumulated on the coaſt.

They call outlandiſh pearls thoſe of an irregular form, ſuch as moſt are that are found in the muſſels from the north, and from Lorrain.

Linnæus found out the art of making pearls grow larger. The Swediſh naturaliſt's diſcovery cauſed its author to be ennobled, with the power of chooſing himſelf a ſucceſſor, in the various offices which he held. It has been obſerved, that muſſels punctured by the ſea-ſcolopendra, contained the largeſt and fineſt pearls. The uſe of pearls for luxury and female dreſs, has made them a very great object of trade. Necklaces, bracelets, ear-rings, headdreſſes, trimmings, and all thoſe ornaments introduced by whim, adopted by faſhion, and perfected by art and taſte, are toilet trinkets made to enhance the charms of beauty, or to ſupply its place. The Perſian and Indian ladies purchaſe pearls by weight of gold. The king of Spain, from a religious motive, deſtined the fineſt pearls to church ornaments. There is ſeen at Guadaloupe, an image of the Virgin dreſſed in pearls, rubies, and emeralds. In France the price of pearls is regulated by the price of precious ſtones. The facility with which pearls may be diſſolved, is the cauſe why none in perfect preſervation are ever found in ancient tombs and monuments.

ORDER III. UNIVALVES.

This order comprehends nineteen genera, viz. fourteen with a regular ſpire, and five without a regular ſpire.

Univalves with a regular Spire.

GENUS XVIII.

ARGONAUTA.

Character of the Genus.

The animal a ſepia. The ſhell univalve, ſpiral, membranaceous and ſingle celled. Inhabits the Indian and Mediterranean ſeas.

GENUS XIX.

NAUTILUS.

Character of the Genus.

The ſhell univalve, perforated, reſembling in figure a boat. In the different ſpecies it is of very different figures, roundiſh or oblong, thin or thick, furrowed or ſmooth, and ſometimes is auriculated, ſometimes not. Bonani obſerves, that this genus of ſhell fiſh is very well named from the Greek ναυτιλος, which ſignifies both a *fiſh*, and a *ſailor*, for that the ſhells of all the nautili carry the appearance of a boat, or ſhip, with a very high poop.

It is ſuppoſed that men firſt learned the method of ſailing in veſſels, from what they ſaw practiſed by this creature.

The Nautilus Papyraceous, or Thin Shelled Nautilus. — Theſe ſhells are found in many parts of the Mediterranean, and alſo in the Eaſt Indies. Mr. Argenville, in his Zoomorphoſe gives us a recital of the lateſt obſervations relative to this animal and its ſailing.

The ſhell of this ſpecies is no ſtronger than a piece of paper. When the animal is to ſail, it extends two of its arms on high, and between theſe ſupports a membrane, which it throws out on this occaſion; this ſerves for its ſail, and the two other arms it hangs out of the ſhell, to ſerve occaſionally either as oars, or as a ſteerage; but this laſt office is generally ſerved by the tail. When the ſea is calm, it is frequent to ſee numbers of theſe creatures diverting themſelves with ſailing about in this manner.

Thus equipped, he navigates, in calm weather; when fearful of danger, he retires within the ſhell, by which action he gains water, and ſinks to the bottom: it often pumps the water out, and often quits the ſhell, which floating empty, is carried by the waves and daſhed to pieces on the rocks.

When the fiſh has gained the ſurface of the water, he turns his ſhell very nimble, empties the water from it, extends its arms and ſets ſail. The fiſherman muſt be exceedingly expert to catch them.

The Thick Shelled Nautilus.—This ſpecies, whoſe ſhell is thick, never quits its habitation. The ſhell is divided into forty or more partitions, which grow ſmaller and ſmaller as they approach the extremity, or center of the ſhell: between every one of theſe cells, and the adjoining ones, there is a communication, by means of a hole in the centre of every one of the partitions. Through this hole there runs a pipe, which is of the whole length of the ſhell. It ſeems that the fiſh occupies always the largeſt chamber in its ſhell, that is, it lives in the cavity between the mouth and the firſt partition; and that it never removes out of this, but that all the apparatus of cells, and a pipe of communication, which we ſo much admire, ſerve only to admit occaſionally air, or water, into the ſhell, in ſuch proportion as may ſerve the creature in its intentions of ſinking or ſwimming.

Some authors call this ſhell *concha margaritifera*; but this can be only on occaſion of the fine colour of its inſide, which is more beautiful than any other mother-of-pearl; for it has not been obſerved that this ſpecies of fiſh ever produced pearls.

The principal difference of the genus of nautilus are, that ſome are papyraceous, ſome auriculated, and ſome umbilicated.

GENUS XX.
CONUS.
Character of the Genus.

The animal a Slug. The ſhell univalve, ſpiral. The aperture longitudinal, linear; the baſe fixed.

The Imperial Conus.—The ſhell whitiſh, ſtriated longitudinally and faſciated with a livid colour.

The Virgin Conus.—The ſhell arched with a yellowiſh baſe.

GENUS XXI.
CYPRÆA, OR GOWRIE.
Character of the Genus.

The animal a Slug, the ſhell ſub-oval, blunt at each end. The aperture the length of the ſhell, longitudinal, linear, toothed.

The Gowries are numerous, and moſt of them beautiful in colour and poliſh. They have this elegant poliſh from the ſea, naturally or without the aid of art; and were they not common ſhells, would perhaps be as highly eſteemed as any others. They ſeem to be littoreal ſhells, and chiefly to inhabit the ſeas round iſlands; for the greateſt number of them are found at the Moluccas, Madagaſcar, the Weſt India iſlands, &c.

Though the Gowries are found in great abundance in the recent or living ſtate, they are very rarely found foſſil: and as they loſe their colours when in the foſſil ſtate, it is impoſſible to determine whether any of them are recent ſpecies yet undiſcovered. However the kinds found foſſil near Turin and in France, ſeem to be well known in the recent ſtate.

The Wood Gowrie.—Of an oval form, and ſtriated tranſverſely, of a dirty colour, like ſome wood, from whence it takes its name.

GENUS XXII.
BULLA, OR DIPPER.
Character of the Genus.

The animal is a Slug. Shell ſub-oval, aperture oblong, ſmooth, one end a little convoluted.

The Wood Dipper.—Of an oval form, and ſtriated tranſverſely. Of a dirty colour, like ſome woods; whence the name.

The Cylindric Dipper.—White, cylindric, a little umbilicated at the end. About the ſize of a grain of wheat.

The Open Dipper.—With one end much protracted, and fuſiform. The aperture very patulous. From the Portland cabinet.

GENUS XXIII.
VOLUTE.
Character of the Genus.

The ſhell of a pyramidical or conical ſhape; the baſe flat and wide; the body riſes gradually into a ſharp point at the top. The turban is the baſe, and all the whirles are diſtinguiſhed by linear ſlight prominences. The aperture runs the length of the ſhell. The volutes have an inner lip.

This genus for richneſs and beauty of colouring ſurpaſſes all the other genera of the univalves, and is reckoned the ornament, or capital object of collections. The far greater number of volutes always bear a value, ſome kinds, as the Admirals, Brocades, Purple tips, or Onyxes, &c. fetched ſurprizing prices when perfect ſhells, and the Cedo Nulli is ſo extremely rare and beautiful, that it has been rated at the prodigious ſum of one hundred guineas.

GENUS XXIV.
BUCCINUM, OR WHELK.
Character of the Genus.

The animal a Slug, the ſhell univalve, ſpiral, gibbous, aperture oval, ending in a ſhort canal.

The purpled Whelk.—This ſpecies obtained the name of purpled from the purpled juice or dye the fiſh yielded, which is ſo famous in hiſtory, by the name of the Tyrian purple; though Conchologiſts remark, that moſt turbinated ſhells yield a like purple liquor. The purpled whelks prey on other ſhell fiſh, and for that purpoſe bore a round hole in the ſhells of the fiſh they feed upon by paſſing their tongue, which is hard, bony, long, and ſharp through the hole it bores.

The waved Whelk—With ſeven ſpires, ſpirally ſtriated, and deeply and tranſverſely undulated. Length three inches.

The striated Whelk—With eight ſpires, elevated ſtriæ, undulated near the apex. Length near four inches.

GENUS XXV.
STROMBUS.
Character of the Genus.

The animal a Slug; the ſhell univalve, ſpiral, the opening much dilated, and the lip expanding, ending in a groove.

The Pelican's Foot Strombus.—This ſpecies has ten ſpires, tuberculated along their ridges with the lip expanding and digitated. The ſpires are in a moſt exquiſite point. Length about two inches. Extent of the expanſe an inch and a quarter.

GENUS XXVI.
MUREX, OR ROCK.
Character of the Genus.

The animal a Slug.—The aperture oval; the beak narrows into a canal or gutter a little aſcending.

The Urchin Murex.—With an angular ſhell, ſurrounded with tubular ribs. Conſiſts of ſix ſpires on the whole, a moſt rugged ſhell. The aperture exactly oval; the gutter or canal covered. Length two inches.

The Antique Murex.—With eight ſpires finely ſtriated. Colour a dirty yellow. Length three inches and a half.

The Despised Murex.—With eight ſpires. Striated, and ſomewhat rugged. The outſide white, the inſide gloſſy, and yellow. Length five inches. Inhabits the ſea. Eaten by the poor, but often uſed as baits for cod and ray.

The Angulated Murex.—With five or ſix ſpires, the body ventricoſe, the ſpires riſing into angulated ridges. Length near four inches. From the Portland cabinet.

The Horny Murex.—With a narrow oblong ſhell of eight ſtriated ſpires, ſnout much produced. Colour pure white, with a brown epidermis.

GENUS XXVII.
TROCUS, OR TOP.
Character of the Genns.

The animal a Slug. Shell conic. Aperture ſub-triangular. It is remarkable that all authors who have written on ſhells, agree in this genus, and in its character, ſo that few trochi are found miſplaced. It abounds with curious and fine ſhells.

The Livid Trochus.—With a ſharp apex, imperforated bottom, with a ſtria elevated above the reſt. The colour is livid, much ſpotted with deep red.

The Tuberculated Trochus.—With a perforated baſe, ſomewhat depreſſed; ſtriated, with the ridges of the ſpires riſing into blunt diſtinct turbercles. Colour white, zig-zagged with red. When the upper coat is taken off, the next is a rich mother-of-pearl.

GENUS XXVIII.
TURBO, OR WREATH.
Character of the Genus.

Its animal a Slug. Aperture round.

The Turbo Littoreus, or Perriwinkle.—With five ſpires, the firſt ventricoſe, in younger ſubjects ſtriated ſpirally; in the old, ſmooth, and of a duſky colour.

This ſpecies abounds on moſt rocks, far above low water mark. The Swediſh peaſants believe that when theſe ſhells creep high up the rocks, they indicate a ſtorm from the ſouth.

They are called perriwinkles, ſold in common in London and moſt parts of this kingdom.

The Tumid Turbo.—A ſcarce ſhell, with five tumid ſpires moſt elegantly ſtriated, of a pale red colour.

The Turbo Clathrus, Barred Wreath.—With a taper ſhell of eight ſpires, diſtinguiſhed by elevated diviſions, running from the aperture to the apex. Pellucid, ridges very thin. This ſpecies is analogous to that curious and expenſive ſhell the Wentle trap.

We once met with an anecdote of the Wentle trap which we think worthy to be tranſmitted to the ſubſcribers to this work, as it ſhews at times the value of particular and ſcarce ſpecies. In the year

1763, at the ſale of Commodore Liſle's ſhells at Langford's, four Wentletraps were ſold for ſeventy five pounds twelve ſhillings, viz.

Firſt Day, Feb. 21, Lot 96, one not quite perfect	16	16	0
Third Day, Lot 98, a very fine and perfect one	18	18	0
Fourth Day, Lot 101, one for	16	16	0
Sixth Day, Lot 83, one for	23	2	0
	75	12	0

The Doubled Turbo. — With a ſtrong taper ſhell, each ſpire marked with two prominent ſtriæ. Has about twelve ſpires. Found by Doctor Liſter at Scarborough, who ſays it was five inches long.

The Augur Turbo. — A taper ſhell of twelve ſpires, ſpirally ſtriated.

GENUS XXIX.
HELIX, OR SNAIL.

Character of the Genus.

Its animal a Slug. The ſhell univalve, ſpiral, ſub-pellucid, aperture ſemi-lunar.

The Horny Snail. — With four round ſpires. Umbilicated; of a horny appearance; found in dull deep rivers, and in ponds. The largeſt of the Britiſh depreſſed ſpecies.

The Olive Snail. — Of an oval ſub-conic form, with five ſpires clouded with brown. Inhabits ponds.

GENUS XXX.
NERITE.

Character of the Genus.

The ſhell unival, ſpiral, gibbous, flattiſh at bottom; aperture ſemi-orbicular.

The River Nerite. — With only two ſpires, brittle, duſky, marked with white ſpots; not half the ſize of a pea. Inhabits ſtill rivers and ſtanding waters.

The Strand Nerite. — With a thick ſhell, and four ſpires; generally of a fine yellow. Varies greatly into other colours; large as a horſe bean. Common at the ſea rocks.

GENUS XXXI.
HALIOTIS, OR SEA EARS.

Character of the Genus.

The animal a Slug. Shell of the ſhape of a human ear, with a row of orifices, along the ſurface. The ſpire turned in.

Tuberculated Haliotis. — With a rough ſhell, the inſide like mother-of-pearl. Inhabits the ſea near Guernſey, alſo frequently caſt on the Southern ſhores of Devonſhire; when living adheres to rocks. This was the *λεπας αγρια*, the wild limpet, and *φαλλάττιον ȣ̃ς*, the ſea ear of Ariſtotle.

UNIVALVES WITHOUT A REGULAR SPIRE.
GENUS XXXII.
PATELLA. LIMPET.

Character of the Genus.

The animal a Slug. Shell conic without ſpires. This genus derives its name from its reſemblance to a little plate; like that utenſil, the limpets are for the moſt part round or oval, or approaching thereunto. The part that contains the fiſh is concave, ſmooth, and often finely waſhed with colours. The ſhade is more or leſs conciſe. The apex or eye is either whole or perforated, and is ſeldom placed exactly in the middle of the ſhell. Their external ſurface is often rough and ſcabrous, and their apices often imperfect, for moſt of this genus adhering to the rocks, they are much expoſed to the ſun during the time of ebb, and to all the violences that render dead ſhells unacceptable to the curious.

There are three kinds of limpets. The whole or intire limpets; the chambered limpets; and the pierced or perforated limpets. Theſe ſpecies have their reſpective diviſions, to enumerate which appertains rather to a hiſtory of ſhells, which could not be given conſiſtently within the limits of our work. The fineſt and largeſt limpets are from the Eaſt Indies, Africa, eſpecially the Cape of Good Hope, produces many fine ones; and late diſcovers have brought ſome large and fine limpets from the Straits of Magellan, and the South Seas. We ſhall only notice the following:

The Common Limpet.—With rough prominent ſtriæ, and ſharply crenated edges. The edges in old ſubjects almoſt ſmooth.

The Bonnet Limpet.—With a white acuminated ſtriated ſhell, the top turning down like a Phrygian bonnet.

The Transparent Limpet.—With a pellucid ſhell, marked longitudinally with rich blue ſpots. The vertex placed near one edge.

GENUS XXXIII.
DENTALIUM. TOOTH-SHELL.

Character of the Genus.

The animal, a Terebella. The ſhell univalve and tubiform.

The Common Tooth-Shell.—With a ſlender ſhell, a little bending, pervious. Length near an inch and a half. Inhabits moſt of our ſeas.

The Dentalia are found floating, as it were in their ſhells, no ways fixed, but quite looſe and free, like any thing in a ſheath. However, to reconcile this ſeeming paradox (and perhaps it is the real ſtate of the caſe); it is more reaſonable to advance, tha theſe animals are not abſolutely looſe from their ſhell, but rather that they are only very ſlightly connected to it; and, perhaps, when the ſhell is complete or full grown, they detach themſelves from the muſſels; analogous to what lobſters, and other cruſtaceous animals do when they caſt their yearly cruſts; that is, they detach themſelves from the muſſels of the old cruſts, to affix themſelves on their new ones.

GENUS XXXIV.
SERPULA.

Character of the Genus.

The animal a Terebella. The ſhell univalve, tubular, adhering to other bodies.

The Complicated Serpula. — With a ſlender ſhell greatly entwined, adheres to ſhells, &c. moſt intricately twiſted.

The Spiral Serpula. — With a ſhell ſpiral, or wreathed like the cornu amonis.

GENUS XXXV.
TEREDO. PIERCER.

Character of the Genus.

The animal a Terebella, the ſhell bending and penetrating. The only ſpecies in this genus is

The Teredo Navalis. — Juſtly called by Linnæus, *Calamitas Navium*; was imported from the Indies; penetrates into the ſtouteſt oak plank, and effects their deſtruction.

GENUS XXXVI.
SABELLA.

Character of the Genus.

The animal a Nereis. A tubular covering, fabricated with ſand and broken ſhells; coherent by a glutinous cement.

The Honey Comb Sabella. — With numerous tubes placed parallel, the orifices open, forming in the maſs the appearance of the ſurface of honey combs; compoſed chiefly of ſands with very minute fragments of ſhells. The tubes ſometimes above three inches long.

We have now gone through the laſt order of ſhells, or univalves. This order is the moſt numerous of the teſtaceous animals. The genera of univalves ſurpaſs much in number the two other general orders of multivalves and bivalves joined together. In this order of the univalves the wonderful works of the creation are alſo manifeſted by the vaſt variety of beauties in their colours and ſtructures. It is on this account that univalves are the choiceſt objects of collectors, and bear more value than multivalves or bivalves; for few of the latter ever fetch above five or ſix guineas, while numbers of the volutes and other univalves bear from ten to twenty, or thirty guineas, and even greater prices.

In order to render this Syſtem as complete and intelligible as poſſible, we have ſubjoined the following SYNOPTICAL TABLE *of* CONCHOLOGY *for the purpoſe of ſhewing in one point of view, that part of the ſixth Claſs of Animal Nature, called by Linnæus* Vermes Teſtacea. *In all the other Syſtems of Natural Hiſtory will be given* Synoptical Tables, *as they will at once ſhew the Claſſification of the different Orders and Genera in each Diviſion, and ſerve as Indexes to the reſpective Syſtems.*

SYNOPTICAL TABLE OF TESTACEOUS SHELLS.
ORDER I. MULTIVALVES.

Genus 1. Chiton Multivalve, longitudinally dorſal.
Genus 2. Lepas Multivalve, the valves unequal, fixed by a ſtem.
Genus 3. Pholas Bivalve, with acceſſory valves behind.

ORDER II. BIVALVES.

Genus 4. Mya, hinges with a thick empty tooth.
Genus 5. Solen, hinges with diſtant lateral teeth.
Genus 6. Tellina, hinges with lateral teeth on one ſide empty.
Genus 7. Cardium, hinges with lateral, diſtant, and penetrating teeth.
Genus 8. Mactra, hinges with a middle complicated tooth.
Genus 9. Donax, hinges with a lateral tooth, diſtant and void.
Genus 10. Venus, hinge with teeth approximated and divaricated.
Genus 11. Spondylus, hinges with two teeth ſeparated by a ſmall hole.
Genus 12. Chama, hinges have oblique, obtuſe teeth.
Genus 13. Arca, hinges with numerous penetrating teeth.
Genus 14. Ostrea, hinges without teeth, with an ovated depreſſure.
Genus 15. Anomia, hinges without teeth; a lineary depreſſure on the rim.
Genus 16. Mytilus, hinges void of teeth, with a diſtinct indenture.
Genus 17. Pinna, hinges void of teeth, one of the rims enlarged.

ORDER III. UNIVALVES.

Univalves with a regular Spire.

Genus 18. Argonauta, the ſhell with only one cell.
Genus 19. Nautilus, ſhell with many cells and a hole of communication.
Genus 20. Conus, ſhell with aperture effuſe, linear, void of teeth.
Genus 21. Cypræa, ſhell with aperture effuſe, linear; teeth on both ſides.
Genus 22. Bulla, ſhell with aperture ſtriated, ſhaped obliquely.
Genus 23. Voluta, ſhell with aperture effuſe, the pillar plaited.
Genus 24. Buccinum, ſhell with ſmall channel on right ſide of the aperture
Genus 25 Strombus, ſhell with a channel on the left ſide of the aperture.
Genus 26. Murex, the aperture has a ſtrait channel.
Genus 27. Trochus, ſhell with an aperture ſtraitned, nearly four-cornered
Genus 28. Turbo, ſhell with an aperture ſtraitned and orbicular.
Genus 29. Helix, ſhell with an aperture ſtraitned and lunar.
Genus 30. Nerita, a ſhell with an aperture ſtraitned and ſemicorbicular.
Genus 31. Haliotis, ſhell with an aperture widened, and bored through.

Univalves without a regular Spire.

Genus 32. Patella, ſhell ſpread out and conic, lying down.
Genus 33. Dentalium, ſhell awl-ſhaped, opened at both ends.
Genus 34. Serpula, ſhell ſerpentine and tubulous.
Genus 35. Teredo, the ſhell boring into wood.
Genus 36. Sabella, the ſhell made up of grains of ſand.

SYSTEM OF CONCHOLOGY.

Review of Publications on CONCHOLOGY.

We preſent the following account of the works written ſolely on Shells, in order to aſſiſt collectors in making a proper choice of authors.

The firſt profeſſed work on the ſubject of Conchology, was that of Buonanni, printed in Italian, in quarto at Rome, in 1681. It was afterwards tranſlated into Latin by the author, and republiſhed with additions, alſo in quarto in 1684, but the Latin edition is ſcarce. In the original he introduced 450 ſpecies of Shells, and in the tranſlation 550. Thoſe in the latter were in general well engraved, but faulty, in that they are reverſed by the inaccuracy of the engraver. He accompanies each with it's particular deſcription, but the deſcriptions are not good; being too conciſe and uninſtructive, he beſides gives ſeveral philoſophical chapters on the origin, nature, forms, colours, properties, and other curious particulars of Teſtaceous Animals.

The next we ſhall notice, is Liſter's Hiſtory of Shells, publiſhed in folio, at different times, from 1685 to 1692. It is an excellent work, and we are of opinion that it may be pronounced the very beſt, though the ſecond on the ſubject that ever was printed.

This work which conſiſts entirely of engravings, however, has it's faults, which render the copies more or leſs perfect. In the firſt place no two copies are found to be exactly alike, it is ſubject to ſo many variations. The plates about 1067 (in the more perfect copies) are augmented or diminiſhed, miſplaced, or corrected, at different times according to the fancy or ſubſequent diſcoveries made by the author: it is therefore very difficult to quote the work in ſuch a manner as to be quite anſwerable to other copies. The engravings are very elegant and accurate, and were done by his two daughters. There are no deſcriptions but what the ſynonyms infer, which are generally very good. The native countries of a few are alſo added, but the greater part are mere engravings without any name: and though the many diviſions of the hiſtory into books, parts, ſections, and chapters, ſeem very puzzling and confuſed, yet an accurate obſerver will find that they are proper and neceſſary, to the methodical arrangement, and the minute and nice diſpoſition of ſhells Dr. Liſter propoſed.

This difference in the ſeveral copies induced a French Author, Monſieur Davila, in his cabinet, vol. III. p. 231. to give a collation of his copy with that of the King of France's Library from Monſieur de Bure, who in the ſecond volume of his Bibliographie Inſtructive, has alſo many pertinent obſervations of the different times of taking off the plates. By the account Monſieur de Bure gives, it appears that the French King's copy is a very perfect one, and was preſented to that Royal Library by Dr. Liſter himſelf.

Some copies of this work were collated, all of which were found to diſagree; the moſt perfect copy in London is ſaid to be in the library of the College of Phyſicians.

Some foreign Naturaliſts have been pleaſed to call Liſter's Hiſtory, a dry and ſteril work, alluding to its having no deſcriptions, but only ſynonyms, though in all other reſpects they extol it greatly. But Monſieur de Argenville has carried his cenſure upon it beyond all bounds. He inſinuates that out of the firſt book of Land ſhells, three parts of them are known to be Sea ſhells.

His next criticiſm ſhews him diveſted of common grammatical knowledge. His words are, the third book of Liſter is of Bivalves; he mixes the families with the Murex or Rock, and calls ſome Pecten Muricatus, Spondylus Muricatus, &c. Argenville certainly might have ſpared the preſs from groaning under ſuch trivialities, had he known common expreſſion; for the word *muricatus* has no dependance at all on *murex*; being an adjective, of itſelf grammatically ſignifying any ſubject rugged or full of ſharp points. Yet this poor critic would ſtrive to prove, that Liſter, by his Pectens, or Spondylus Muricatus, joins, as he expreſſes himſelf, two different families of ſhells together, and means a Rock Turbinite Scallop, or Rock Turbinite Spondyle, whereas he means no more than a muricated or thorny Scallop or Spondyle, without any relation or tendency to the Murices or Rock Turbens. He alſo criticizes Liſter's adjectives of *margaritiferus* and *echinatus*, in the ſame ignorant manner; for the former term ſignifies only a pearly-coated ſhell, or as the French even now expreſs it in an analogous phraſe, *une Coquille Nacreé*, and the latter or *echinatus*, only a ſhell ſet with thorns or ſpines, like the Echini or Sea Eggs.

Theſe criticiſms, to diſparage Liſter's work, are cloſed by an inſinuation of a yet more hurtful and envious nature. The laſt lines of his account run thus. "One may ſay, that not any author "has thrown ſo much confuſion on the hiſtory of ſhells as Liſter, "otherwiſe a good philoſopher, and a great phyſician."

We ſhould not have troubled our readers with ſuch unentertaining criticiſms, had not Argenville's Conchology been a work ſo greatly in vogue among the collectors, and ſo univerſal, as it is written in French, the faſhionable language. Impreſſions therefore to the diſadvantage of Liſter, had not theſe erroneous inſinuations been hinted at, muſt conſequently have taken place in the minds of the curious in this branch of Natural Hiſtory, and have led them to reject a moſt excellent work for the trivialities of a writer of very inferior merit.

Upon the whole, we give it as our opinion, that Liſter's Hiſtory of Shells is a moſt uſeful work, as perfect as any other ſince publiſhed, and of great conſequence to thoſe who make the Natural Hiſtory of Shells their ſtudy.

Another edition of this excellent work was publiſhed in large folio, in 1770, by the Rev. William Huddesford of Trinity College, Oxford, and Keeper of the Aſhmolean Muſeum.

La Conchyliologie of Monſieur d'Argenville, in French, publiſhed at Paris, with 33 plates, in 1742, upon the whole is a work of great merit, though not perfect, as it does not comprehend the whole ſeries or ſpecies of ſhells diſcovered; but as the author himſelf obſerves, it is only a number of the fineſt and rareſt ſea, river, and land ſhells, many of which had never been engraved before. The expence he obſerves would have been too great to have engraved all that are methodized in the work. Beſides that the greater part are to be found already figured in Buonanni, Liſter, and other Conchologiſts.

There has been a variety of other foreign works, upon the ſubject of Conchology, but as they are written in foreign languages and would occupy ſo much ſpace, we ſhall omit them here, and only notice the following of our own country.

In 1776 were publiſhed Elements of Conchology, or an introduction to the knowledge of ſhells, with ſeven plates, containing figures of every Genus of Shells, by Emanuel Mendes da Coſta.

In this work the Author conveys much information in the Science he treats of, and from his knowledge of foſſils throws great light upon the ſubject. But his not adhering to the Plan which ſhould be adopted by all Naturaliſts, viz. that of keeping the Generic Characters diſtinct from each other, and deſcribing them in a progreſſive manner renders his aſſiduous reſearches leſs valuable than they otherwiſe would be.

Nor is this to be wondered at, as the work was deſigned to be given in form of Lectures and not as a Treatiſe. Beſides the bent of his ſtudy is the foſſil Kingdom, in which his attainments ſurpaſs thoſe of any other that have come within our notice. To thoſe who are curious in inveſtigating Foſſils, we cannot recommend a better production than his Natural Hiſtory of Foſſils, in which he has evidently diſplayed himſelf to be an experienced Naturaliſt and a profound Scholar.

In the year 1787, appeared a work entitled, The Genera Vermium of Linnæus Exemplified, from ſeveral of the rareſt and moſt elegant ſubjects, by James Barbut, Author of the Genera Inſectorum.

The firſt part contains 76 Pages deſcribing 17 Genera, with fourteen Copper Plates, and ſells coloured for two Guineas. In the other part he propoſes to finiſh the ſubject.

The figures Mr. Barbut has adopted to illuſtrate each Genus, in his Syſtem of Conchology are well ſelected, and his method of arrangement truly claſſical, clear and diſtinct. The ſpecific Characters he has preferred as illuſtrative of each Genus are judiciouſly choſen and pleaſingly deſcribed.

It appears from a general review of the productions of thoſe authors who have written upon the ſubject of Natural Hiſtory, that the greater part of them have fallen into a material error, which merits the ſevereſt cenſure. This is the changing long received and authorized names, to others which have as long and conſtantly conveyed a different received idea or meaning.

Such tranſpoſitions of names, from one object to another, is by no means juſtifiable, as it creates a vaſt confuſion in ſcience, by rendering it extremely difficult to identify ſubjects. Names given to bodies that are univerſally adopted and authorized by cuſtom, even though not very appoſite or proper, ſhould be kept ſacred and retained without variation. When once a body, or ſet of bodies, have been ſtamped with an eſtabliſhed or fixed name, it may be affimed without preſumption that no writer whatever, has a right to tranſpoſe it, to gratify either his pride or his fancy. Writers may be allowed the liberty of framing new and correct names more appoſite and ſcientifical, to define ſuch bodies by; but to tranſpoſe names from one object to another that is very different, is a wantonneſs that can never be juſtified.

In forming this Syſtem, we have conſulted numerous Treatiſes on the ſubject, from each of which we have ſelected what we conſidered material; as a curious floriſt would the choiceſt productions of a garden; for he that would fill his hive, muſt gather honey from every flower; and poor indeed is that weed, which yields not a particle of fragrance.

In the courſe of the Syſtem we have ſcrupulouſly adhered to the plan of the immortal Linnæus; and have directed our attention to thoſe ſpecific characters which tend moſt to mark the Genus, ſtill having in view thoſe Shells which are curious in their ſtructure, and entertaining to the ſpeculatiſt.

With reſpect to the drawings, they are executed with neatneſs and accuracy, and we doubt not from the abilities of the engravers to whom they are committed, but they will ſurpaſs thoſe given in any other periodical publication.

If this part of the Work meets with that proportion of commendation with which the other Syſtems have been honoured, it will afford ſingular ſatisfaction to the reſpective Contributors to this Circle of Science, and more particularly to the Author of this Syſtem.

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T. LLOYD.

CONCLAVE, an aſſembly, or meeting of all the cardinals that are at Rome, ſhut up for the election of a Pope. The conclave is ſtrictly guarded by troops: neither the cardinals, nor any perſon ſhut up in the conclave, are ſpoke to, but at the hours allowed of, and then in Italian or Latin; even the proviſions for the conclave are examined, that no letters be conveyed by that means from the miniſters of foreign powers, or other perſons who may have an intereſt in the election of the pontiff.

Conclave is alſo uſed for the aſſembly or meeting of the cardinals ſhut up, for the election of the pontiff.

Conclave is alſo uſed for the aſſembly or meeting of the cardinals ſhut up, for the election of a pope.

After the aſſembly has continued three days, they are only allowed one diſh for a meal; and after fifteen days more, only bread and water: though this rule is not very ſtrictly regarded.

Each cardinal is allowed two conclaviſts, or ſervants to attend him, and to be ſhut up with him.

The election is begun ten days after the pope's deceaſe, and decided by a majority of two parts in three of the cardinals preſent.

Theſe regulations were principally eſtabliſhed by Gregory X. in 1274, and Clement VI. in 1351.

Matthew Paris ſays, the word conclave anciently ſignified the pope's wardrobe.

CONCLUSION, in a general ſenſe, determination, or putting an end to an affair or tranſaction, an opinion from experience, or from a collection of propoſitions; the event of experiments.

Concluſion, in logic, the conſequence or judgment drawn from what was aſſerted in the premiſes; or previous judgments in reaſoning, gained from combining the extreme ideas between themſelves.

The concluſion of an argument contains two parts: the conſequent, which is the matter of it; and the conſequence, which is it's form, and which, of a ſimple abſolute propoſition, renders the concluſion relative to the premiſes whence it is drawn.

CONCOCTION, in medicine, the change which the food undergoes in the ſtomach, &c. to become chyle.

The firſt concoction is made in the ſtomach, by a kind of ferment, as ſeveral ſuppoſe, which partly remains there from the relics of the former meats, and partly flows thither from the cœliac arteries. The ſecond is made in the guts, by the gall and pancreatic juice. The third is in the glandulæ of the meſentery, from the lympha or water which mixes with the chyle. The fourth is in the lungs, from the mixture of the air in ſome meaſure with the blood there. The fifth is in the veſſels and bowels, as in the ſpleen, liver, teſticles, &c.

Theſe five are accounted the ſeveral concoctions in the belly, with regard to the preſervation of the individual, and the propagation of the ſpecies. They are more particularly called, the firſt, chyloſis, for the chyle: the ſecond, chymoſis, for chyme; the third, hæmatoſis, for blood; the fourth, pneumatoſis, for air; and the fifth, ſpermatoſis, for ſeed.

CONCORD, in grammar, that part of conſtruction called ſyntax, in which the words of a ſentence agree; that is, in which nouns are put in the ſame gender, number, and caſe; and verbs in the ſame number and perſon with nouns and pronouns.

Concord, in muſic, the relation of two ſounds that are always agreeable to the ear, whether applied in ſucceſſion or conſonance. See Syſtem of Music.

CONCORDANCE, a dictionary or index to the bible, wherein all the leading words, uſed in the inſpired writings, are ranged alphabetically; and the various places wherein they occur, referred to; calculated to aſſiſt in finding out paſſages, and compiring the ſeveral ſignifications of the ſame word.

The beſt and moſt uſeful Hebrew concordance is that of Buxtorf, printed at Baſil in 1632. In 1718, Trommius publiſhed his Greek concordance for the Septuagint at Amſterdam, in two volumes folio; and Schmidius improving on a ſimilar work of H. Stephen, has given an excellent Greek concordance for the New Teſtament, the beſt edition of which is that of Leipſic, ann. 1717.

We have ſeveral very copious concordances in Engliſh; as Newman's, the Cambridge, &c. but the laſt and beſt eſteemed, is that in 4to. by Alex. Cruden.

CONCOU, in botany, a name given by the people of Guinea to an herb, which is in great eſteem among them for killing that troubleſome ſort of worm called the guinea worm, that breeds in their fleſh. They bruiſe the leaves, and mixing them with oil, apply them in form of a cataplaſm.

CONCOURSE, a crowd, or ſeveral perſons aſſembled together in one place.

CONCRETE, in natural philoſophy and chymiſtry, ſignifies a body made up of different principles, or any mixed body: thus, ſoap is a factitious concrete mixed together by art; and antimony is a natural concrete, or a mixed body compounded in the bowels of the earth.

CONCRETION is the act whereby ſoft bodies are rendered hard; or an inſenſible motion of the particles of a fluid or ſoft body, whereby they come to a conſiſtence. It is indifferently uſed for induration, condenſation, congelation, and coagulation.

Concretion alſo denotes the coalition of ſeveral little particles into a ſenſible maſs, called a concrete.

CONCUBINAGE, ſometimes expreſſes a criminal, or prohibited intercourſe between the two ſexes; in which ſenſe it comprehends adultery, inceſt, and ſimple fornication: but in a more limited ſenſe, concubinage is uſed for the cohabitation of a man and woman in the way of marriage; without having paſſed the ceremony thereof.

Concubinage was anciently tolerated: the Roman law calls it an allowed cuſtom, *licita conſuetudo*. When this expreſſion occurs in the conſtitutions of the Chriſtian emperors, it ſignifies what we now call a marriage in conſcience. The Roman laws had allowed of concubinage long before Julius Cæſar made that law whereby every one was allowed to marry as many wives as he pleaſed. The emperor Valentinian Socrates tells us allowed every man two. The clergy in this kingdom, and other parts of Chriſtendom, who ſubmitted to the juriſdiction of the pope, were for ſome time indulged in keeping concubines, though they were abſolutely reſtrained from marrying; and when both were interdicted to the clergy of England, by the 31ſt Hen. VIII. c. 24, it was made much more penal to keep a wife than a concubine; for the former was felony, without benefit of clergy, when, by the latter, the prieſt only incurred the loſs of his goods and preferments.

Concubinage is alſo uſed for a marriage performed with leſs ſolemnity than the formal marriage; or a marriage with a woman of inferior condition, and to whom the huſband does not convey his rank, or quality.

Cujas obſerves that the ancient laws allowed a man to eſpouſe, under the title of concubine, certain perſons, ſuch as were eſteemed unequal to him, on account of the want of ſome qualities requiſite to ſuſtain the full honour of marriage. But though concubinage was beneath marriage, both as to dignity, and civil effects; yet was a concubine a reputable title, very different from that of miſtreſs among us. The intercourſe was eſteemed ſo lawful, that the concubine might be accuſed of adultery in the ſame manner as a wife.

This kind of concubinage is ſtill in uſe in ſome countries, particularly in Germany, under the title of a half marriage, morgengabic marriage, or marriage with the left hand; alluding to the manner of its being contracted, viz. by the man's giving the woman his left hand inſtead of the right.

CONCUBINE, a woman whom a man takes to cohabit with in the manner of a wife, without being authoriſed thereto by a legal marriage.

Concubines, among the Greeks, were uſually women taken captive, or bought with money, and were always inferior to lawful wives, whoſe dowry or parentage gave them the pre-eminence.

Among the Jews, a concubine had not only oftentimes the ſame appellation, but, in the moſt important inſtances, was upon the ſame level with a wife: nor does there ſeem to be any difference made between the ſons of the wife and thoſe of the concubine.

The patriarchs had a great number of wives, which did not all hold the ſame rank; ſome being ſubordinate to the principal wife; theſe were what we call concubines, or half wives.

Solomon had 700 wives, and 300 concubines: the emperor of China has 3000 concubines in his palace. Darius was followed in his army by 365 concubines, all in the equipage of queens.

The Turks ſtill make ſo little diſtinction between a wife and concubine, that whoever firſt has a ſon, ſuch ſon is intitled to all privileges and advantages of an eldeſt ſon.

CONCURRING, or Congruent *Figures*, in geometry, thoſe which, being laid upon one another, exactly correſpond and cover each other, and are therefore equal.

CONDALUS, in antiquity, a kind of ring worn by ſlaves.

COND, Con, or Cun, in ſea language, ſignifies to guide or direct the ſhip to her right courſe, by giving directions to the man at the helm how to ſteer.

The man that *cons* the ſhip, directs him at helm in theſe terms: *ſtarboard* or *port the helm*; that is, put the helm to the right or left of the ſhip, and then the ſhip will go to the larboard or ſtarboard; for the ſhip always ſails contrary to the helm. *Right the helm*, or *helm a midſhip*; that is, keep it right up, or in the midſhips when it is required the ſhip ſhould go right before the wind. *Eaſe the helm, no near, bear up*; that is, let her fall to leeward, or ſail more large, or more before the wind. *Steady as you go*; that is, keep her upon the ſame point. *Keep thus! thus!* that is, let her go juſt as ſhe is. Other directions, much to the ſame purpoſe, importing chiefly to keep the ſhip near the wind, are, *aloof, keep your loof, falt not off, veer no more, keep her to, touch the wind, have a care of the lee latch.*

CONDEMNATION, the act of giving judgment, paſſing or pronouncing ſentence againſt a perſon, ſubjected thereby to ſome penalty or puniſhment, either in reſpect of life, reputation, or fortune.

CONDENSATION, the act whereby a body is rendered more denſe, compact, and heavy.

Condenſation conſiſts in bringing the parts cloſer to each other, and increaſing their contact: in oppoſition to rarefaction; which renders the body lighter and looſer, by ſetting the parts farther aſunder, and diminiſhing their contact, and of conſequence their coheſion.

Air eaſily condenſes, either by cold, or by art; water congeals, but has been ſuppoſed never to condenſe; i. e. to be brought into a leſs ſpace; becauſe it has even penetrated the moſt ſolid body, even gold, rather than loſe of its bulk.

There has been no body yet found, how denſe and compact ſoever, but cold renders ſtill denſer, not even excepting diamonds, the hardeſt of all known bodies; and as the degree of cold increaſes, this contraction is alſo increaſed, the former contraction ſtill decreaſing, as the cold is leſs. Water alone ſeems to expand by cold, inſomuch that, when congealed, the ice takes up more ſpace than the water did before: but this is attributed to the intromiſſion of ſome foreign matter, ſuch as the nitrous particles of the ambient air, rather than to any proper rarefaction of the water, by the action of cold.

If air be condenſed upon water in a bottle, it will cauſe it to ſpout through the tube of communication to a very great height, viz. 30 feet, if only one atmoſphere be injected, 60 if two, and ſo on. A bladder that will ſuſtain the ſpring of common air will be broken by condenſed air. Condenſed air has its effects juſt oppoſite to thoſe of rarefied air; birds, &c. appear briſker and more lively therein than in the common air, &c.

CONDENSER, a pneumatic engine, made of glaſs, in a cylindric or globular figure. See Syſtem of PNUMATICS.

CONDITION, in the civil law, an article of a treaty or contract, or a clauſe, charge, or obligation, ſtipulated in a contract, or added in a donation, legacy, teſtament, &c.

CONDITIONAL, ſomething not abſolute, but ſubject to limitation.

Conditional legacies are not due till the conditions are accompliſhed.

The Arminian divines maintain, that all the degrees of God, relating to the ſalvation and damnation of man, are truly conditional; the Calviniſts on the contrary maintain that thoſe decrees are all abſolute.

CONDITIONAL *Conjunctions*, in grammar, are thoſe which ſerve to make propoſitions conditional. As, if, unleſs, provided that, in caſe of, &c.

CONDORE, in ornithology, a ſpecies of the genus Vultur, in the rapacious order; it is of the largeſt of all birds in South America; and perhaps, in the world. It is frequently met with on the Andes. It is of the carnivorous kind, and ſo very ſtrong, fierce, and voracious, that it often ſeizes lambs from the flock; and Don Ulloa informs us, that he actually ſaw one of them riſing with a lamb in its talons.

CONDUCTOR, a ſurgeon's inſtrument, uſed when a ſinus is laid open, and, being put into the bladder, ſerves to guide or conduct the knife, in the operation of cutting for the ſtone. The ſame word likewiſe denotes an inſtrument, not long ſince contrived by Mr. Wathen, for ſecuring a fractured limb in the conveyance of the patient from the place where the accident occurred, to the place where the cure is to be completed.

CONDUCTORS, in electricity, thoſe ſubſtances which are capable of receiving and tranſmitting the electric virtue, in oppoſition to electrics, in which the ſame virtue may be excited and accumulated. See ELECTRICITY.

CONDUIT, a canal or pipe, for the conveyance of water, or other fluid matter.

In the earth are ſeveral ſubterraneous conduits, through which the waters paſs that form ſprings; and through which alſo paſs the vapours, which form metals and minerals.

CONDYLOMA, a tubercle, or callous eminence, which ariſes in the folds of the anus; or rather a ſwelling or hardening of the wrinkles of that part.

CONDYLUS, a name given by anatomiſts to a little round eminence, or protuberance, at the extremity of a bone. Such is that of the lower jaw, received within the cavity of the oſpetroſum. When this eminence is large, it is called the head of the bone.

CONE, a ſolid body, having a circle for its baſis, and terminated at the top in a point, or vertex. See Syſtem of GEOMETRY.

CONE *Stone*, in natural hiſtory, a name applied by ſome to a ſpecies of tubulus marinus, not known to us in its recent ſtate, but frequently found foſſile in the Swediſh ſtones uſed in pavements.

CONEPATL, in tetrapodology, an American animal, very much like the rackoon in ſhape, but variegated with two long ſtreaks of white, one on each ſide of the ridge of the back, which run even into the tail. It is tame and harmleſs, but of a ſtinking ſmell, and diſcharges its excrements at the perſon who provokes or purſues it.

CONESSI, a ſort of bark of a tree which grows on the Coromandel coaſt in the Eaſt-Indies. It is recommended in a letter to Dr. Monro, in the Medical Eſſays, as a ſpecific in diarrhœas. It is to be pounded into a fine powder, and made into an electuary with ſyrup of oranges; and the bark ſhould be freſh, and the electuary new made every day, or ſecond day, otherwiſe it loſes it's auſtere but grateful bitterneſs on the palate, and its proper effects on the inteſtines.

CONFECTION, in pharmacy, ſignifies in general any thing prepared with ſugar in particular.

CONFECTION alſo ſignifies a liquid or ſoft electuary, of which there are various ſorts directed in diſpenſatories. See Syſtem of PHARMACY.

CONFECTS, or CONFITS, a denomination given to fruits, flowers, herbs, roots, and juices, when boiled and prepared with ſugar, or honey, to diſpoſe them to keep, or render them more agreeable to the take.

Confects are reduced to eight kinds, viz. liquid confects, marmalades, jellies, paſtes, dry confects, conſerves, candies, and dragees, or ſugar plums.

Liquid confects are thoſe whoſe fruits, either whole, in pieces, ſeeds, or in cluſters, are confitted in a fluid tranſparent ſyrup, which takes its colour from that of the fruits boiled in it. There is much art in preparing theſe well; if they be too little ſugared they turn; and if too much, they candy. The moſt eſteemed of the liquid confects are plums, eſpecially thoſe called mirables, barberries, quinces, apricots, cherries, orange flowers, little green citrons from Madeira, green caſſia from the Levant, myrobalans, ginger, cloves, &c.

Marmalades are a kind of paſtes almoſt liquid, made of the pulp of fruits, or flowers, that have ſome conſiſtence; ſuch as apricots, apples, pears, plums, quinces, oranges, and ginger. Marmalade of ginger is brought from the Indies by way of Holland: it is eſteemed good to revive the natural heat in old men.

Jellies are juices of ſeveral fruits, wherein ſugar has been diſſolved, and the whole, by boiling, reduced into a pretty thick conſiſtence; ſo as, upon cooling, to reſemble a kind of thin tranſparent glue, or ſize. Jellies are made of various kinds of fruits, eſpecially gooſberries, currants, apples, and quinces: there are other jellies made of fleſh, fiſh, hartſhorn, &c. but they are not to be kept, being very ſubject to corrupt.

Paſtes are a kind of marmalades, thickened to that degree by a proper boiling, as to aſſume any form, when put into little moulds, and dried in the oven. The moſt in uſe are thoſe of gooſberries, quinces, apples, apricots, and orange flowers: thoſe of piſtachoes are much eſteemed: thoſe of ginger are brought from the Indies. Dry confects are thoſe whoſe fruits after having been boiled in the ſyrup, are taken out again, drained, and put to dry in an oven. Theſe are made of ſo many kind of fruits, that it would be hard to explain them all: the moſt conſiderable are citron, and orange peel, plums, pears, cherries, apricots, &c.

Conſerves are a kind of dry confects, made with ſugar, and paſtes of flowers or fruits, &c. The moſt uſual among theſe are thoſe of roſes, mallows, roſemary; of heps, of orange flowers, violets, jeſſamin, piſtaches, citrons, and ſloes.

Note. The apothecaries, under the title of conſerves, comprehend all kind of confects, both dry and liquid; whether of flowers, fruits, ſeeds, roots, barks, or leaves, prepared with ſugar or honey, to preſerve, &c.

Candies are ordinarily entire fruits, candied over with ſugar, after having been boiled in the ſyrup; which renders them like little rocks cryſtalliſed; of various figures and colours, according to the fruits encloſed within them. The beſt candies are brought from Italy.

Sugar plums are a kind of little dry confects, made of ſmall fruids or ſeeds, little pieces of bark, or odoriferous and aromatic roots, &c. incruſtrated and covered over with a very hard ſugar, ordinarily very white. Of theſe there are various kinds, diſtinguiſhed by various names: ſome made of raſberries, others of barberries, melon ſeeds, piſtachoes, filberds, almonds, cinnamon, orange peel, corianders, aniſeed, caraways, &c.

It was intended to introduce in this work a Treatiſe on the Art of Confectionary, for which purpoſe Mr. Cooke had purchaſed a manuſcript of Mr. Robert Abbott, late Apprentice to Meſſrs. Negri and Gunter, confectioners, in Berkely Square, London. It being ſo copious, it could not be admitted into the work, and the Author objecting to its being publiſhed in his name in an abridged and mutilated ſtate; it is, therefore, committed to the preſs, and will ſhortly appear as a diſtinct Treatiſe, under the title of the Art Confectionary, or the Houſekeeper's valuable preſent.

CONFEDERACY, in law, is when two or more perſons combine to do any damage to another, or to commit any unlawful act.

Confederacy is puniſhable, though nothing be put in execution: but then it muſt have theſe four incidents; 1. That it be declared by ſome matter of proſecution; as by making of bonds or promiſes to one another: 2. That it be malicious; as for unjuſt revenge: 3. That it be falſe; i. e. againſt the innocent: and, laſtly, That it be out of court voluntarily.

CONFERVA, river-weed; a genus of the order of the algæ, belonging to the crytogamia claſs of plants. There are 21 ſpecies, moſt of them growing on ſtones in ſlow ſtreams, on the ſides of ciſterns, or in ponds.

CONFESSION, in a general ſenſe, a declaration or acknowlegement of ſome truth, though it be againſt the intereſt of the party who makes it; whether it be in a court of juſtice, or out of it. It is a maxim, that in civil matters, the confeſſion is never

never to be divided, but always taken entire; and that a criminal is never condemned on his ſimple confeſſion, without other collateral proofs; nor is a voluntary extra-judicial confeſſion admitted as any proof. A perſon is not admitted to accuſe himſelf, according to that rule in law, *non auditer perire volens.*

Confession, in the Romiſh Church, is a declaration of a perſon's ſins, made to a prieſt, in order to obtain abſolution for the ſame. The Romiſh church makes confeſſion a part of the ſacrament of penance.

Confession *of Faith,* denotes a liſt, or enumeration and declaration of the ſeveral articles of belief, in a church.

Confessional *Box*, or *Deſk*, in the Romiſh church, where the confeſſor takes the confeſſions of the penitent.

CONFESSOR, in the Romiſh church, is a prieſt who has a power to hear ſinners in the ſacrament of penance, and to give them abſolution.

CONFIRMATION, in a general ſenſe, the act of ratifying or rendering a title, claim, report, or the like, more ſure and indiſputable.

Confirmation, in theology, the ceremony of laying on of hands, for the conveyance of the Holy Ghoſt.

The antiquity of this ceremony is, by all ancient writers, carried as high as the apoſtles, and founded upon their example and practice. In the primitive church, it uſed to be given to Chriſtians immediately after baptiſm, if the biſhop happened to be preſent at the ſolemnity.

The order of confirmation in the church of England, does not determine the preciſe age of the perſons to be confirmed.

CONFISCATE, in law, is applied to goods forfeited to the exchequer, or public treaſury.

The word is derived from *fiſcus, a hamper, panier*, or *baſket*, wherein the emperor's money uſed to be kept.

CONFISCATION, a legal adjudication of goods or effects.

Thus, the bodies and effects of criminals, traitors, &c. and merchandizes that are contraband, prohibited, or brought aboard or aſhore without paying the duties, when ſeized, are confiſcated.

CONFLAGRATION, a general burning of a city, or other conſiderable place. In which ſenſe, Nero is ſaid to have procured the Chriſtians to be accuſed of the conflagration of Rome, which was done by his own order.

This word is commonly applied to that grand period or cataſtrophe of our world, when the face of nature is to be changed by a deluge of fire, as formerly it was by that of water.

Seneca ſays expreſsly, *Tempus advenerit quo ſidera ſideribus incurrent, & omni flagrante materia uno igne, quicquid nunc ex depoſito lucet, ardebit.* This general diſſolution the Stoics call εκπυρωσις, *ecpyroſis.* Mention of the conflagration is alſo ſeveral times made in the books of the Sibyls, Sophocles, Hyſtaſpes, Ovid, Lucan, &c.

Dr. Burnet, after F. Tachard, and others, relates, that the Siameſe believe, that the earth will at laſt be parched up with heat; the mountains melted down; and the earth's whole ſurface reduced to a level, and then conſumed with fire. And the Bramins of Siam do not only hold, that the world ſhall be deſtroyed by fire; but alſo, that a new earth ſhall be made out of the cinders of the old.

The ſentiments of authors are various in regard to the cauſe whence the conflagration is to ariſe, and the effects it is to produce. Divines will have it take its riſe from a miracle, as a fire from heaven; but philoſophers contend for its being produced from natural cauſes; ſome think an eruption of the central fire ſufficient for the purpoſe; others look for the cauſe in the atmoſphere. Aſtrologers account for it from a conjunction of all the planets in the ſign Cancer, as they ſay the deluge of water was occaſioned by the conjunction in Capricorn; but others aſſure themſelves that the world is to undergo its conflagration from the near approach of a comet, in its return from the ſun; as theſe huge bodies, by the intenſity of their heat, and their wandering tranſverſe motion acroſs the earth's orbit, threaten to produce the moſt ſignal changes and revolutions in the ſyſtem of things.

CONFLUENCE, or Conflux, the place where two rivers join, and mix their ſtreams.

CONFLUENT, in medicine, an epithet given to that ſpecies of ſmall-pox wherein the puſtules run into one another.

CONFORMATION, the particular texture and conſiſtence of the parts of any body, and their diſpoſition to make a whole.

We ſay, light of different colours is reflected from bodies according to their different conformation.

CONFORMITY, is the relation of agreement between one thing and another: as between the meaſure, and the thing meaſured; the object, and the underſtanding; the thing, and the conception; the thing, and the diviſion thereof, &c.

CONFRONTATION, the act of bringing two perſons, in preſence of each other, to diſcover the truth of ſome fact, which they relate differently.

The word is chiefly uſed in criminal matters; where the witneſſes are confronted with the accuſed; the accuſed with one another, or the witneſſes with one another.

CONFUSE, to put in diſorder, to make irregular, to perplex by indiſtinct ideas, or by uſing words without any determinate ſignification.

CONFUSION, in a general ſenſe, is oppoſed to order; in a perturbation whereof, confuſion conſiſts: e. gr. when things prior in nature do not precede; or poſterior do not follow, &c.

In a logical ſenſe, confuſion is oppoſed to diſtinctneſs, or perſpicuity; and may happen, either in words, as when miſconſtrued or miſapplied; or in ideas, as when the idea of any thing preſents ſomething along with it, which does not properly belong to that thing.

In a phyſical ſenſe, confuſion is a ſort of union, or mixture by mere contiguity. Such is that between fluids of contrary natures; as oil and vinegar, &c.

Confusion *of Tongues*, in the hiſtory of the world, is a memorable event, which happened in the 101ſt year, according to the Hebrew chronology, and the four hundred and firſt year by the Samaritan, after the flood, at the overthrow of Babel; and which was providentially brought about, in order to facilitate the diſperſion of mankind, and the population of the earth.

CONFUTATION, in rhetoric, &c. a part of an oration, wherein the orator ſeconds his own arguments, and ſtrengthens his cauſe, by refuting and deſtroying the oppoſite arguments of the antagoniſt. This is done by denying what is apparently falſe, by detecting ſome flaw in the reaſoning of the adverſe party, by granting their argument, and ſhewing its invalidity, or retorting it upon the adverſary.

CONGE, in the French law, a licence, or permiſſion, granted by a ſuperior to an inferior, which gives him a diſpenſation from ſome duty to which he was before obliged.

CONGELATION, freezing, or ſuch a change produced by cold in a fluid body, that it quits its former ſtate, and becomes congealed.

The word congelation is only applied to homogeneous fluids, ſuch as water, oils, or pinguous ſubſtances, and fuſed metals, in which, beſides a concretion in the cold air, no change is obſerved.

By congelation, ſome bodies, ſuch as water, are rarefied and expanded: whereas others are condenſed, or rendered more compact, ſuch as fixed metals, and pinguous bodies. In the ſhops, the condenſation of any liquor in a cold place, is alſo called congelation. The ſtones produced in ſome caverns from the drops of petrified water, are alſo called congelations: for one method, in which nature forms ſtones, is by ſuch a congelation as does not ſuffer any thing of an earthly nature to be ſeparated or precipitated from the whole maſs, either ſpontaneouſly, or by the motion of fire; but produces an uniform dryneſs and induration of the whole maſs.

CONGENERES *Muſculi*, in anatomy, are ſuch muſcles in an animal body, as ſerve together to produce the ſame motion: and they are ſo called becauſe they aſſiſt one another in their action.

CONGER, in ichthyology, a ſpecies of the muræna; the name of the ſea-eel, a very voracious and extremely large fiſh of the eel kind.

The name is derived from γογγρος, which is formed of a duplication of the adjective γρωος, or γρος, *voracious*, from γρω, *I devour.*

It grows to an enormous ſize, four or five cubits being a common length with it, and its thickneſs that of a man's thigh. It is of a pale grey on the back, and a fine milk white on the belly, and has on each ſide a ſtrait white line, ſomewhat broad, made as it were of a double, ſometimes ſingle row of dots, and running from the head to the tail; the top of its back fin is black all the way; and in the end of its upper jaw, juſt at the noſe, it has two ſhort tubular horns, out of which a mucous liquor may be ſqueezed. Their fleſh is very agreeable, but is not eaſy of digeſtion.

Theſe fiſhes form a conſiderable article of commerce in Cornwall; whence they are exported to Spain and Portugal, particularly to Barcelona. They are ſometimes caught by a ſingle hook and line; but chiefly by bulters. They are afterwards cured, by ſlitting and hanging them on a frame to dry, that the fat may exude. The dried congers are ground into a powder, and uſed by the Portugueſe and Spaniards to thicken and give a reliſh to their ſoups. Pennant's Zoology, Vol. iii. p. 149.

CONGESTION, in medicine, a maſs, or collection of humours, crouded together, and hardened, in any part of the body; and there forming a preternatural tumor.

Congeſtion is effected by little and little: in which it differs from defluxion, which is more ſudden.

CONGLOBATE *Glands*, in anatomy, thoſe glands whoſe ſubſtance is not divided, but firm, entire, and continued; and their ſurface ſmooth and uniform.

CONGLOMERATE *Glands*, are thoſe which are compoſed of ſeveral little ones; or they are ſeveral glandulous bodies joined together under the ſame common membrane.

CONGLUTINATION, the act of glueing, or faſtening two bodies together, by the intervention of ſome third, whoſe parts are unctuous and tenacious, in the nature of a glue, *gluten*; from whence the word is formed.

CONGREGATION, an aſſembly of ſeveral perſons united ſo as to conſtitute a body.

The term is principally uſed for aſſemblies of cardinals, appointed by the pope, and diſtributed into ſeveral chambers, for the diſcharge of certain functions and juriſdictions, after the manner of our offices and courts.

Congregation, in phyſics, is uſed by Dr. Grew for the leaſt and loweſt degree of mixtion; or that wherein the parts of the mixture do not conſiſt with, or adhere to, each other, but only touch in one point.

That author declares himſelf of opinion, that the particles of all fluids only touch in this manner; or that their coheſion only amounts to a congregation.

CONGRESS, in political affairs, an aſſembly of commiſſioners, envoys, deputies, &c. from ſeveral courts, meeting to concert matters for their common good. Such was the congreſs held at the Hague, in 1697. There is alſo the American congreſs, a meeting of the deputies from the ſeveral provinces of the United States,

Congress, in a judicial ſenſe, the trial made by appointment of a judge, before ſurgeons and matrons, in order to prove whether or no a man be impotent, before ſentence is paſſed for the diſſolution of a marriage, ſolicited upon ſuch a complaint.

CONGRUITY, a ſuitableneſs or relation of agreement between things.

The terms congruity and propriety are not applicable to any ſingle object: they imply a plurality, and obviouſly ſignify a particular relation between different objects.

The perception we have of this relation, which ſeems peculiar to man, cannot proceed from any other cauſe, but from a ſenſe of congruity or propriety; for, ſuppoſing us deſtitute of that ſenſe, the terms would be to us unintelligible.

Congruity, in geometry, is applied to figures, lines, &c. which being laid upon each other, exactly agree in all their parts, as having the very ſame dimenſions.

Euclid, and, by his example, moſt other geometricians, demonſtrate all their elements from the ſole principle of congruity. See Syſtem of Geometry.

Congruity, among naturaliſts, a property relative to a fluid body, whereby any part of it is really united with any other part, either of itſelf, or of any other ſimilar fluid, or ſolid body.

Congruity is alſo a property by which it is hindered from uniting with the ſolid of fluid body diſſimilar to it. Thus quickſilver will ſtick to gold, ſilver, lead, tin, &c. and unite with them, but will roll off from wood, ſtone, glaſs, &c. and water, which will wet ſalt and diſſolve it, will ſlip off from tallow, without adhering to it, as alſo from a duſty ſurface, and from the feathers of water-fowls.

CONIC *Section*, a curve line ariſing from the ſection of a cone by a plane.

The elementary properties of Conic Sections, and other Curves, conſtitute what is uſually ſtyled, The Higher Geometry; *and as we propoſe to give a full and complete Syſtem of Geometry, we conceive the Conic Sections will appear more in order under that head; as it is indiſpenſably neceſſary that the ſtudent ſhould be thoroughly acquainted with the plain, or ordinary Geometry, before he engages in the Geometry of Curve Lines.*

It will alſo concur with the plan generally adopted in this Work, of bringing the parts of Science that are connected, under one head, in order to facilitate the acquiſition of them, which muſt certainly be more effectually accompliſhed by ſuch means, than by preſenting them abſtractedly in divers parts of a work.

CONICTHYODONTES, or Plectronitæ, in natural hiſtory, one of the three names by which the foſſil teeth of fiſh are known; ſo called, from their ſuppoſed reſemblance to the ſpur of a fighting cock.

CONIFEROUS, a term applied to ſuch trees, ſhrubs, or herbs, as bear a ſqammous or ſcaly fruit, of a woody ſubſtance, and a figure approaching to that of a cone; in which there are uſually many ſeeds; and, when they are ripe, the ſeveral cells or partitions in the cone gape or open, and the ſeeds drop out. Of this kind are the fir, the pine, beech, and the like.

CONISSALÆ, in natural hiſtory, the name of a claſs of foſſil bodies; the word is derived from *κονισσαλος, powders;* all the ſpecies of bodies of this claſs being found like common ſand, in form of powder, have been uſually confounded together, under the common name of ſands.

CONJUGATION, in grammar, an orderly diſtribution of the ſeveral parts or inflexions of verbs, in their different moods and tenſes, to diſtinguiſh them from each other. See Grammar.

Conjugation, in anatomy, is underſtood of a pair of nerves; or two nerves ariſing together, and ſerving for the ſame operation, ſenſation, or motion; there being ſcarce any nerve in the body without its fellow.

The ancient phyſicians only knew of ſeven pairs, or conjugations of nerves; the moderns have diſcovered thirty new ones.

CONJUNCTION, in aſtronomy, the meeting of two ſtars, or planets, in the ſame optical point of the heavens, i.e. in the ſame degree of the zodiac; and is either true or apparent.

Conjunction, in grammar, an indeclinable word or particle, which ſerves to join words and ſentences, and thereby ſhews their relation or dependence upon one another. See Grammar.

CONJURER, an enchanter, or one who makes uſe of magical charms; an impoſtor, who pretends to have commerce with the world of ſpirits, and by that means to be able to foretel the future events of a perſon's life, to diſcover thieves, &c.

The Romiſh prieſts pretend to expel devils, by preparing holy water in a particular manner, and ſprinkling it over the poſſeſſed, with a number of conjurations and exorciſms.

The ſtatute of king James I. againſt conjuration and witchcraft, is repealed; and no proſecution ſhall be commenced on the ſame: but where perſons pretend to exerciſe any kind of witchcraft or conjuration, &c. or undertake to tell fortunes, or, from their ſkill in any crafty ſcience, to diſcover where goods ſtolen or loſt may be found; upon conviction they ſhall be impriſoned a year, and ſtand in the pillory once in every quarter, in ſome market-town, and may be ordered to give ſecurity for their good behaviour, by ſtat. 9 Geo. II. c. 5.

CONNECTION, or Connexion, a relation whereby one thing adheres to, or depends on another.

CONNIVENTES *Valvulæ,* in anatomy, wrinkles, or corrugations, in the inner coat, or membrane, of the two large inteſtines, the *jejunum* and *ilium.*

They are formed as the rugæ of the ſtomach, viz. by the inner coat's being larger than the outer.

Theſe folds, or corrugations, ſome anatomiſts imagine in ſome meaſure to do the office of valves; by ſtreightening the paſſages, and conſequently impeding the motion of their contents: by which means, the lacteals have the more time to imbibe the chyle.

CONNOISSEUR, a French term, of late uſed in Engliſh: it literally denotes a perſon well verſed in any thing; being formed of the verb *connoitre, to know, underſtand.* Hence it comes to be uſed in our language for a critic, or perſon who is a thorough judge, or maſter in any way; particularly in matters of painting and ſculpture.

CONOID, Conoides, in geometry, a ſolid body, reſembling a cone, except in this, that, inſtead of a perfect circle for its baſe, it has an ellipſis, or ſome other curve approaching thereto.

CONOIDES, or Conarium, is a name given by anatomiſts to a gland found in the third ventricle of the brain, reſembling a pine apple; whence M. Des Cartes called it *pinealis*; and has fixed there the ſeat of the rational ſoul.

CONQUEST, in civil juriſprudence, is the acquiſition of property in common by a number of perſons.

In ſome countries they confound acquiſition with conqueſt; but, according to the moſt general acceptation, acquiſition is the gaining of unappropriated goods before the eſtabliſhment of a community: whereas by the term conqueſt, is ordinarily intended whatever is acquired by a number of perſons in community; or by ſome one for all the others.

Conquest, in the law of nations, is the acquiſition of ſovereignty by force of arms, by ſome foreign prince; who reduces the vanquiſhed under his empire. The right of conqueſt is derived from the laws of war; and when a people is ſubjected, the conduct of the conqueror is regulated by four kinds of law. Firſt, the law of nature, which dictates whatever tends to ſelf-preſervation; ſecondly, our reaſon, which teaches us to uſe others, as we would be treated ourſelves; thirdly, the laws of political ſociety, to which nature has not aſſigned any preciſe boundary; laſtly, the law which is derived from the particular circumſtances attending the conqueſt.

Thus, a ſtate conquered by another will be treated in one of the four methods following. Either the conqueror will continue it under its own laws, and will only claim the exerciſe of civil and eccleſiaſtical ſovereignty; or he will impoſe a new form of government; or he will deſtroy the frame of their ſociety, and incorporate the inhabitants with others; or he will exterminate them.

CONSANGUINITY, the relation of kinſhip, between perſons of the ſame blood, or ſprung from the ſame root. It is either lineal, when it ſubſiſts between perſons of whom one is deſcended in a direct line from the other; or collateral, when relations deſcend from the ſame anceſtor, but do not deſcend from each other.

CONSCIENCE, Consciousness, in ethics, a ſecret teſtimony or judgment of the ſoul, whereby it gives its approbation to things it does that are naturally good; and reproaches itſelf for thoſe that are evil.

Some divines maintain, that conſcience is infallible; and hold it to be that immutable law whereby God will judge men: they deny that the underſtanding can be the ſource of errors, and lay them all at the door of the will.

CONSECRATION, the act of converting, or ſetting apart, any profane, or common thing, to a pious purpoſe; with certain ceremonies, prayers, benedictions, &c. appropriate thereto.

Conſecration is the reverſe of ſacrilege and profanation, which conſiſt in perverting a thing ſet apart for a pious purpoſe, to a profane and popular one.

Consecration is particularly uſed for the benediction of the elements in the euchariſt.

The Romaniſts define it, the converſion of the bread and wine into the real body and blood of Jeſus Chriſt: and that this is the ſentiment of their church, is evident from the prieſt's elevating the hoſt immediately after conſecration, for the people to adore it. See Elevation, &c. There is a great controverſy between the Latin and Greek churches, touching the words of conſecration; the common opinion among the Romaniſts, agreeable to St. Thomas and the ſchoolmen, is, that the conſecration of the bread and wine conſiſts in theſe words, *This is my body*; *this is my blood.* The Greeks, on the contrary, attribute the change of the elements to a certain prayer, which they call *invocation of the Holy Ghoſt*, rehearſed after the words, *This is my body*; *this is my blood*; which the Greeks maintain are only neceſſary in the proceſs of the *conſecration*, as they contain the hiſtory of the inſtitution; not as they contribute any thing to the change.

The Romaniſts have a great deal of pious foppery in the ceremonies of conſecration; which they beſtow on almoſt every thing, as bells, candles, books, water, oil, aſhes, palms, ſword, banners, pictures, croſſes, agnus dei's, roſes, &c.

In England, churches have been always conſecrated with particular ceremonies, the form of which was left to the diſcretion of the biſhop. That obſerved by biſhop Laud, in conſecrating St. Catharine Cree church, in London, gave great offence.

CONSENT, the act of yielding, or compliance with a requeſt; agreement; unity of ſentiment; harmony, or agreement of parts.

Consent *of Parts*, in the animal œconomy, a certain agreement, or ſympathy, by means whereof, when one part is immediately affected, another, at a diſtance, becomes affected in like manner.

This mutual accord, or conſent, is doubtleſs effected by the commerce of the nerves, and their artful diſtribution and ramification throughout the body.

Conjugation of nerves branched to the parts of the eye, the ear, thoſe of the mouth, cheeks, præcordia, and parts adjacent, &c. is ſuppoſed by naturaliſts to be the inſtrument of that particular and extraordinary conſent between thoſe parts. Hence it is, that a ſavoury thing ſeen or ſmelt excites the appetite, and affects the glands and parts of the mouth; that a ſhameful thing ſeen or heard affects the cheeks with bluſhes; on the contrary, if it pleaſe, it affects the præcordia, and excites the muſcles of the mouth and face to laughter; if it grieve, it affects the glands of the eyes, ſo as to occaſion tears, and the muſcles of the face, putting them into an aſpect of crying.

Dr. Willis, quoted by Mr. Derham, imputes the pleaſure of kiſſing, and its effects, to this pair of nerves; which being branched both to the lips and the genital parts, when the former are affected, an irritation is occaſioned in the latter. See Sympathy.

CONSEQUENCE, in logic, the concluſion of a reaſoning, or argument.

The two premiſes of a ſyllogiſm being granted, the conſequence muſt alſo be granted.

In a more reſtrained ſignification, conſequence is uſed for the relation or connexion between two propoſitions, whereof one follows, or is inferred, from the other. Thus: *It is an animal, and therefore feels.*

CONSEQUENT, the laſt propoſition of an argument; being ſomething deduced or gathered from a preceding argumentation.

CONSERVATORY is ſometimes uſed for a place to preſerve ſnow or ice. See Phil. Tranſ. N° VIII. p. 140. See Ice-House.

CONSERVE, a dry confect, or form of medicine, or food, contrived to preſerve the flowers, leaves, roots, peels, or fruits of ſeveral ſimples, as near as poſſible to what they were when freſh gathered; and to give them an agreeable taſte. See Confects.

CONSIDERATION, in law, the material cauſe, or *quid pro quo* of any contract, and without which no contract is obligatory or binding.

This conſideration is either expreſſed; as if a man bargain to give ten guineas for a horſe: or implied, when the law itſelf enforces a conſideration; as if a man coming into an inn, takes meat, drink, and lodging for himſelf and horſe, the law preſumes he intends to pay for them, though there be no expreſs contract between him and his hoſt; and if he diſcharge not the houſe, the hoſt may ſtop his horſe.

CONSIGNMENT, or Consignation, in law, the depoſiting any ſum of money, bills, papers, or commodities, in ſure hands; either by order of a court of juſtice, in order to be delivered to the perſons to whom they are adjudged.

Consignment *of Goods*, in commerce, is the delivering, or making them over to another. Thus, goods are ſaid to be conſigned to a factor, when they are ſent to him to be ſold, &c. or when a factor ſends back goods to his principal, they are ſaid to be conſigned to him.

CONSISTENCE, or Consistency, the natural ſtate of bodies; the degree of thickneſs or thinneſs, applied to fluids; ſubſtance; uniformity of appearance, action, or qualities; free from contradiction, or variety.

CONSISTENT *Bodies*, is a term much uſed by Mr. Boyle for ſuch as we ordinarily call *firm* or *fixt bodies*; in oppoſition to *fluid* ones.

That author has a particular eſſay of the atmoſphere of conſiſtent bodies; wherein he ſhews, that all, even ſolid, hard, ponderous, and fixed bodies, do exhale or emit effluvia to a certain ſpace all around them.

CONSISTORY, ſignifies as much as prætorium, a tribunal: it is commonly uſed for a council-houſe of eccleſiaſtical perſons, or place of juſtice in the ſpiritual court; a ſeſſion or aſſembly of prelates. And every archbiſhop and biſhop of every dioceſe hath a conſiſtory court held before his chancellor or commiſſary in his cathedral church, or other convenient place of his dioceſe, for eccleſiaſtical cauſes. The biſhop's chancellor is the judge of this court, ſuppoſed to be ſkilled in the civil and canon law; and in places of the dioceſe far remote from the biſhop's conſiſtory, the biſhop appoints a commiſſary to judge in all cauſes within a certain diſtrict, and a regiſter to enter his decrees, &c.

CONSISTORY, at Rome, is an eccleſiaſtical aſſembly held in the preſence of the pope, for the reception of princes or their ambaſſadors, for the canonization of ſaints, for the promotion of cardinals, and other important affairs.

CONSOLATION, in rhetoric, a figure, wherein the orator endeavours to abate and moderate the grief or concern of another.

In conſolation, a principal regard is to be had to the circumſtances and relations of the parties. Thus,

" A ſuperior may interpoſe his authority, and may even chide;
" a wiſe man may even diſpute; ſentences will become him.
" An inferior is to ſhew reſpect and affection, and own he had
" this from ſome wiſe or learned perſon: an equal to appeal to
" their common friendſhip."

In a general ſenſe Conſolation is that which diminiſhes grief, and alleviates miſery.

CONSOLE, in architecture, a part or member projecting in manner of a bracket, or ſhoulder piece; ſerving to ſupport a corniche, buſt, baſe, beam, little vault, or the like.

CONSOLIDATION, in law, the combining and uniting two benefices into one.

The term is borrowed from the civil law; where it properly ſignifies an union of the poſſeſſion, or occupation, with the property. Thus, if a man hath by legacy *uſumfructum fundi*, and afterwards buys the property, or fee ſimple, of the heir; this is called a conſolidation.

Consolidation, in medicine, expreſſes the action of uniting broken bones, or the lips of wounds, by means of conſolidating remedies, as they are called; which, cleanſing with a moderate heat and force, taking corruption out of the wounds, and preſerving the temperature of the parts, affords nouriſhment.

CONSONANCE, in muſic, is ordinarily uſed in the ſame ſenſe with concord, viz. for the union or agreement of two ſounds produced at the ſame time, the one grave, the other acute; which, mingling in the air, in a certain proportion, occaſion an accord agreeable to the ear.

Consonance, in grammar, denotes a like cadence, or cloſe of words, periods, &c.

CONSONANT, a letter that cannot be ſounded without ſome ſingle or double vowel before or after it; as *b*, *c*, *d*, &c.

CONSPIRACY, in law, ſignifies an agreement between two or more, falſely to indict, or procure to be indicted, an innocent perſon, of felony.

CONSPIRATORS are, by ſtatute, defined to be ſuch as bind themſelves by oath, covenant, or other alliance, to aſſiſt one another falſely and maliciouſly to indict perſons, or falſely to maintain pleas.

Conſpirators in treaſon, are thoſe that plot againſt the king and the government.

CONSPIRING, from conſpire, tending mutually to produce one deſign. In mechanics, conſpiring powers are ſuch as do not act in directions oppoſite to each other.

CONSTABLE. The lord high conſtable was an officer who had the care of the peace of the kingdom in deeds of arms, and matters of war. The firſt conſtable was created by the conqueror, and the office continued hereditary, till the 13th of Henry VIII. who laid it aſide, as being both formidable and troubleſome to him. From theſe magiſtrates were derived the conſtables of hundreds, two of which were ordained by Edward I. to be choſen out of every hundred, for the preſervation of the peace. Theſe are called now high conſtables, becauſe increaſe of people and crimes have given occaſion for officers of the like nature, in every town, called petty conſtables. Beſides, the conſtables of the tower, of Dover caſtle, and of the caſtle of Caernarvon, are properly governors of thoſe caſtles. *To over-run the conſtable*, is to ſpend more than a man is worth, and ſeems derived from *conte*, ſtable, a ſettled or ſtated account.

Constables *of London*. The city of London is divided into twenty-ſix wards, and the wards into precincts, in each whereof is a conſtable. They are nominated by the inhabitants of each precinct on St. Thomas's day, and confirmed, or otherwiſe, at the court of wardmote. After confirmation, they are ſworn into their offices at a court of Aldermen, on the next Monday after Twelfth day.

CONSTANT, in general, an appellation given to things which remain in the ſame ſtate, without changing their nature or circumſtances: thus we ſay, *conſtant* quantities, *conſtant* winds, &c.

CONSTELLATION, in aſtronomy, a ſyſtem of ſeveral ſtars that are ſeen in the heavens, near to one another. Aſtronomers not only mark out the ſtars, but that they may better bring them into order, they diſtinguiſh them by their ſituation and poſition in reſpect to each other; and therefore they diſtribute them into aſteriſms, or conſtellations, allowing ſeveral ſtars to make up one conſtellation: and for the better diſtinguiſhing and obſerving them, they reduce the conſtellations to the forms of animals, as men, bulls, bears, &c. or to the images of ſome things known, as of a crown, a harp, a balance, &c. or give them the names of thoſe whoſe memories, in conſideration of ſome notable exploit, they had a mind to tranſmit to future ages.

The diviſion of the ſtars by images and figures is of great antiquity, and ſeems to be as old as aſtronomy itſelf: for in the moſt ancient book of Job, Orion, Arcturus, and the Pleiades, are mentioned; and we meet with the names of many of the conſtellations in the writings of the firſt poets, Homer and Heſiod.

The ancients, in their diviſion of the firmament, took in only ſo much as came under their notice, diſtributing it into 48 conſtellations; but the modern aſtronomers comprehend the whole ſtarry firmament, dividing it into three regions. See Syſtem of Astronomy, Section VIII.

CONSTERNATION is defined by ethical writers to be an exceſs of horror, owing to the ill government of our admiration and fear: or ſuch an immoderate degree of fear as confounds the faculties, and incapacitates a perſon for conſultation and execution.

CONSTIPATION, in medicine, a hardneſs of the belly, with great coſtiveneſs.

Riding poſt, eating of medlars, or quinces, ſeveral preparations of milk, hard roaſted eggs, &c. conſtipate the belly.

A conſtipation of the belly, if it continue long, ſometimes degenerates into the iliac paſſion, or twiſting of the guts. Moſt perſons of a hot and dry conſtitution are afflicted with a coſtiveneſs, or conſtipation; but this is ſeldom attended with any ill conſequences. See Syſtem of Medicine.

CONSTITUENT *Part*, in phyſiology, an eſſential part in the compoſition of any thing, differing little from what is otherwiſe called element or principle.

CONSTITUTION, in matters of policy, ſignifies the form of government eſtabliſhed in any country or kingdom. Conſtitution alſo denotes an ordinance, deciſion, regulation, or law, made by authority of any ſuperior, eccleſiaſtical or civil.

Apoſtolical Constitutions, a collection of regulations attributed to the apoſtles, and ſuppoſed to have been collected by St. Clement, whoſe name they likewiſe bear.

Constitution is alſo uſed, in a phyſical ſenſe, for the temperament of the body, or for that diſpoſition of the whole which ariſes from the quality and proportion of its parts.

Phyſicians conſider the conſtitution as depending chiefly on the humours or juices of the body; and hence, as this or that humour is ſuppoſed to predominate, the bile, e. g. or the blood, phlegm, choler, or ſpirit; the perſon uſed to be denominated of a bilious, ſanguine, phlegmatic, choleric, or mercurial conſtitution.

CONSTRICTION, the act of binding, or drawing the parts of a thing cloſe together. The word is compounded of *con, together*, and *ſtringere, to tie* or *cloſe up*.

CONSTRUCTOR, in anatomy, an appellation given to ſeveral muſcles on account of their conſtringing, or cloſing ſome of the orifices of the body. Thus,

Constructor *Cunni*, in anatomy, the name given by Albinus to a muſcle called by others the *ſphincter vaginæ*: by ſome the *orbicularis pudendi*, and the *inferior cutoridis muſculus*.

Constrictor *Labiorum*, called alſo *orbicularis*, becauſe it's fibres are of an arched figure, is a muſcle which conſtitutes the very ſubſtance of the lips, and draws them up as in kiſſing; whence it it is alſo called *baſiator* and *oſculatorius*.

CONSTRUCTION, in geometry, the art or manner of drawing or deſcribing a figure, ſcheme, the lines of a problem, or the like. The equality of the lines of ſuch a triangle, &c. is demonſtrated from their conſtruction.

Construction *of Equations*, is the method of reducing a known equation into lines and figures; whereby the truth of the rule, canon, or equation, may be demonſtrated geometrically.

The method of conſtructing equations is different, according to the diverſity of equations. See Syſtem of Algebra, Sect. VI.

Construction, in grammar, ſyntax; or the arranging and connecting the words of a ſentence, according to the rules of the language.

The conſtruction is generally more ſimple, eaſy, and direct in the modern tongues than in the ancient: we have very few of thoſe inverſions which occaſion ſo much embarraſſment and obſcurity in the Latin; our thoughts are uſually delivered in the ſame order wherein the imagination conceives them; the nominative caſe, for inſtance, always precedes the verb, and the verb goes before the oblique caſes it governs.

Conſtruction is either ſimple or figurative. Simple, is that wherein all the terms or parts of the diſcourſe, are placed in their natural order.

Figurative conſtruction, is that wherein we recede from this ſimplicity, and uſe certain expreſſions, ſhorter, and more elegant than nature affords.

The ſyntax, or conſtruction of words, is diſtinguiſhed into two parts, concord, and government or regimen.

CONSUALIA, in antiquity, feaſts which were held among the ancients, in honour of the god Conſus, i. e. Neptune; different from thoſe other feaſts of the ſame deity called Neptunalia.

CONSUBSTANTIAL, in theology, a term of like import with co-eſſential; denoting ſomething of the ſame ſubſtance with another.

The orthodox believe the Son of God to be conſubſtantial with the Father.

The term ομοουσιος, *conſubſtantial*, was firſt adopted by the fathers of the councils of Antioch and Nice, to expreſs the orthodox doctrine the more preciſely, and to ſerve as a barrier and precaution againſt the errors and ſubtilties of the Arians; who owned every thing excepting the conſubſtantiality.

CONSUBSTANTIATION, a tenet of the Lutheran church with regard to the manner of the change made in the bread and wine in the euchariſt.

The divines of that profeſſion maintain, that, after conſecration, the body and blood of our Saviour are ſubſtantially preſent, together with the ſubſtance of the bread and wine: which is called conſubſtantiation, or impanation.

CONSUL, the chief magiſtrate of the Roman commonwealth.

After the Romans had expelled their kings, they were governed by two conſuls, eſtabliſhed in the year of Rome 245, having their name *à conſulendo*. Brutus and Collatinus were the firſt elected by an aſſembly of the people: their office was to hold a year; and if either of them died in the courſe of the year of their conſulate, a new one was to be elected. They were the head of the ſenate; they commanded the armies of the republic, and were ſupreme judges of the differences between the citizens. But as they had made ſome abuſe of this power, it was allowed, by the Valerian law, for the party aggrieved to appeal from the tribunal to the people; eſpecially in caſes where the life of a Roman citizen was concerned.

Conſuls were continued under the emperors, after the republic was deſtroyed; but conſul was here little more than an honourable title; which, however, the people were fond of keeping up; as eſteeming it ſome remains of their ancient liberty. It dwindled for a long time; and, at laſt, became abſolutely extinct in the time of Juſtinian.

From the eſtabliſhment of the republic, and the conſulate under L. Jun. Brutus, and L. Tarq. Collantinus, to the conſulate of Baſil, that is, from the year of Rome 244, to the year of Rome 1294, the ſpace of 1049 years, the years were accounted by the conſuls; but after that period the time was computed by the years of the emperors reigns, and the indictions.

In the middle age, we find the word *conſul* uſed for *comes*, count, and *proconſul*, for viſcount; as is obſerved by Spelman, and De Marca.

And thus *conſul*, in our law books, ſignifies an earl. Bract. lib. i. cap. 8. tells us, that as *comes* is derived from *comitatu*, ſo *conſul* is derived from *conſulendo*: and in the laws of Edward the Confeſſor, mention is made of *vicecomites*, and *viceconſules*.

Consul, at preſent, is an officer eſtabliſhed by virtue of a commiſſion from the king, and other princes, in the ports and factories of the Levant, on the coaſts of Africa, Barbary, Spain, and other foreign countries of any conſiderable trade; to facilitate and diſpatch buſineſs, and protect the merchants of the nation.

The conſuls are to keep up a correſpondence with the miniſters of England reſiding in the courts whereon their conſulates depend. Their buſineſs is, to ſupport the commerce and intereſt of the nation; to diſpoſe of the ſums given, and the preſents made, to the lords and principals of places: to obtain their protection, and prevent the inſults of the natives on the merchants of the nation. There are alſo conſuls of other nations eſtabliſhed in the Levant, eſpecially French and Dutch.

CONSULTATION, the act of taking the advice of one or more perſons; an aſſembly of ſeveral perſons meeting together to give their opinions on any ſubject. In medicine, applied to the calling in two or more perſons to conſider the diſtemper of a perſon, where a ſingle practitioner is dubious of his own abilities and experience; a council.

CONSUMMATION, the end, period, or completion, of any work. Thus, we ſay, the conſummation of all things: meaning the end of the world. By the incarnation, all the prophecies are to be conſummated. Conſummation of marriage denotes the laſt act of marriage, which makes its accompliſhment, or the moſt intimate union between the married pair.

CONSUMPTION, in medicine, a word of very extenſive ſignification, implies all diſorders that bring any decay or waſte upon the conſtitution; but is moſt commonly uſed for the *phthiſis pulmonaſis*. For the ſymptoms and methods of cure, ſee Syſtem of Medicine.

Consumption is alſo a diſeaſe incident to horſes, conſiſting of a waſte of muſcular fleſh, attended with a ſlow fever. See Farriery.

CONTACT, is when one line, plane, or body, is made to touch another; and the parts that do thus touch are called the *points* or *places of contact*.

CONTAGION, inſection, or the communicating, or transferring a diſeaſe from one body to another.

Contagion, in ſome diſeaſes, is only effected by an immediate contact, or touch: as the madneſs of a dog, which is communicated by biting; and the poiſon of the pox, which is tranſmitted from the infected perſon in the act of copulation. In others it is conveyed by infected cloaths; as the itch. In others the contagion is tranſmitted through the air to a great diſtance, by means of ſteams or effluvia, exhaling from the ſick; as in the plague, and other peſtilential diſtempers: in which caſe, the air is even ſaid to be contagious, that is, full of contagious particles.

In viſiting an infected patient's apartment, great care is to be taken never to eat or drink there, nor to ſwallow ſpittle; and it is no idle cuſtom in thoſe who are continually in the infected room to chew zedoary, myrrh, angelica, cinnamon, or the like warm and aromatic drugs; for all theſe things promote a plentiful diſcharge of ſaliva from the mouth, which it is certain when ſwallowed, cannot but often carry peſtilential particles down with it into the ſtomach, whence they will eaſily find their way into the blood.

After returning from a viſit of this kind, it is always proper to waſh the hands and mouth with vinegar and water; to change cloaths, and expoſe them in the air; then to drink ſome warm liquor, as tea of ſcordium, ſage, or other herbs of that kind, or, in their place, coffee; for this opens the pores; and if any ſmall quantity of the peſtilential virus ſhould have mixed itſelf with the blood, expels it by a gentle perſpiration. It may be alſo of great aſſiſtance to all about the ſick, for preventing them from being infected, to hold frequently ſpunges dipt in vinegar to their noſes, and frequently to ſprinkle vinegar on a red-hot iron, in the room, to correct and mend the air, and to ſmoak tobacco.

CONTEMPLATION, an act of the mind, whereby it applies itſelf to conſider, reflect on, and admire, the wonderful works of God, nature, &c.

CONTEMPORARY, or Cotemporary, a perſon, or thing, of the ſame time, or that exiſted in the ſame age with another. Socrates, Plato, and Ariſtophanes, were contemporaries: the beſt hiſtories are thoſe of contemporary authors.

CONTEMPT, in a general ſenſe, the act of looking on a thing as an object worthy of ſcorn, and, on account of its meanneſs, unfit for approbation; the ſtate of being deſpiſed.

Contempt, in law, is diſobedience to the rules and orders of a court, which hath power to puniſh ſuch offence; and a man may be impriſoned for a contempt done in court, and not for a contempt out of court, or for private abuſe. Cro. Eliz. 689.

CONTENTMENT, in a general ſenſe, a full ſatisfaction in preſent enjoyment, without a wiſh for more; pleaſure; gratification; or delight.

CONTENT, in mathematics, a term frequently uſed for the capacity of a veſſel, or the area of ſpace; or the quantity of any matter, or ſpace, included in certain bounds. The content of a tun of round timber is 43 ſolid feet.

CONTESTATIO *Litis*, among civilians, denotes a general aſſertion that the plaintiff hath no ground of action, which aſſertion is afterwards extended and maintained in his plea.

CONTEXT, among divines and critics, that part of ſcripture, or other writing, which lies about the text, before or after it, or both. To take the full and genuine ſenſe of the text, the context ſhould be regarded.

CONTEXTURE, a word frequently uſed in ſpeaking both of the works of nature and art; and denoting the diſpoſition and union of the conſtituent parts with reſpect to one another.

CONTIGUOUS, a relative term, underſtood of things diſpoſed ſo near each other that they join their ſurfaces, or touch.

CONTINENCE, in ethics, a moral virtue, by which we reſiſt concupiſcence. It ſhould ſeem that there is this diſtinction between chaſtity and continence, in that it requires no effort to be chaſte, which reſults from conſtitution; whereas continence appears to be the conſequence of victory gained over ourſelves.

CONTINENT, in general, given to things continued without interruption; in which ſenſe we ſay, continent fever, &c.

Continent, in geography, a terra firma, main land, or a large extent of country, not interrupted by ſeas: ſo called in oppoſition to iſland, peninſula, &c.

The world is ordinarily divided into two grand continents; the old and the new; the old comprehends Europe, Aſia, and Africa; the new the two Americans, north and ſouth.

CONTINGENT, ſomething caſual, uncertain, or dependent upon chance.

Contingent denotes a conditional event which may, or may not, happen, according as circumſtances fall out.

Contingent is a term of relation for the quota that falls to any perſon upon a diviſion.

Each prince of Germany, in time of war, is to furniſh ſo many men, ſo much money and ammunition, for his contingent. By the treaty of Hanover it is ſtipulated, that in caſe of a rupture with the emperor, the kings of Great Britain and Pruſſia may furniſh their contingents, as fiefs of the empire, at the ſame time they are at war therewith.

CONTINUANCE, an uninterrupted ſucceſſion, habit, or repeated act of the ſame kind; abode or dwelling for ſome time in the ſame place; duration; proceſs of time; perſeverance.

CONTINUED, in a general ſenſe, means inceſſant, or proceeding without interruption.

Continued *Fever*, is ſuch a one as ſometimes remits, but never intermits or goes entirely off till its period.

Continued *Proportion*, in arithmetic, is that were the conſequent of the firſt ratio is the ſame with the antecedent of the ſecond; as 4 : 8 : : 8 : 16; in contradiſtinction to diſcrete proportion.

CONTINUITY is uſually defined among ſchoolmen, the immediate coheſion of parts in the ſame *quantum*. Others define it, a mode of body, whereby its extremes become one: and others, a ſtate of body reſulting from the mutual implication of its parts.

There are two kinds of continuity, mathematical, and phyſical. The firſt is merely imaginary and fictitious; ſince it ſuppoſes real or phyſical parts where there are none.

Phyſical continuity is ſtrictly, that ſtate of two or more parts, or particles, wherein they appear to adhere, or conſtitute one uninterrupted quantity, or continuum.

CONTORSION, the action of twiſting, or wreſting a member of the body out of its natural ſituation.

Rope dancers accuſtom themſelves to contorſions of their limbs from their youth, to render the fibres of their articulations lax and ſimple, for all kinds of poſtures.

Contorsion, in medicine, has many ſignifications. Firſt, the iliac paſſion is thus called; ſecondly, an incomplete diſlocation is thus named, when a bone is partly forced from its articulation; thirdly, a diſlocation of the vertebræ of the back ſideways, or crookedneſs of theſe vertebræ, are called contorſions of them: fourthly, a diſorder of the head is thus called, in which it is drawn towards one ſide, either by a ſpaſmodic contraction of the muſcles on the ſame ſide, or a palſy of their antagoniſt muſcles on the other. James's Med. Dict.

CONTOUR, or Outline, that which terminates and defines a figure. A great part of the ſkill of the painter conſiſts in managing the contours.

CONTOURNE, in heraldry, is uſed when beaſts are repreſented ſtanding, or running, with their faces to the ſiniſter ſide of the eſcutcheon; they being always ſuppoſed to look to the dexter ſide, unleſs it be otherwiſe expreſſed.

CONTRA, uſed in commerce, to ſignify the ſide of an account contrary to the debt; that is the credit ſide. In compoſition, it ſignifies contrary or againſt.

CONTRABAND, in commerce, a prohibited commodity; or, a merchandize bought or ſold, imported or exported, in prejudice, and contrary to the laws and ordinances of a ſtate, or the public prohibitions of the ſovereign.

The word comes from the Italian *contrabando*, of *contra* and *bando*, q. d. contrary to edict, or publication of prohibition.

Contraband goods are not only liable to confiſcations themſelves, but do alſo ſubject all other allowed merchandizes found with them in the ſame box, parcel, or bale, together with the horſes, waggons, &c. which conduct them to the ſame.

CONTRACT, in a general ſenſe, a mutual conſent of two or more parties, who voluntarily promiſe and oblige themſelves to do ſomething, pay a certain ſum, or the like. All donations, exchanges, leaſes, &c. are ſo many different contracts.

CONTRACTILE *Force*, that property, or power, inherent in certain bodies, whereby, when extended, they are enabled to draw themſelves up again to their former dimenſions.

CONTRACTION, the act of ſhortening a writing, or reducing the ſubſtance of it to leſs compaſs; the act of ſhrinking or decreaſing in magnitude or dimenſions; the ſtate of a thing ſhrunk, ſhriveled, or drawn into a narrower compaſs. In grammar, the reducing two ſyllables or vowels into one, as *can't* for *cannot*.

CONTRADICTION, a ſpecies of direct oppoſition, wherein one thing is found diametrically oppoſite to another.

CONTRADICTORY *Propoſitions*, are oppoſites, one of which imports a meer and naked denial of the other.

CONTRA-FISSURE, in ſurgery, a term applied to that ſpecies of fractures, or fiſſure, in the ſkull, where the ſide, oppoſite to that where the blow was received, is cracked.

CONTRAMURE, in fortification, an outwall, built about the main wall of a city. See Rampart.

CONTRARIETY, an oppoſition between two things, which imports their being contrary to one another; and conſiſts in this, that one of the terms implies a negation of the other, either mediately or immediately; ſo that contrariety may be ſaid to be the contraſt, or oppoſition of two things, one of which imports the abſence of the other, as love and hatred.

CONTRARY, a thing which has qualities oppoſite to thoſe of another; a propoſition or truth oppoſite to another. On the contrary, borrowed from the commercial phraſe *per contra*, ſigniſies on the oppoſite ſide; or in oppoſition to ſome thing which has been alledged or offered. To the contrary, to an intention or purpoſe quite contrary; againſt; or in oppoſition to the performance of any action. "They did it, notwithſtanding all I could ſay to the contrary."

CONTRAST, in painting and ſculpture, an oppoſition or difference between the poſition, attitude, &c. of any two figures, or the lines which form objects, by means whereof they cauſe a variety, and tend to ſet off each other. In architecture, the avoiding of the repetition of the ſame thing in order to pleaſe by variety; as in the gallery of the Louvre, the pediments are alternately arched and angular.

CONTRAVENTION, in law, a man's failing to diſcharge his word, obligation, duty, or the laws or cuſtoms of the place.

CONTRAYERVA, in botany. See DORSTENIA.

CONTRE, in heraldry, an appellation given to ſeveral bearings, on account of their cutting the ſhield contrary and oppoſite ways: thus we meet with contre-bend, contre-chevron, contre-pale, &c. when there are two ordinaries of the ſame nature oppoſite to each other, ſo as colour may be oppoſed to metal, and metal to colour. See Syſtem of HERALDRY.

CONTRIBUTION, the payment of each perſon's quota, or the part he is to bear in ſome impoſition, or common expence. Contributions are either involuntary, as thoſe of taxes and impoſts; or voluntary, as thoſe of expences for carrying on ſome undertaking for the intereſt of the community, or individuals.

CONTRITION, in theology, expreſſes a real ſorrow, reſulting from the thought of having offended God; from the ſole conſideration of his goodneſs; without any regard to the puniſhment the ſin is entitled to.

CONTROVERSY, an oppoſition of opinions or ſentiments, generally applied to diſputes carried on with ſome warmth in writing or print; a ſuit at law, about the property of a thing; oppoſition, or ſtruggling againſt the force of a thing.

CONTUMACY, in law, a refuſal to appear in court when legally ſummoned; a diſobedience to the rules and orders of a court, having power to puniſh ſuch offence.

In a criminal ſenſe, the contumacious is condemned, not becauſe the crime is proved on him, but becauſe he is abſent.

In England, contumacy is to be proſecuted to outlawry. In France, all contumacies are annulled, if the accuſed make his appearance in five years: if he die in that time, his relations are allowed to purge his memory.

CONTUSION, bruiſe, in ſurgery, a ſolution of continuity, either in fleſh or bone, occaſioned by a fall, a blow, or a violent preſſure, whereby the fleſh is damaged, but without any external rupture, or any manifeſt loſs of ſubſtance; and effuſion of blood enſues, from ſeveral little broken veſſels, ſo as to diſcolour the ſkin, though it doth not make its way through the pores. See Syſtem of SURGERY.

CONVALESCENCE, in medicine, the inſenſible recovery of health; or that ſtate in which after the cure of a diſorder, the body, which has been reduced, has not yet regained its vigour, but begins to reſume its powers, as in the caſe of his preſent Majeſty, after his late indiſpoſition.

CONVENT, an aſſembly of perſons, dedicating themſelves entirely to the ſervice of religion, and without any commerce with the world; the place inhabited by the religious of either ſex.

The word comes from the Latin *conventus*, meeting, of *convenire*, to come together.

CONVENTICLE, an aſſembly: figuratively, a place of worſhip, generally applied, by warm churchmen, to the meetings of non-conformiſts, by way of reproach; a ſecret aſſembly for the contrivance of ſome plot, or crime. "Myſelf had notice of your conventicles." By 22 Car. II. cap. 1. it is enacted, that if any perſons of the age of ſixteen years, ſubjects of this kingdom, ſhall be preſent at any conventicle, where there are five or more aſſembled, they ſhall be fined 5s. for the firſt offence, and 10s. for the ſecond; and perſons preaching incur a penalty of 20l. Alſo ſuffering a meeting to be held in a houſe, &c. is liable to 20l. penalty. Juſtices of peace have power to enter ſuch houſes, and ſeize perſons aſſembled, &c. And if they neglect their duty, they ſhall forfeit 100 l. And if any conſtable, &c. know of ſuch meetings, and do not inform a juſtice of peace, or chief magiſtrate, &c. he ſhall forfeit 5l. But the 1ſt W. and M. cap. 18. ordains, that proteſtant diſſenters ſhall be exempted from penalties; though if they meet in a houſe with the doors locked, barred, or bolted, ſuch diſſenters ſhall have no benefit from 1 W. and M. Officers of the government, &c. preſent at any conventicle, at which there ſhall be ten perſons, if the royal family be not prayed for in expreſs words, ſhall forfeit 40 l. and be diſabled. Stat. 10 Anne, cap. 2.

CONVENTION, in our law books, is uſed when a parliament is called, which ſits and is diſſolved without any act paſſed or judgment given. It is then ſaid not to be a ſeſſion of parliament, but a convention.

CONVENTION *of Rouen*, the ſame with Burſe of Rouen.

CONVENTION, a treaty, contract, or agreement, between two or more parties.

CONVENTION is much uſed both in ancient and modern pleadings for an agreement, or covenant.

In the book of rolls of the manor of Hatfield in Yorkſhire, we have a ſingular record of a pleaſant convention, anno 11, Edward III. between Robert de Roderham and John de Ithen; the latter of whom ſold the devil in a ſtring for three-pence halfpenny to the former, to be delivered on the fourth day after the convention: when the purchaſer, making his demand, the ſeller refuſed to give him livery; to the great loſs (as the record repreſents it), of forty ſhillings to the purchaſer, &c. But it appearing to the court, that ſuch a plea does not lie among Chriſtians, the parties were adjourned to hell for judgment.

CONVENTION is alſo the name given to an exraordinary aſſembly of parliament, or of the ſtates of the realm, held without the king's writ. Of this kind was the convention parliament which reſtored Charles II. This parliament met above a month before his return, and ſat full ſeven months after his reſtoration, and enacted ſeveral laws ſtill in force, which were confirmed by Stat. 13 Car. II. c. 7. and c. 14.

The convention of eſtates, who, upon the retreat of king James II. came to a concluſion that he had abdicated the throne, and that the right of ſucceſſion devolved to king William and queen Mary; whereupon their aſſembly expired as a convention, and was converted into a parliament, notwithſtanding the writs and other defects of form. There was a convention of the like kind in Scotland, and with the like effect.

CONVENTUAL, ſomething belonging to a convent or monaſtery; and is particularly uſed for a religious who actually reſide in a convent; in contradiſtinction to thoſe who are only gueſts, or are entertained there, or in poſſeſſion of benefices depending on the houſe.

CONVERGING, or CONVERGENT *Lines*, in geometry, are ſuch as continually approach nearer one another, or whoſe diſtances become ſtill leſs and leſs. Theſe are oppoſed to divergent lines, the diſtances of which become continually greater: thoſe lines which converge one way, diverge the other.

CONVERGING *Rays*, in dioptrics, thoſe rays that iſſuing from divers points of an object, incline towards another, till, at laſt, they meet and croſs, and become diverging rays.

CONVERSATION, DISCOURSE; theſe two words denote an interlocution between two, or among more perſons: with this diſtinction, that the converſation is uſed for any general intercourſe of ſentiments whatever; whereas a diſcourſe means a converſation limited to ſome particular ſubject. Thus we ſay, a *converſable* man; meaning a man able to converſe on a variety of ſubjects, or a man of general knowledge; but we do not ſay, a *diſcourſable* man. The word *diſcourſe* is generally uſed when we mention a ſuperior talking to an inferior.

CONVERSE, in geometry. One propoſition is called the *converſe* of another, when, after a concluſion is drawn from ſomething ſuppoſed in the *converſe* propoſition, that concluſion is ſuppoſed; and then, that which in the other was ſuppoſed, is now drawn as a concluſion from it: thus, when two ſides of a triangle are equal, the angles under theſe ſides are equal; and, on the *converſe*, if theſe angles are equal, the two ſides are equal.

CONVERSION, in a moral ſenſe, implies a repentance for a temper and conduct unworthy our nature, and unbecoming our obligations to its author, and a reſolution to act a wiſer and a better part for the future.

CONVERSION, in war, a military motion whereby the front of a battalion is turned where the flank was, in caſe the battalion is attacked in the flank.

CONVERSION *of Equations*, the ſame with reduction of equations by multiplication. See ALGEBRA, Art. XVIII.

CONVERSION, *Converſio*, in logic, a circumſtance or affection of propoſitions, wherein the order of the terms, or extremes, is changed; ſo that the ſubject comes into the place of the predicate, and the predicate into that of the ſubject; without any alteration in the quality of either.

As, *No virtue is vice*; *No vice is virtue*; in which we ſee the ſubject of the former, made the predicate of the latter, and the predicate the ſubject; yet both true.

Converſion is uſually defined a due change of the order of the extremes, under ſuch a habitude and coherence with reſpect to each other, that the one is rightly inferred from the other.

CONVERT, a perſon who has undergone a converſion.

CONVERT is chiefly uſed in reſpect of changes from one religion, or religious ſect, to another.

Converts with relation to the religion turned to, are denominated apoſtates with regard to that they have relinquiſhed.

The Jews formerly converted to Chriſtianity in England, were called *converſos*. Henry III. built them a houſe in London, and allowed them a competent ſubſiſtence for their lives; which houſe was called *domus converſorum*. But the number afterwards increaſing, they grew a burthen to the crown; upon which they were diſtributed among the monaſteries: and after the expulſion of the Jews under Edward III. the *domus converſorum* was given for keeping the rolls.

CONVERTIBILITY *of Spirits* into one another. See SPIRITS.

CONVEX, bending down on every ſide, as the outſide of a globular body.

CONVEXITY, the exterior ſurface of a convex, i. e. gibbous and globular thing; in oppoſition to concavity, or the inner ſurface, when hollow or depreſſed. The word is of particular import in catoptrics, and dioptrics; where it is applied to mirrors and lenſes. A convex mirror repreſents its images ſmaller than the objects; as a concave one repreſents them larger: a convex mirror reflects the rays from it, diverging; and therefore diſperſes and weakens their effect: as a concave one reflects them converging, ſo as they concur in a point, and have their effect increaſed. See Syſtem of Optics.

CONVEYANCE, in a general ſenſe, the act of moving a thing from one place to another. Figuratively, the means or inſtruments by which any thing is introduced from one place to another.

Conveyance, in law, a deed, or inſtrument, by which lands, &c. are conveyed, or transferred by the proprietor, or owner thereof, to ſome other perſon. The moſt uſual conveyances are deeds of gift, bargain and ſale, leaſe and releaſe, fines and recoveries, &c. The words give and grant are neceſſary in a conveyance at common law: but though ſome maintain that conveyances ſhall operate according to the words; yet, of late, the judges have a greater regard to the paſſing of the eſtate, than to the manner in which it is paſſed. See Law.

CONVICT, in common law, a perſon that is found guilty of an offence, by the verdict of a jury.

CONVICTION, in theology, expreſſes the firſt degree of repentance, wherein the ſinner becomes ſenſible of his guilt, of the evil nature of ſin, and of the danger of his own ways.

Conviction, in law, when a jury has given a verdict upon trial, finding the priſoner guilty, he is ſaid to be convicted of the crime whereof he ſtands indicted.

CONULUS, in natural hiſtory, the name of a genus of the echinodermata, of the general claſs of the fibulæ. Theſe are raiſed from a circular baſe into a taller and more pointed, or a ſhorter and more obtuſe cone. The echinitæ of this genus have been called by authors, ſcolopendritæ, and by ſome bufonitæ; and are generally known in Engliſh by the name of cap-ſtones.

CONVOCATION, an aſſembly of the clergy of England, by their repreſentatives to conſult of eccleſiaſtical matters. The convocation is ſummoned by the king's writ, directed to the archbiſhop of each province, requiring him to ſummon all biſhops, deans, archdeacons, &c. The power of the convocation is limited by a ſtatute of Henry VIII. They are not to make any canons or eccleſiaſtical laws, without the king's licence; nor, when permitted to make any, can they put them in execution, but under ſeveral reſtrictions. They have the examining and cenſuring all heretical and ſchiſmatical books and perſons, &c.; but there lies an appeal to the king in chancery, or to his delegates. The clergy that form the convocation, and their ſervants, have the ſame privileges as members of parliament.

CONVOLVULUS, bindweed, in botany, a genus of the pentandria monogynia claſs. There are thirty-two ſpecies, natives of various parts of the world.

CONVOLUTION, a winding or turning motion, proper to the trunks of ſome plants; as the convolvulæ, or bindweeds, and the claſpers of vines, and briony.

CONVOY, in military affairs, a body of forces, that guard any ſupply of men, money, ammunition, or proviſions, conveyed by land into a town, army, or the like, in time of war.

Convoy, in naval affairs, any fleet or navy of merchant ſhips bound on a voyage to ſome particular part, or place of rendezvous; or, more particularly, the ſhip or ſhips appointed to conduct and defend them on their paſſage thither.

CONVULSION, from *convello, to draw together*, ſpaſmus, in medicine, a præternatural and violent contraction of the membranous and muſcular parts, ariſing from a ſpaſmodic ſtricture of the membranes ſurrounding the ſpinal marrow, and the nerves diſtributed from it, and an impetuous influx of the nervous fluid into the organs of motion. For the ſymptoms and cure, ſee Syſtem of Medicine.

CONVULSIVE, in medicine, a term applied to thoſe motions which naturally ſhould depend on the will, but are produced involuntarily by ſome external cauſe, as a contraction of the muſcles, &c.

Convulsive alſo denotes any thing that occaſions a convulſion. Children are very liable to convulſive diſorders from various cauſes, as repletion, curdling of the blood in the ſtomach or inteſtines, worms, dentition, &c.

COOK, in ichthyology, a ſpecies of fiſh, which is ſometimes taken in great plenty on the coaſt of Cornwall. It is a ſcaly fiſh, and does not grow to any great ſize; the back is purple, the belly yellow, and the tail rounded.

Cook *Room*, in a ſhip, is where the cook and his mate dreſs and deliver out the meat, &c. See Naval Architecture.

COOLER, among brewers, diſtillers, &c. a large veſſel, uſually of ſmall depth and large ſurface, in which liquors are cooled, after having been boiled.

Coolers, in phyſic, are thoſe medicines which affect the organs of feeling with an intermediate ſenſe of coldneſs, or by a particular viſcidity or groſſneſs of parts, give the animal fluids a greater conſiſtency, and conſequently retard their motion. Cucumbers, melons, and all ſubſtances producing viſcidity, are of this kind.

COOMB, or **Comb**, *of Corn*, a dry meaſure containing four buſhels, or half a quarter.

COOP, the name of a pen, or encloſed place, where lambs, poultry, &c. are ſhut up in order to be fed.

COOPER, a perſon that looks to the caſks and all other veſſels, for beer, water, or any other liquor.

CO-ORDINATE, ſomething of equal order, rank, or degree, with another.

CO-ORDINATION, in reſpect of cauſes, denotes an order of cauſes, wherein ſeveral of the ſame kind, order, and tendency, concur to the production of the ſame effect.

COOT, fulica, in ornithology, the name of a diſtinct genus of birds of the order of the grallæ, the diſtinguiſhing character of which is, that the beak is convex, the thighs are half naked, the noſtrils oblong, and the forehead wholly naked.

The fulica is a water fowl diſtinguiſhed from the moor-hen kind, by having its toes widened by a membrane, though not joined together by it, or webbed like the ducks. Of this there are ſeveral ſpecies; thoſe moſt known with us are, the common *coot*, and a larger kind called *macroule*, or *diable de mer*, the ſea devil. The common *coot* is a conſiderably large bird, weighing uſually a pound and a half; its moſt obvious diſtinction is, that it has from the beak to the crown of the head, a fleſhy excreſcence, which is roundiſh, ſoft, and ſmooth, and is always naked or deſtitute of feathers; and hence the bird is commonly called with us, the bald *coot*.

COPAIBA, or *Balſam of* Copaiba, a liquid reſinous juice, flowing from inciſions made in the trunk of the fera, a large tree which grows in the Spaniſh Weſt Indies; and is uſed as a corroborating and detergent medicine.

COPAL, improperly called *gum copal*, is a gum of the reſinous kind brought from New Spain. It is the concrete juice of a tree which grows in theſe parts; and comes to us in irregular maſſes. Copal itſelf is ſoluble in the eſſential oils, particularly in that of lavender, but not eaſily in the expreſſed ones. It may, however, be diſſolved in linſeed oil by digeſtion, with a heat very little leſs than is ſufficient to boil or decompoſe the oil. This ſolution, diluted with ſpirit of turpentine, forms a beautiful tranſparent varniſh, which when properly applied, and ſlowly dried, is very hard and durable. This varniſh is applied to ſnuff boxes, tea boards, and other utenſils. It preſerves and gives luſtre to paintings, and greatly reſtores the decayed colours of old pictures, by filling up the cracks and rendering the ſurfaces capable of reflecting light more uniformly.

COPE, an eccleſiaſtical ornament, uſually worn by chantors and ſub-chantors, when they officiate in the church ſolemnity. It is alſo worn by the Romiſh biſhops, and other ordinaries: it reaches from the ſhoulders to the feet. The ancients called it pluviale.

COPERNICAN *Syſtem*, is that ſyſtem of the world, wherein the ſun is ſuppoſed at reſt in the centre; and the planets with the earth, to move in ellipſes round it. The heavens and ſtars are here ſuppoſed at reſt; and that diurnal motion which they appear to have from eaſt to weſt, is imputed to the earth's motion from weſt to eaſt. This ſyſtem was aſſerted by many of the ancients; and particularly Eophantus, Seleucus, Ariſtarchus, Philolacus, Cleanthes Samius, Nicetas, Heraclides Ponticus, Plato, and Pythagoras, from the laſt of whom it was anciently denominated the Pythagoric ſyſtem. It was alſo held by Archimedes, in his book De Granorum Arenæ Numero; but after him it became neglected, and even forgotten, for many ages; till about three hundred years ago, when Copernicus revived it; from whom it took the new name of the Copernican ſyſtem. For a further account, ſee the Solar ſyſtem, Sect. II. in the Syſtem of Astronomy.

COPERNICUS is the name of an aſtronomical inſtrument, contrived, by Mr. Whiſton, for the calculation and exhibition of eclipſes, and of the motions of the planets, both the primary and ſecondary ones, &c. It was ſo called by the inventor, as being built on the Copernican ſyſtem. The inſtrument not being very common, a particular deſcription would be ſuperfluous. The author of it has written a book to explain it.

COPHTI, **Cophts**, or **Copti**, a name given to the chriſtians, who were of the ſect of Jacobites. The cophts have a patriarch, who is ſtyled the patriarch of Alexandria, having 11 or 12 biſhops under him, but no archbiſhop. The reſt of the clergy, whether ſecular or regular, are of the order of St. Anthony, St. Paul, and St. Macarius, each of whom have their monaſteries. The cophts have ſeven ſacraments, viz. baptiſm, the euchariſt, confirmation, ordination, faith, faſting and prayer.

COPHTIC, or **Coptic** *Language*, is that ſpoken by the Cophts, being the ancient language of the Egyptians, intermixed with the Greek, and the characters of it being thoſe of the Greek. The ancient Coptic is now a dead language, to be met with no where but in books, and thoſe only tranſlations of the ſcriptures, and of eccleſiaſtical offices, or others that have a relation thereto; the language now uſed over all the country being that of the Arabic.

COPING *of a Wall*, the top or cover of a wall, made ſloping to carry off the water. In carpentry, a ſort of hanging over, not ſquare to its upright, but bevelling on its under ſide till it end in an edge.

COPIST, in diplomatic ſcience, ſignifies a tranſcriber or copier of deeds, books, &c.

COPPER, a hard, heavy, ductile, imperfect metal; found in mines, in ſeveral parts of Europe, but moſt abundantly in Sweden.

It is the lighteſt of all metals except iron and tin; and more ſimple in its nature than iron, though greatly leſs ſo than gold or ſilver. It is, next after iron, the hardeſt metal. It communicates that quality to gold and ſilver which greatly want it, with which it readily mixes in fuſion, and is the beſt alloy for both. It is malleable much more eaſily than iron, though not ſo readily as any of the other metals. In its natural ſtate we ſee it drawn out into extremely fine wire, and in the form of braſs, in which it is only altered in colour by an admixture of a ſemi-metal called zinc; it is beaten into leaves, which, though not ſo thin as thoſe of gold, ſerve for many purpoſes in their ſtead.

It requires a very conſiderable degree of fire to melt it, leſs indeed than iron, but much greater than that required for the fuſion of any of the other metals: on this is founded that eaſy practice of ſeparating all the other metals, except iron, from copper, by what is called eliquation: for, if the fire be kept up juſt under the degree neceſſary to melt a plate of copper, every other metal will be perfectly ſeparated from it, if iron be not there. Copper grows red-hot before it melts, and, when in a ſtate of fuſion, is deſtructive to every body near, if but the leaſt quantity of water be in the way of its courſe; for a ſingle drop will ſcatter a vaſt quantity of melted copper like ſhot from a gun. It amalgamates with mercury, but not without conſiderable difficulty: melted with antimony, it readily runs into ſcoria, or vitrifies: and the ſame effect is produced, though not ſo ſuddenly, on fuſing it with iron.

The extreme diviſibility of this metal almoſt exceeds imagination. Mr. Boyle obſerves, that a grain of it, diſſolved in an alkali, will give a ſenſible colour to more than 500000 times its weight of water. It very readily diſſolves in aqua fortis, aqua regia, ſpirit of ſalt, and in ſhort, in all the ſtronger, and even the weaker acids; the very mildeſt of the vegetable tribe being able to produce a green tincture from it, and to acquire an emetic virtue by being ſuffered to ſtand in it. The acids make a green ſolution of it; the alkalies, and particularly the volatile urinous kinds, a blue one that is equal to the fineſt colour among painters, not excepting the ultramarine.

The method of procuring the metal from the ore is this: mix one or two centers of the ore for an aſſay, beaten to a very fine powder, with ſix centres of the black flux; put the powder into a crucible, and cover it half an inch high with common ſalt; preſs the whole down with the finger, but let the capacity of the veſſel be ſuch that it may be only half full; ſhut the veſſel cloſe with a lute, and put it into the furnace. Increaſe the fire ſlowly till the common ſalt crackles; then increaſe it ſo far, that the veſſel may preſently be made red-hot, and after about a quarter of an hour's ſtanding in this heat, the metal will be ſeparated: then take out the veſſel, and ſetting it on the floor, ſtrike with a few blows of a hammer near where it ſtands, to make the metal get together at the bottom. Break the veſſel, when grown cold, in two, from top to bottom, as nearly as you can, and you will find a ſolid and malleable regulus at the bottom. Cramer's Art of Aſſaying, p. 301.

Verdigreaſe is a ruſt of copper. Becher obſerves, that the drinking of acid liquors, even out of common ſilver plate, is very unwholeſome becauſe of the mixture of copper therein; much more is it ſo out of veſſels of copper.

COPPERAS, a name given to green vitriol, particularly to vitriol of iron. See CABRUSI.

Copperas is purified and prepared in the ſame manner as alum and ſaltpetre, by paſſing through ſeveral lixiviums, till it be wholly reduced to cryſtal. There is copperas of England, of Piſa, Germany, Cyprus, Hungary, and Italy, which differ from each other in colour, richneſs, and perfection. White copperas, is a vitriol of iron, with a mixture of ſome other mineral, brought from Germany in cakes of forty or fifty pounds each; ſuch are thoſe brought from Goſlar in Saxony. The Engliſh copperas is of a fine green; that of Cyprus and Hungary is of a ſky blue, and has copper for its baſis. It is in pieces cut like the point of a diamond. That of Piſa and Italy is likewiſe green; and the laſt as tranſparent as glaſs. The Engliſh green copperas is of conſiderable uſe in many preparations, but eſpecially in dying. The hatters alſo uſe it in their dye; and this and galls are ingredients in writing ink. The ordinary Engliſh copperas is made of a kind of ſtones found on the ſea-ſhore in Eſſex, Hampſhire, and ſo weſtward, ordinarily called *gold ſtones*, from their colour, or *pyritæ:* they abound much in iron.

COPPICE, or COPSE, a little wood, conſiſting of underwoods; and ſuch as may be raiſed either by ſowing, or planting. See WOOD.

When they are intended to be raiſed from maſt or ſeed, the ground is ploughed in the ſame manner as it is for corn: and either in autumn or in ſpring, good ſtore of ſuch maſts, nuts, ſeeds, berries, &c. are to be ſown with the graſs, which crop is to be cut, and then the land laid for wood. They may alſo be planted about autumn, with young ſets, or plants, in rows about ten or fifteen feet diſtance. If the copſes happen to grow thin, the beſt way of thickening them is to lay ſome of the branches or layer of the trees, that lie neareſt to the bare places, on the ground, or a little in the ground: this detained with a hook or two, and covered with freſh mould at a competent depth, will produce a multitude of ſuckers, and thicken a copſe ſpeedily.

COPULATION, the act of generation, or the congreſs of the male and female, otherwiſe called coition. See GENERATION.

COPULATIVE *Propoſitions*, are thoſe which include ſeveral ſubjects, or ſeveral attributes joined together by an affirmative or negative conjunction. Thus, v. gr. *Power and riches do not make a man happy.* Where *and* is the conjunction that couples *power* and *riches*.

COPULATIVE *Conjunction*. See CONJUNCTION.

COPY, in law, a tranſcript of a writing or inſtrument, made for the uſe and ſatisfaction of ſome of the parties concerned; or in order to preſerve the memory thereof.

COPY is alſo uſed for an imitation of any original work; particularly a painting, draught, figure, &c.

COPY, among printers, denotes the manuſcript or original of a book given to print from. *To caſt off a copy*, is to make a computation of the number of ſheets a manuſcript will make in print. *A good copy*, in the bookſeller's ſtyle, is that which renders a book ſaleable and productive.

COPY-HOLD, is a tenure for which the tenant has nothing to ſhew but the copy of the roll made by the ſteward of the lord's court. This tenure is called a baſe tenure, becauſe the tenant holds, at the will of the lord. Fitzherbert ſays, it was formerly called tenure in villenage; and that copy-hold is but a modern name. This is the land which the Saxons called folk-land, as being held *ſine ſcripto*, in contradiſtinction to a bock-land, or charter land, *terra ex ſcripto*, and now free land, or free-hold. However, it is not ſimply at the lord's will, but according to the cuſtom of the manor; ſo that if the copy-holder doth not break that cuſtom, and forfeit his tenure, he ſeems not to ſtand at the lord's courteſy. Theſe cuſtoms are infinite; varying in one point or other almoſt in every manor. *Copy-hold land* cannot be made at this day; for the foundation of a copyhold is, that it hath been demiſed time out of mind, by copy of court-roll; and that the tenements are parcel of, or within the manor. *Copy-holders* are not allowed to vote for knights of the ſhire. 31 Geo. II. c. 14.

COPY-HOLDER, is defined by Weſt, a perſon admitted tenant of any lands, or tenements, within a manor, which, time out of mind, by the uſe and cuſtom thereof, have been deviſeable to ſuch as will take the ſame by copy of court-roll, according to the cuſtom of the ſaid manor.

COR *Caroli*, Charles's heart, in aſtronomy, an extra conſtellated ſtar in the northern hemiſphere, ſituated between Coma Berenices, and Urſa Major. It owes its appellation to Dr. Halley, who gave it the name in honour of king Charles II. who founded the royal obſervatory at Greenwich. *Cor Hydræ*, a fixed ſtar of the firſt magnitude, in the conſtellation of Hydra. *Cor Leonis*, or Regulus, in aſtronomy, a fixed ſtar of the firſt magnitude in the conſtellation Leo.

CORACIAS, in ornithology, a name given by Linnæus for the pica or pye. This bird makes, in that author's ſyſtem, a diſtinct genus; the characters of which are, that the inner tail-feathers grow gradually one longer than another. This bird is called by ſome the pyrrhocorax, and in Engliſh the Corniſh chough. It is of the ſhape of a jackdaw, but of the ſize of the common crow. Its beak is red, long, and ſomewhat hooked at the end. It frequents rocks, and ruined buildings about the ſea ſhores, and is found about the high cliffs, all along the weſtern ſhores of England. Its voice is much like that of the jackdaw, but is more hoarſe and rough. Ray's Ornithol. p. 86.

CORACO-BRACHIALIS, in anatomy, the name of a muſcle in the arm, ſerving to raiſe it upwards.

CORACOIDES, in anatomy, a ſmall ſharp proceſs of the ſcapula.

CORACOHYOIDÆUS, in anatomy, a muſcle which having its origin from the upper edge of the ſcapula, near it's neck, aſcends obliquely under the maſtoidæus, and is inſerted in the os-hyodes, which it ſerves to pull obliquely downwards.

CORACOIDES, in anatomy, a ſmall ſharp proceſs of the ſcapula, ſo called from its reſembling a crow's bill. The coracoide proceſs in infants is but a cartilage, afterwards it becomes an epiphyſis; and, after this, about the age of ſixteen, it is perceived to be a ſeparate bone. It ſerves to ſtrengthen the articulation of the ſhoulder, and gives origin to one of the muſcles of the arm.

CORALLINA, or CORAL, in zoology, a genus belonging to the order of vermes zoophyta. The trunk is radicated, jointed, and calcarious. The ſpecies are eight, diſtinguiſhed by the form of their branches, and are found in the ocean adhering to ſtones, bones, ſhells, &c. The corals were formerly believed to be vegetable ſubſtances hardened by the air; but are now known to be compoſed of congeries of animals, which are even endued with the faculty of moving ſpontaneouſly.

The iſlands in the South ſea are moſtly coral rocks covered over with earth. The little creatures, which have ſcarce ſenſation enough to diſtinguiſh them from plants, build up a rocky ſtructure from the bottom of that ſea too deep to be meaſured by human art, till it reaches the ſurface. Some of theſe coralline iſlands appear to be of a much older date than others; particularly the friendly iſlands: and it is probable that as theſe ſubmarine works are continually going on, new iſlands may by that means frequently be produced.

When coral is newly taken up out of the ſea, the ſmall protuberances on its ſurface are ſoft, and yield, on being preſſed, a milky juice which effervesces with acids. The cortical part with which the coral is all over covered is not near ſo compact as the internal, and may eaſily be taken off whilſt freſh; and from this part it is uſually freed before it comes to the market. The greateſt coral trade is in Genoa and Leghorn. The ſmall ſprigs unfit for ornamental uſes are in the ſhops levigated into a ſubtile powder; which, however, has no medicinal virtues ſuperior to the common teſtacea.

The coral inſect, or polype, M. Peyſſonnel obſerves, expands itſelf in water, and contracts itſelf in air, or when it is touched with the hand in water, or acid liquors are poured upon it: and he actually ſaw theſe inſects move their claws or legs, and expand themſelves, when the ſea water containing coral was placed near the fire, and keep themſelves in their expanded ſtate when ſeparated from the coral in boiling water. Broken branches of coral have been obſerved to faſten themſelves to other branches, and have continued to grow; and this is the caſe, when they are connected with detached pieces of rock and other ſubſtances, from which no nouriſhment could be derived.

The principles obtained from coral, by a chymical analyſis, appeared to reſemble thoſe drawn from the human ſcull, hartſhorn, and other parts of animals. See an account of a manuſcript treatiſe, entitled Traité du Corail, preſented to the Royal Society by Sieur de Peyſſonnel in 1751. Phil. Tranſ. vol. xlvii. p. 445, &c. This ſyſtem was little regarded, though firſt communicated to the academy of Sciences at Paris in 1727, till Mr. Trembley's diſcovery of the freſh water polype; but ſince that time, it has been confirmed by the obſervations of M. Bernard de Juſſieu on the ſea coaſts of Normandy, and thoſe of M. de Reaumur near Rochelle. M. Donati of Turin has alſo adopted the ſame hypotheſis, viz. that coral is a maſs of animals of the polype kind; and inſtead of repreſenting the polype-beds and cells which they contain as the work of polypes, he thinks it more juſt to ſay, that coral and other coralline bodies have the ſame relation to the polypes united to them, that there is between the ſhell of a ſnail and the ſnail itſelf; or the bones of an animal and the animal itſelf. Phil. Tranſ. vol. l. p. 58.

CORAL, *Foſſile.* It has been matter of ſurprize to naturaliſts, that as red coral is ſo common in the ſea, and is a ſubſtance of ſo firm and durable a nature, it is not frequently found among other remains of the ſea productions in the foſſile ſtate. This had long puzzled the naturaliſts, when Agoſtino Scilla attempted to account for it by ſome ſpecimens in his own cuſtody. This gentleman, living at Meſſina, had an opportunity of ſearching the quarries in the neighbourhood of thoſe ſeas, where red coral grows in abundance, and whither it might moſt eaſily be carried by any inundation. Accordingly he found, among a vaſt quantity of white coral, ſome ſpecimens, which doubtleſs had once been red; and theſe, though they had in a great meaſure loſt their colour on the outſide, yet they retain ſo much of it within, as plainly ſhewed that they had once been red; and the whole truth ſeems to conſiſt in this, that though the ſubſtance of the coral is permanent, the colour is not ſo.

Beſide the great variety of corals found in their natural ſtate, in the ſea, we find great numbers buried in the earth, and immerſed even in the bodies of ſolid ſtones, and marble; of theſe many are the ſame with the ſpecies now known to us at ſea, and many differ from all the known recent ones. The foſſile corals are found ſometimes nearly in their own natural ſtate; but much more frequently they have their pores filled up with ſtony particles, ſo as to ſeem mere ſtones. Thoſe which are not reducible to any of the known recent ſpecies, are probably, the produce of ſeas and ſhores yet unſearched.

CORALLODENDRON, *Erithrina,* coral tree, in botany, the name of a genus of trees, of the diadelphia decandria claſs of plants. There are ſix ſpecies, natives of the warm parts of America.

Theſe plants, when they produce their flower, are ſome of the greateſt ornaments of the ſtove; for their flowers are produced in large ſpikes, and are of a beautiful ſcarlet; but they do not often flower in the northern parts of Europe. The inhabitants of Malabar make ſheaths of the wood, for ſwords and knives. They uſe the ſame, together with the bark, in waſhing a ſort of garments which they call ſaraſſas; and make of the flowers, the confection caryl.

CORAM *Non Judice,* in law, is when a cauſe is brought into a court whereof the judges have no juriſdiction.

CORANA, or *Nai* CORANA, the name of a peculiar ſort of phaſeolus, or kidney bean, the down of the pod of which is the couhage, or as it is commonly called, cowitch.

CORAX, in ornithology, the trivial name of a ſpecies of corvus.

CORBELIS, in fortification, little baſkets, about a foot and a half high, eight inches wide at the bottom, and twelve at the top; which being filled with earth, are frequently ſet one againſt another upon the parapet, or elſewhere; leaving certain port-holes, from whence to fire upon the enemy under covert, without being ſeen by them.

CORBEL is uſed by ſome architects for a niche, or hollow, left in walls for images, figures, or ſtatues to ſtand in.

CORCELET, in entomology, that part of the fly claſs, which is analogous in its ſituation to the breaſt in other animals. Many have called it the breaſt in theſe alſo, but improperly; becauſe the breaſt of other animals is the place of the lungs and trachea; but theſe organs are in the fly claſs diſtributed through the whole body. The wings are affixed to this part of the fly claſs: and there are ſome diſtinctions of great conſequence in regard to the arrangement and diſtribution of thoſe animals into genera. Reaumur's Hiſt. Inſect. tom. iv. p. 126.

CORD, or CHORD, an aſſemblage of ſeveral threads of hemp, cabled or twiſted together by means of a wheel. The word comes from χορδη, which properly ſignifies an inteſtine, or gut, whereof cords may be made.

CORD *of St. Francis,* a kind of rope adorned with knots, worn by the brothers of the fraternity inſtituted in honour of that ſaint. Some, as the Cordeliers, Capuchins, Minorites, and Recolets, wear it white; others, as the Pique-puces, black. Its deſign is to commemorate the bonds wherewith Jeſus Chriſt was bound. The Society of the Cords includes a great number of people beſides religious. To obtain indulgences, they are only obliged to ſay five Paters, Ave Maries, and Gloria Patri's, and to wear this rope, which muſt have been firſt bleſſed by the ſuperiors of the order.

CORD, in geometry, muſic, &c. See CHORD and STRING.

CORDAGE, in the ſea language, is uſed in general for all the ropes and cords uſed in the rigging and fitting out of a veſſel. The word is alſo uſed for the art of preparing and manufacturing the ropes, &c.

CORDIAL, in botany, the name by which Linnæus calls a genus of plants of the pentandria monogynia claſs. There are three ſpecies; which being natives of warm countries, are too tender to live through the winter in England, unleſs preſerved in a ſtove. A ſmall piece of the wood of the tree, being put on a pan of lighted coals, will ſend forth a moſt agreeable odour, which will perfume a whole houſe. The fruit is accounted cooling and moiſtening; uſeful againſt ſharp thin defluxions upon the lungs, helping coughs and catarrhs, and taking off the heat of urine. Miller's Gard. Dict.

CORDIAL, *Cardiac,* in medicine, a comforting, or refreſhing remedy, that gives a ſudden ſtrength and chearfulneſs, by raiſing the ſpirits when depreſſed by too much exerciſe, ſome diſeaſe, or the like cauſe. In faintings, where the circulation of the blood is languid, ſal volatile oleoſum, or ſpirit of hartſhorn, dropt in cold water, and drank immediately, occaſion a contraction of the fibrillæ, the laſt by its coldneſs, and the firſt by entering the ſmall veſſels; and thus they inſtantly augment the circulation, or in other words, prove cordial.

CORDON, in fortification, a row of ſtones jutting out between the rampart and the baſis of the parapet, like the tore of a column.

CORDWAINERS, or CORDINERS, the term whereby the ſtatutes denominate ſhoe-makers. The word is formed from the French *cordonnier,* which Menage derives from *cordouan,* a kind of leather brought from Cordoua, whereof they formerly made the upper-leathers of their ſhoes. Others derive it from *corde, rope,* becauſe anciently ſhoes were made of cords; as they ſtill are in ſome parts of Spain, under the name of *alpargates.*

CORDYLUS, in zoology, the name of the ſpecies of lizard, called alſo *uromaſtyx* and *caudiverba.* It is larger than the green lizard. Its tail is rounded, and divided into a number of circles covered with ſcales, which coat them over, and cover the whole tail like the tiling of the roof of a houſe.

COREIA, in antiquity, a feſtival in honour of Proſerpine, named *Core,* Κορη, which, in the Moloſſian dialect, ſignifies a beautiful woman.

COREOPSIS, in botany, thickſeeded ſunflower; a genus of the ſyngeneſia order, belonging to the polygamia fruſtanea claſs of plants. There are 11 ſpecies, moſt of them herbaceous perennials. They are very flowery, and riſe from three to eight feet ſtature; terminated by cluſters of compound radiated flowers of a yellow colour.

CORETT, in ichthyology, the name of a large Eaſt Indian fiſh of the tunny kind, and ſuſpected to be no other than the common tunny. It grows to ſix or ſeven feet long. It is generally caught with hooks, and is a very fine taſted fiſh.

CORIANDRUM, coriander, a genus of the diagynia order, belonging to the pentandria claſs of plants. There are only two ſpecies, both of them herbaceous annuals, the leaves of which are uſeful for the kitchen, and the ſeeds for medicine. The ſeeds when freſh have a ſtrong diſagreeable ſmell, which improves by drying, and becomes ſufficiently grateful; they are recommended as carminative and ſtomachic. The leaves are ſometimes uſed for culinary purpoſes in ſoups, and as an ingredient in ſalads; but as they are of a fetid ſmell, they are held in no great eſteem in this country. It is much uſed by the brewers, both in England and Holland, to give a flavour to their ſtrongeſt beer. The ancients had a notion, that the juice of coriander would deprive people of their ſenſes, and even of life.

CORIDOR, or CORRIDOR, in fortification, a road, or way, along the edge of the ditch, without-ſide; encompaſſing the whole fortification. The word comes from the Italian *coridore*, or the Spaniſh *coridor*.

CORINDUM, or CARDIOSPERMUM, in botany. See *Heart-Pea*.

CORINTHIAN *Order*, in architecture, the fourth order. See Plate IV. in the Syſtem of ARCHITECTURE.

CORIS, in botany, heathlow pine, a genus of the monagynia order belonging to the pentandria claſs of plants, for which there is no Engliſh name. There is only one ſpecies, viz. the monſpelienſis, or blue maritime coris.

CORIZIOLA, in the materia medica, is a name given by ſome authors, particularly by Rhaſis, to the ſcammony.

CORK, or CORK-TREE, in botany, a ſpecies of the genus quercus of the poliandria order, belonging to the monoecia claſs of plants. See QUERCUS.

CORK, or CORKING *of a Saddle*, are pieces of wood upon which the bolſters are made faſt. This part of the ſaddle was formerly made of cork, whence it ſtill retains the name.

CORMORANT, a corruption of Carvorant, in ornithology, a ſpecies of the genus pelicanus, or pelican, belonging to the order of anſeres. See PELICANUS.

CORN, in agriculture, a genus of plants which produce a grain in an ear fit for bread, the ordinary food of man. Corn alſo denotes the grain or ſeed of that plant, ſeparated from the ſpica, or ear, and uſed for making bread. There are ſeveral ſpecies of corn, ſuch as wheat, rye, and barley, millet and rice, oats, maize, and lentils, peas, and a number of other kinds, each of which has its uſefulneſs and propriety. For the cultivation and management of corn, ſee Syſtem of AGRICULTURE, Sect. 3, 4, and 5.

CORN, in medicine and ſurgery, a hard tubercle like a flat wart, growing in ſeveral parts of the feet, eſpecially upon the joints of the toes.

CORNARISTS, in eccleſiaſtical hiſtory, the diſciples of Theodore Cornhert, an enthuſiaſtic ſecretary of the ſtates of Holland. He writ at the ſame time againſt the Catholics, Lutherans, and Calviniſts. He maintained that every religious communion needed reformation; but he added, that no perſon had a right to engage in accompliſhing it, without a miſſion ſupported by miracles. He was alſo of opinion, that a perſon might be a good Chriſtian, without being a member of any viſible church.

CORNEA *Tunica*, in anatomy, the ſecond coat of the eye; ſo called from its ſubſtance reſembling the horn of a lantern, in Latin *cornu*. See Syſtem of ANATOMY, Part VI. Sect. II.

CORNELIAN, or CARNELIAN, *Carneolus*, a precious ſtone. See CARNELIAN.

CORNER, an angle, or ſpace formed by the meeting of two walls. Figuratively, a ſecret or private place; the extremities. *Corner Teeth*, are thoſe which appear in a horſe when he is coming five years old.

CORNET is the name of a compound ſtop of an organ, in which five pipes are made to ſpeak at the touch of a ſingle key.

CORNET, in the military art of the moderns, the third commiſſion officer in a troop of horſe or dragoons. This is a very honourable poſt: he commands in the lieutenant's abſence; his principal duty being to carry the ſtandard near the middle of the firſt rank of the ſquadron.

CORNEUS, the name by which Linnæus calls a kind of tin ore, found in black columns, with irregular ſides, and terminating in priſms.

CORNICHE, CORNISH, or CORNICE, in architecture, the uppermoſt member of the entablature of a column; or that which crowns the order. See Syſtem of ARCHITECTURE.

CORNICHE is alſo uſed, in the general, for any little projecture, either of maſonry, or joinery; even where there are no columns. Thus, we ſay, the corniche of a chimney, a beaufet, &c.

CORNICULATE *Plants*, are ſuch as, after they have blown into flowers, produce many diſtinct and horned pods, or ſeed-veſſels, called *ſiliquæ*; for which reaſon, the plants are alſo, by ſome, denominated *ſiliquous plants*.

CORNISH *Diamond*, a name given by many people to the cryſtals found in digging the mines of tin in Cornwall.

CORNISH, or BRITISH, *Language*. Some remains of this language were met with in Cornwall, ſo lately as the year 1768. See Archæol. vol. iii.

CORNIX, in ornithology, the trivial name of a ſpecies of corvus. See CORVUS.

CORNU *Ammonis*, in natural hiſtory, foſſile ſhells, called alſo ſerpent-ſtones, or ſnake-ſtones. They are found of all ſizes, from the breadth of a ſixpence, to more than two feet in diameter; ſome of them rounded, others greatly compreſſed, and lodged in different ſtrata of ſtones and clays; ſome again are ſmooth, and others ridged in different manners, their ſtriæ and ridges being either ſtraight, irregularly crooked, or undulated. It is rough, knotty, of an aſh-colour, and twiſted in manner of a ram's horn; ſuch as thoſe wherewith the ancients repreſented Jupiter Ammon; whence its name. It is diſputed, among naturaliſts, whether it be a native foſſil, a nautilus, or a rock-plant.

Dr. Woodward aſſerts it a ſhell, and of the number of the nautili, formed in the ſea, and carried thence, by the waters of the deluge, into the countries whence it is dug. He argues, that, if it be rarely found on the ſea coaſts, it is becauſe ſhells and other bodies lying in the bottom of the ſea, as moſt kinds of the Cornua Ammonis muſt do, are only to be torn thence, and driven aſhore by tempeſts: but the moſt violent tempeſts never move the bottom of the ſea, as the divers have put paſt doubt; ſo that it is no wonder, if none of theſe cornua be thrown up: but in overturning of the earth by the deluge, theſe, with a thouſand more productions of the ſea, might be thrown from the bottom of the waters to the place where they are now found.

The Cornua Ammonis are of different thickneſſes and lengths; ſome of them weigh twenty pounds. They are found in the ſtone quarries of Bath, in Germany, and elſewhere. Phil. Tranſ. Nº 129. See SNAKE STONES.

CORNU *Cervi*, hartſhorn, in medicine, makes one of the TESTACEOUS powders. See HART'S HORN.

CORNUCOPIA, or HORN OF PLENTY, among painters, &c. is repreſented under the figure of a large horn, out of which iſſue fruits, flowers, &c. Upon medals the cornucopia is given to all deities, genii, and heroes, to mark the felicity and abundance of all the wealth procured by the goodneſs of the former, or the care and valour of the latter.

CORNUCOPIÆ, in botany, the name of one of the ſpecies of the graſs kind, which, in the Linnæan Syſtem of Botany, makes a diſtinct genus of plants, of the triandria digynia claſs.

CORNUS, CORNEL TREE, CORNELIAN CHERRY, or DOG WOOD, a genus of the monogynia order, belonging to the tetandria claſs of plants. Of this genus there are five ſpecies.

CORNUTIA, in botany, a genus of the digynia order, belonging to the triandria claſs of plants. There is but one ſpecies, viz. the pyramidata, with a blue pyramidal flower, and hoary leaves.

COROLLA, among botaniſts, the moſt conſpicuous part of a flower, ſurrounding the organs of generation, and compoſed of one or more flower leaves, moſt commoly called petals, to diſtinguiſh them from the leaves of the plant; according as are there is one, two, or three of theſe petals, the corolla is ſaid to be monopetalous, dipetalous, tripetalous, &c.

COROLLISTÆ, a name by which Linnæus diſtinguiſhes thoſe ſyſtematic botaniſts who have arranged vegetables from the regularity, figure, number, and other circumſtances, of the petals, or beautiful coloured leaves of the flower. The beſt ſyſtems of this kind are thoſe of Rivinus and Tournefort. The former proceeds upon the regularity and number of the petals; the latter, with much more certainty, on their regularity and figure.

COROLLULA, a term uſed by botaniſts to expreſs the little partial flowers which make up the compound ones.

CORONA, in anatomy, is that edge of the glans of the penis, where the perputium begins.

CORONA, in optics, ſignifies a luminous circle, generally coloured, round the ſun, moon, or largeſt planets.

CORONA *Borealis*, or *Septentrionalis*, *Northern Crown*, or *Garland*, in aſtronomy, conſtellation of the northern hemiſphere; whoſe ſtars in Ptolemy's Catalogue, in Tycho's, and in Hevelius's, are 8; in the Britannic Catalogue 21.

CORONA, among botaniſts, the name given by ſome to the circumference or margin of a radiated compound flower. It correſponds to the radius of Linnæus; and is exemplified in the flat, tongue-ſhaped petals which occupy the margin of the daiſy or ſun-flower.

CORONALE *Os*, in anatomy, the bone of the forehead; called *os frontis*, *os occipitis*, and *verecundum*.

CORONALIS, denotes the firſt ſuture of the cranium or ſkull. The coronal ſuture reaches tranſverſely from one temple to the other, and joins the *os frontis*, with the *oſſa parietalia*. It is open, the breadth of a finger or two, in the middle, in young children, but grows cloſer with age; though ſometimes by convulſion fits, or a bad conformation, it not only cloſes in children, but the edges ſhoot over one other, which is what the women call head mould ſhot; after which they ſeldom live long.

CORONARIA *Vaſa*, CORONARY *Veſſels*, the arteries and veins which ſurround the heart to nouriſh and ſupply it with blood.

CORONARIÆ, in botany, the tenth order of plants in Linnæus's fragments of a natural method. Under this name, inſtead of the more obvious one libaceæ, Linnæus collects a great number of genera, moſt of which furniſh very beautiful garden flowers, viz. albuca, cyanella, fritillaria, helonias, hyacinthus, hypoxis, lilium, melanthium, ornithogalum, ſcilla, tulipa, agave, aletris, aloe, anthericum, aſphodelus, bromelia, burmannia, hemerocallis, polianthes, tillandſia, veratrum, yucca.

CORONARY *Arteries*, are two arteries ſpringing out of the aorta, before it leaves the pericardium; and ſerving to carry the blood into the ſubſtance of the heart.

Coronary *Vein*, is a vein diffuſed over the exterior ſurface of the heart. It is formed of ſeveral branches ariſing from all parts of the viſcus, and terminates in the vena cava, whither it conveys the remains of the blood brought by the coronary arteries.

CORONE, in anatomy, a ſharp-pointed eminence, or proceſs of a bone. Of theſe there are ſeveral in the body, diſtinguiſhed, according to their figures, by different names.

CORONER, an ancient officer in this kingdom, ſo called, becauſe he hath principally to do with the pleas of the crown. They are choſen by the freeholders of the county, by virtue of a writ out of chancery; and the choice is for life, unleſs they become ſheriffs or verderors, or are diſcharged by the writ *de coronatore exonerando*, or by ſtat. 25 Geo. II. cap. 29. for extortion, neglect, or miſbehaviour.

Their authority is judicial and miniſterial; judicial, where a perſon comes to a violent death, and to take and enter appeals of murder, pronounce judgment upon outlawries, &c. and to enquire of lands and goods, and eſcapes of murderers, treaſure trove, wreck of the ſea, deodands, &c. The miniſterial power is where the coroners execute the king's writs, on exception to the ſheriff, as being party to a ſuit, kin to either of the parties, on default of the ſheriff, &c. In their former capacity the act of one has the ſame force as if they had all joined; in the latter, their acts are void, unleſs they join. And the authority of coroners does not determine by the demiſe of the king; as that of judges, &c. doth, who act by the king's commiſſion. 2 Inſt. 174. The lord chief juſtice of the king's bench is the ſovereign coroner of the whole realm, or whereſoever he abides.

CORONET, in farriery. See Cornet.

CORONILLA, jointed podded colutea; a genus of the decandria order, belonging to the diadelphia claſs of plants. To this genus Linnæus alſo joins the emerus, or ſcorpion ſena; though Mr. Miller makes it a diſtinct ſpecies. There are eleven ſpecies, all of them plants of conſiderable beauty, with very bright yellow flowers. All of them, however, are rather too tender for this climate, except the emerus. The leaves of this plant are eſteemed laxative, and uſed as a ſubſtitute for common ſena in ſome parts of Europe. A dye is procured by fermentation from the leaves like that of indigo.

CORPORA *Cavernoſa*, in anatomy, two ſpongious bodies, called alſo *corpora nervoſa*, and *corpora ſpongioſa*.

CORPORAL, an inferior officer in a company of foot, who has charge over one of the diviſions: he places and relieves centinels, and keeps good order in the *corps de garde*; receiving, withal, the word of the inferior rounds that paſs by his *corps de garde*. There are uſually three corporals in each company. The word comes from the Italian *coporale*, which ſignifies the ſame thing; and that from *caput, head, chief*; the corporal being the firſt of the company.

Corporal *of a Ship*, is an officer who hath the charge of ſetting the watch and centries, and relieving them; and who ſees that all the ſoldiers and ſailors keep their arms neat and clean: he alſo teaches them how to uſe their arms, and hath a mate under him.

CORPORATION, a body politic, or incorporate; ſo called, becauſe the ſeveral members thereof are formed into one body; and are qualified to take, purchaſe, grant, have a common ſeal, ſue and be ſued, &c. in their joint capacity. A corporation may be eſtabliſhed three ways, viz. by preſcription, by letters patent, and by act of parliament. Corporations are either eccleſiaſtical, or lay. Eccleſiaſtical are either regular, as abbeys, priories, chapters, &c. or ſecular, as biſhopricks, deanries, parſonages, &c. to which add, univerſities, colleges, hoſpitals, &c. Lay corporations are again ſubdivided into civil and eleemoſynary. Of the former ſort are ſuch as are eſtabliſhed for a variety of temporal purpoſes; as thoſe of cities, towns, mayoralties, bailiwicks, companies, or communities of commerce; and for the improvement of ſcience, churchwardens, and the two univerſities. Thus the king is made a corporation, to prevent an inter regnum; for on his demiſe, his ſucceſſor is in full poſſeſſion of the regal rights and dignity. Eleemoſynary corporations are ſuch as are eſtabliſhed for the diſtribution of the free alms of the foundery, as hoſpitals and colleges. The corporation of the city of London is to anſwer for all particular miſdemeanors committed in any of the courts of juſtice within the city, and for all other general miſdemeanors committed in the city.

Corporation *Courts* are ſuch as are held in corporations, by preſcription, charter, or act of parliament.

CORPOREAL, conſiſting of matter or body, oppoſed to ſpiritual.

CORPOREITY, the quality of that which is corporeal, or has body; or that which conſtitutes or denominates it ſuch. The Mahometans reproach the Samaritans at this day, with a belief of the corporeity of God. Many of the ancients believed the corporeity of angels.

CORPS, in architecture, is a term borrowed from the French, ſignifying any part that projects or advances beyond the naked of a wall; and which ſerves as a ground for ſome decoration, or the like.

CORPSE, a dead body. If any one, in taking up a dead body, ſteals the ſhrowd, or other apparel, it will be felony. Stealing only the corpſe itſelf is not felony; but is puniſhable as a miſdemeanor by indictment at common law.

CORPULENCY, the ſtate of a perſon too much loaded with fat. Sennertus mentions a man that weighed ſix hundred pounds; and a maid, thirty-ſix years of age, who weighed four hundred and fifty. Bright, of Malden, who died at the age of twenty-nine years, in 1750, weighed ſix hundred and ſixteen pounds. Corpulency is promoted by every thing that tends to ſoften the blood, and render it leſs ſharp and ſaline; ſuch as a want of proper exerciſe both of body and mind, an indolent life, and too much ſleep and nouriſhing foods, &c. And as theſe cauſe or promote corpulency, ſo do their oppoſites prevent or remove it; particularly ſaline meats and acid drinks, &c. Some have propoſed, as one of the beſt remedies for corpulency, *acet. ſcilliticum*; but as great miſchiefs and ſometimes fatal effects have followed from ſuch medicines, particularly in young ladies, in attempting to reduce themſelves by drinking vinegar, &c. we would therefore adviſe proper exerciſe and moderate eating, with a total abſtinence from all kinds of malt liquors, and recommend water for common drink, and cider or perry to be drank occaſionally.

CORPUS, *Body*, in anatomy, is applied to ſeveral parts in the animal ſtructure; as *corpus calloſum, corpus glanduloſum, corpus reticulare*, &c.

Corpus *Chriſti-Day*, a feaſt held always on the next Thurſday after Trinity Sunday. It was inſtituted in the year 1264, in honour of the bleſſed ſacrament, to which alſo a college in Oxford is dedicated. We find it mentioned in 32 Hen. VIII. cap. 21. By which ſtatute Trinity-term is appointed for ever to begin the morrow after this feaſt.

CORPUSCLE, in phyſics, a minute particle, or phyſical atom; being ſuch as a natural body is made up of. By this word is not meant the elementary particles, nor the hypoſtatical principles of chymiſts; but ſuch particles, whether of ſimple or compound nature, whoſe parts will not be diſſolved nor diſſipated by ordinary degrees of heat.

CORPUSCULAR Philosophy, that way of philoſophiſing which endeavours to explain things, and to account for the phenomena of nature, by the motion, figure, reſt, poſition, &c. of the corpuſcles or the minute particles of matter. Mr. Boyle ſums up the chief principles of the corpuſcular hypotheſis, which now flouriſhes under the mechanical philoſophy, in theſe particulars:

1. That there is but one catholic, or univerſal matter, which is an extended, impenetrable, and diviſible ſubſtance, common to all bodies, and capable of all forms.

This ſir Iſaac Newton finely improves on: "All things conſidered, ſays that great author, it appears probable to me, that God, in the beginning, created matter in ſolid, hard, impenetrable, moveable particles: of ſuch ſizes and figures, and with ſuch other properties, as moſt conduced to the end for which he formed them; and that theſe primitive particles, being ſolids, are incomparably harder than any of the ſenſible porous bodies compounded of them; even ſo hard as never to wear, or break in pieces: no other power being able to divide what God made one in the firſt creation. While theſe corpuſcles remain entire, they may compoſe bodies of one and the ſame nature and texture in all ages: but ſhould they wear away, or break in pieces, the nature of things depending on them would be changed: water and earth, compoſed of old worn particles, and fragments of particles, would not be of the ſame nature and texture now, with water and earth compoſed of entire particles at the beginning. And therefore, that nature may be laſting, the changes of corporeal things are to be placed only in the various ſeparations, and new aſſociations, of theſe permanent corpuſcles."

2. That this matter, in order to form the vaſt variety of natural bodies, muſt have motion in ſome, or all its aſſignable parts; and that this motion was given to matter by God, the creator of all things; and has all manner of directions and tendencies.

"Theſe corpuſcles, ſays ſir Iſaac Newton, have not only a vis inertiæ, accompanied with ſuch paſſive laws of motion as naturally reſult from that force; but alſo are moved by certain active principles; ſuch as that of gravity, and that which cauſes fermentation, and the coheſion of bodies."

3. That matter muſt alſo be actually divided into parts; and each of thoſe primitive particles, fragments or atoms of matter, muſt have its proper magnitude, figure, and ſhape.

4. That theſe differently ſized and ſhaped particles have different orders, poſitions, ſituations and poſtures, from whence all the variety of compound bodies ariſe.

CORRECTION, puniſhment for faults, in order to produce amendment; the alteration or amendment of an error or miſtake in writing or printing; an amendment; reprehenſion; cenſure; or notice of a fault In medicine, the leſſening any quantity of an ingredient, by joining it with one of oppoſite qualities.

Correction, in printing. See the Art of Printing.

CORRECTOR, he who amends a perſon by means of puniſhment. In printing, the perſon who examines and alters the errors of the compoſitor in the proofs. In medicine, an ingredient in a compoſition, which guards againſt, or abates the force of another.

CORREGIDOR, the name of an officer of juſtice in Spain, and countries ſubject to the Spaniſh government. He is the chief judge of a town or province.

CORRELATIVE, ſomething oppoſed to another in any certain relation. Thus, father and ſon are *correlatives*; *pater & filius ſibi mutuo reſpondent.* Light and darkneſs, motion and reſt, are correlative and oppoſite terms.

CORRESPONDENCE, or correſpondency, denotes the relation and reciprocal adaptation of one thing to another; and alſo intercourſe and friendſhip.

CORROBORATIVE, in medicine, any thing that increaſes ſtrength, or gives new force.

CORROSION, in a general ſenſe, the action of gnawing away, by degrees, the continuity of the parts of bodies.

Corrosion, in chymiſtry, an action of bodies, by means of proper menſtruums, that produces new combinations, and a change of their form, without converting them to fluidity.

CORROSIVES, in ſurgery, are medicines which corrode whatever part of the body they are applied to: ſuch are burnt alum, white precipitate of mercury, white vitriol, red precipitate of mercury, butter of antimony, *lapis infernalis*, &c.

CORRUPTION, the deſtruction, extinction, or, at leaſt, ceſſation for a time, of the proper mode of exiſtence of any natural body. Putrefaction.

Whenever any body loſes all or any of thoſe accidents, which are eſſentially neceſſary to the conſtituting of ſuch a particular kind, it is then ſaid to be corrupted, or deſtroyed, and loſes its former denomination: but nothing can be deſtroyed of its ſubſtance, or materiality; for as in generation, nothing of matter is produced that did not before exiſt, ſo in corruption, nothing more is loſt beſides that particular modification which was its form, and conſtituted it of ſuch a ſpecies.

Corruption, or corrupting of words and phraſes, denotes the changing them from a true to a falſe or wrong meaning.

Corruption *of Blood*, in law, an infection accruing to a man's ſtate, attainted of felony, or treaſon, and to his iſſue. For, as he loſes all to the prince, or other lord of the fee, ſo his heirs cannot be iſſue to him, or to any other anceſtor by him; and if he were noble, or a gentleman, he and his heirs, are thereby ignoble and degraded.

CORSAIR, a pirate, or perſon, who ſcours the ſeas, eſpecially the Mediterranean, with a veſſel armed for war, without commiſſion from any prince, or power; to plunder merchant veſſels. The word comes from the Italian *corſare*, of *corſo*, or a *curſibus*, by reaſon of their courſes, or excurſions. The name is commonly given to the piratical cruiſers of Barbary, who had their riſe about the beginning of the ſixteenth century.

A corſair is diſtinguiſhed from a privateer in this, that the latter does it under a commiſſion, and only attacks the veſſels of thoſe at war with the ſtate whence his commiſſion is derived. The puniſhment of a corſair is to be hanged without remiſſion; whereas privateers are to be treated as priſoners of war. All corſair veſſels are good prizes.

CORTEX, a Latin name, denoting the bark, or outer coat of a tree, or ſhrub.

Cortex *Peruvianus*, called alſo *quinquina*, *kinkinna*, *quinaquina*, *pulvis patrum*, and popularly the *Jeſuit's bark*, is called by the Spaniards *palo de calenturas*, q. d. *fever-wood*; by reaſon of its extraordinary virtue in removing all kinds of intermitting fevers and agues. Peruvian jeſuit bark, there are four ſorts viz. the reddiſh, yellowiſh, whitiſh, and the curling; the two firſt are the beſt, the curling is from young trees.

Its virtues were diſcovered by the Indians about the year 1500. A lake near a town in Peru was ſurrounded by theſe trees, which were torn up by an earthquake, and falling into the adjacent water, they rendered it bitter. An Indian, urged by his thirſt during a fever, under which he laboured, drank of this water, becauſe no other could be had; however, obſerving that he ſoon recovered, he related the caſe, and others were alſo cured. On this inquiry was made, and to the trees it was found that the water owed its virtue; then it was ſoon diſcovered, that the bark alone poſſeſſed the medicinal quality. In 1640, a Spaniſh ſoldier was quartered in an Indian's houſe, and being ſeized with an ague, his landlord, moved with compaſſion, told him of a cure, and with the ſame he cured his companions. At length the vice queen, wife of the count de Cinchon, then vice-roy of Peru, was ſeized with an intermitting fever; this ſoldier cured her alſo; hence the name Cinchona and Comitiſſæ. After this, father de Lugo brought a parcel of it to Rome, and from him alſo it received the name of cort. card. de Lugo. From Rome it was ſpread into France and England, and at length became general. By way of eminence it is called The Bark.

This bark is brought in pieces of different ſizes, ſome rolled up in ſhort thick quils, and others flat; the out-ſide is browniſh, and generally has a whitiſh moſs ſpread on it; the inſide is of a yellowiſh, reddiſh, or ruſty iron colour. The beſt ſort is bitter, reſinous, breaks cloſe and ſmooth, is friable betwixt the teeth, pulverizes eaſily, when powdered is of a cinnamon colour, but rather paler; and, according to the opinion of ſome, as the ſureſt teſt of its goodneſs, it has a muſty kind of ſmell, and at the ſame time ſo much of the aromatic, as not to be diſagreeable. The inferior kinds, when broken, appear woody, and in chewing ſeparate into fibres. That which is called female bark, is redder in the inſide, is alſo thicker, and on the outſide more white and ſmooth, is weaker to the ſmell and taſte than the above, and, in medical virtue, greatly inferior.

Bark is found to have much ſurer and quicker effects when green than when dry; ſo that the Europeans only come in for the ſecond rate virtues: what is worſe, the bad ſort is in great plenty, and the good is very ſcarce, and hard to come at: for which reaſon, with a little of the fine bark ſent yearly to Panama, for Europe, large quantities of the worſt ſort are uſually mixed.

Bark, when firſt introduced, is ſaid to have been ſold for about eight ſhillings ſterling the doſe; which great price, with the little effects found from it, by reaſon of their ignorance of the manner of preparing and preſcribing it, occaſioned its being diſuſed, till about the year 1679, that Mr. Talbor, an Engliſh practitioner in phyſic, brought it into vogue again, by the great number of cures wrought about the court and city of Paris with this powder, prepared after his manner: the ſecret whereof was ſoon after made public by the munificence of Louis XIV. who rewarded Talbor for the communication with five thouſand crowns.

Some call the gentian root the European quinquina, becauſe it is good againſt intermitting fevers. The ſea-ſide beech of Jamaica, or Cinchona Carribæa of Linnæus, is a ſpecies of the Jeſuits bark, produced in Jamaica and the Carribee iſlands, which, together with its virtues, has lately been accurately deſcribed by Dr. Wright, who has found it very efficacious in the dangerous remittent fevers of the Weſt Indies; and it has lately been adminiſtered in London in intermittents, in which it has effected a cure as completely as the Peruvian bark. Phil. Tranſ. vol. lxvii. 504. Med. Com. vol. v. p. 398. part ii.

Cortex *Winteranus*, or *Winteri*, the bark of a tree brought from the ſtreights of Magellan, by captain Winter, in his voyage with ſir Francis Drake, in 1579. Cluſius calls the tree, *Magellanica aromatica arbor*. The bark is aromatic, and found of good uſe at ſea againſt the ſcurvy: half a dram of it, boiled with ſome carminative ſeeds, ſweats and relieves ſcorbutic patients. It has alſo proved an antidote againſt a poiſonous ſort of ſeal, called a ſea lion, frequent in thoſe parts. The bark ſold in the ſhops under the name of *cortex winteranus*, or wild cinnamon, Dr. Sloane obſerves, is not the true *cortex winteranus*; they grow on different trees, and in different countries, and their appearance is very different: yet are they ſo like in taſte, that he thinks they may be uſed as ſuccedaniums to each other.

All the parts of this tree, when freſh, are very hot, aromatic, and biting to the taſte, which is ſo troubleſome as ſometimes to need a remedy from fair water. It grows in the low land, or ſavanna-woods, in Jamaica, Antigua, and other Carribee iſlands. The bark of this tree is what is chiefly in uſe, both in the plantations of the Engliſh between the tropics, in the Weſt Indies, and in Europe, and is without any difficulty cured by only cutting off the bark, and letting it dry in the ſhade. The people of the Weſt Indies uſe it inſtead of all other ſpices, being thought very good to conſume the immoderate humidities of the ſtomach, help digeſtion, expel wind, &c. It is likewiſe, as well there as in Europe, thought a very good remedy againſt the ſcurvy, and to cleanſe and invigorate the blood, being among the apothecaries and druggiſts of London uſed for thoſe purpoſes under this name, though differing from the true *cortex winteranus*, as before obſerved. Phil. Tranſ. Abr. vol. ii. p. 666.

We ſhall not here treat on the uſes of bark or the different modes of adminiſtering it, but refer thoſe particulars to our Syſtem of Medicine, under which it will come with more propriety, as introduced in the ſame point of view with other ſubjects of the healing art.

Cortex *Cerebri*, the cortical, or cineritious ſubſtance of the brain. This is the exterior part of the brain and cerebellum; or that part immediately under the pia mater; ſo called, becauſe of its inveſting the inner or medullary part, as a bark does a tree. The ſame is alſo called the cineritious ſubſtance, from its greyiſh or aſh-colour.

CORTUSA, bear's-ear ſanicle; a genus of the monogynia order, belonging to the pentandria claſs of plants. There are two ſpecies, both of them very low, flowery, herbaceous perennials, crowned by umbels of monopetalous, wheel-ſhaped flowers, of a red colour.

CORUS, Omer, Homer, or Chomer, in the Jewiſh antiquities, a meaſure containing ten baths, or ſeventy five gallons, and five pints, as a meaſure of things liquid, and thirty two pecks and one pint, as a meaſure for things dry. The corus or omer, was moſt commonly a meaſure for things dry, and the greateſt that was uſed among the Jews. It contained, according to the rabbins, ten ephas, or thirty ſata or ſeahs. Corus is the moſt uſual term in the hiſtorical writers, and omer or chomer among the prophets. *Corus* is alſo uſed in ſome of our old writers for eight buſhels, or a quarter; *decem coros tritici, ſive decem quarteria.*

CORUSCATION, glittering, or flaſhing, a gleam of light emitted from any thing. The term is chiefly uſed for a flaſh of lightning nimbly darting down from the clouds, in time of thunder.

CORVUS, the raven or crow kind, in ornithology, a genus of birds of the order of picæ, the diſtinguiſhing characteriſtics of which are theſe: the beak is convex and cultrated: the noſtrils are covered with briſtly feathers; the tongue is forked and cartilaginous; and the feet are of the walking kind. The ſpecies are 19. The moſt remarkable are:

1. The Corax, or Raven, is about two feet two inches in length; the colour is black, finely gloſſed with a rich blue; which is of a duſky colour. They build in trees, and lay five or ſix eggs of a pale green colour marked with ſmall browniſh ſpots. They are very docile birds, and may be trained up to fowling like hawks; they fly to a great height, making a deep loud noiſe, different from the common croaking. Their ſcent is remarkably good; and they are very long lived. The quills of ravens ſell for 6s. per hundred, being of great uſe in tuning the lower notes of an harpſichord when the wires are ſet at a conſiderable diſtance from the ſticks.

2. The Corone, or Carrion Crow, in the form of its body agrees with the raven; alſo in its food, which is carrion and other filth. It will alſo eat grain and inſects; and like the raven will pick out the eyes: for which reaſon it was formerly diſtinguiſhed from the rook, which feeds entirely on grain and inſects. It lays the ſame number of eggs as the raven, and of the ſame colour: immediately after deſerting their young they go in pairs. The crow is in length 18 inches; in breadth two feet two inches.

3. The Frugilegus, or Rook, differs not greatly in its form from the carrion crow: the moſt remarkable difference is in the bill: the noſtrils, chin, and ſides of that and the mouth being in old birds quite white and bared of feathers by often thruſting the bill into the ground in ſearch of the erucæ of the dor-beetle. The rook then, inſtead of being proſcribed, ſhould be treated as the farmer's friend; as it clears his ground from caterpillars, which do incredible damage by eating the roots of the corn. Rooks are ſocial birds, living in vaſt flocks: but crows go only in pairs. They begin to build their neſts in March; one bringing materials, while the other watches the neſt, leſt it ſhould be plundered by its brethren: they lay the ſame number of eggs as the crow, and of the ſame colour, but leſs. After the breeding ſeaſon, the rooks forſake their neſt-trees, and for ſome time go and rooſt elſewhere, but return to them in Auguſt: in October they repair their neſts.

4. The Cornix, or Royſton crow, pretty much reſembles the rook, feeding on inſects, and flying together in great flocks. In England it is a bird of paſſage, viſiting that kingdom in the beginning of winter, and leaving it with the woodcocks. They have a ſhriller note than the common crows; are much more miſchievous: pick out the eyes of lambs, and even of horſes when engaged in bogs.

5. The Monedula, or Jack-daw, the length thirteen inches, the breadth twenty-eight. The head is large in proportion to its body. It is a docile and loquacious bird. Jack-daws breed in ſteeples, old caſtles, and in high rocks, laying five or ſix eggs. they build in the interſtices between the upright and tranſum ſtones of Stonehenge; a proof of the prodigious height of that ſtupendous antiquity, for their neſts are placed beyond the reach of the ſhepherd boys, who are always idling about this ſpot. They are gregarious birds; and feed on inſects, grain, and ſeeds.

6. The Glandularius, or Jay, is one of the beautiful Britiſh birds. The length 13 inches, the breadth 20½. The forehead is white ſtreaked with black: the head is covered with very long feathers, which it can erect at pleaſure inot the form of a creſt. It lays five or ſix eggs of a dull whitiſh olive, mottled very obſcurely with pale brown. The neſt is made entirely of the fine fibres of roots of trees; but has for the foundation a few coarſe ſticks. Jays are very docile, and may be taught to imitate the human voice: their native note is very loud and diſagreeable. When they are enticing their fledged young to follow them, they emit a noiſe like the mewing of a cat.

7. The Pica, or Magpye, is ſo well known that it would be ſuperfluous to deſcribe it minutely. Its food conſiſts of worms, inſects, and ſmall birds. It will deſtroy young chickens; and is a crafty, reſtleſs, and noiſy bird. It is eaſily tamed; and may be taught to imitate the human voice. It builds its neſt with great art, covering it entirely with thorns, except one ſmall hole for admittance. It lays ſix or ſeven eggs of a pale green colour ſpotted with green. The length is 18 inches; the breadth 24.

8. The Graculus, or red-legged crow, is but thinly ſcattered over the northern world: no mention is made of it by any of the Fauniſts: nor do we find it in other parts of Europe, except England and the Alps. It is of an elegant, ſlender-make; active, reſtleſs and thieving; much taken with glitter, and ſo meddling as not to be truſted where things of conſequence lie. It is very apt to catch up bits of lighted ſticks; ſo that there are inſtances of houſes being ſet on fire by its means; on which account Camden calls it *incendiaria avis*. It is found in Cornwall, Flintſhire, Caernarvonſhire, and Angleſea, in the rocky cliffs along the ſhores. Its colour is wholly black, beautifully gloſſed over with blue, and purple: the legs and bill are of a bright orange colour inclining to red: the tongue is almoſt as long as the bill, and little cloven, the claws large, hooked and black. See Plate I. ORNITHOLOGY.

CORVUS *Raven*, in aſtronomy, a conſtellation of the ſouthern hemiſphere; whoſe ſtars in Ptolemy's Catalogue are 7; in Tycho's as many; in the Britannic Catalogue 9.

CORVUS *Piſcis*, the crow fiſh, a river fiſh of the chub kind, common in Italy, and in ſome parts of Germany, and called by Geſner, *capito fluviatilis rapax*, and by the common people *roppe*. It ſeldom grows to more than ſix or ſeven pounds weight: it is an extremely rapacious fiſh, not leſs ſo than the pike, and very frequently chaſes its prey ſo hard as to drive them out upon the bank, and in that caſe, he uſually follows them alſo, and both are frequently taken, ſtranded together. It is caught at all ſeaſons of the year, but never in any great abundance; it is eſteemed a very delicate fiſh. Geſner de Piſc. p. 1267.

CORYBANTES, in antiquity, prieſts of Cybele, who danced and capered to the ſound of flutes and drums. See CROTALUM. Horace, lib. i. Ode 16. Ver. 8.

Catullus, in his poem called Atys, gives a beautiful deſcription of them: repreſenting them as madmen.

CORYBANTICA, a feſtival held in Crete, in memory of the Corybantes, who educated Jupiter when he was concealed in that iſland, from his father Saturn, who would have devoured him.

CORYCUS, whence CORYCOMACHIA, among the Greeks, a kind of exerciſe with the hand-ball, which they puſhed forwards, ſuſpended from the ceiling, and at its return either caught it with their hands, or ſuffered it to meet their body. Oribaſius informs us, it was recommended for extenuating too groſs bodies.

CORYLUS, the hazle; a genus of the polyandria order, belonging to the monœcia claſs of plants. Mr. Miller reckons three ſpecies, though other botaniſts make only two. They are all of the large ſhrub kind, hardy and deciduous; and have ſeveral varieties, valuable for their nuts, as alſo for their variety in large wilderneſſes and ſhrubbery works. They will proſper in almoſt any ſoil or ſituation, and turn out to good account when growing in coppices to cut as underwood, and as poles for various uſes, as hoops, ſpars, hurdles, handles to huſbandry implements, walking ſticks, fiſhing rods, &c. for which purpoſes they may be cut every 5th, 7th, or 8th year, according to the purpoſes for which they are deſigned. The beſt method of propagating them is by layers, though they may alſo be raiſed from the nuts.

CORYMBIFERÆ, in botany, the name of an order or diviſion of the compound flowers adepted by Linnæus after Ray and Vaillant, in the former editions of his Fragments of a Natural Method. This title in the latter editions is changed for Diſcoideæ, another name borrowed from Ray's Method, but uſed in a ſomewhat different ſenſe.

CORYMBUS, properly ſignifies a cluſter of ivy berries. Among botaniſts, it is a mode of flowering in which the leſſer or partial flower-ſtalks are produced along the common ſtalk on both ſides; and, though of unequal lengths, riſe to the ſame height, ſo as to form a flat and even ſurface at the top.

CORYPHÆNA, in ichthyology, the name of a genus of fiſh of the malacopterygious kind, of the thoraic order in the Linnæan ſyſtem, the characters of which are theſe: the branchioſtege membrane contains on each ſide five bones, beſides two others which lie under the bony coverings of the gills, and cannot be ſeen. The fins are ſeven in number, one upon the back, reaching from the top of the head to the tail; the head is very obtuſe at the end, or, as it were, perpendicularly declivious from the vertex to the mouth; the head and body are ſomewhat compreſſed. There are three ſpecies of this genus enumerated by Artedi, and twelve by Linnæus.

CORYZA, in medicine, a running at the noſe; or a defluxion of ſharp ſerous humours from the glands of the head; ariſing from a diminution of perſpiration, or catching of cold.

COS, *Whetſtone*, in natural hiſtory, a genus of ſand ſtones, conſiſting of fragments of an indeterminate figure, ſubopake, and granulated. There are ſeveral ſpecies of this genus, which are uſed for mill-ſtones, &c.

CO-SECANT, in geometry, the ſecant of an arch, which arch is the complement of another arch to 90 degrees.

COSENING, in law, an offence whereby any thing is done deceitfully, in, or out of, contracts, which cannot be fitly termed by any eſpecial name. In the civil law, it is called ſtellionatus.

COSHERING, in the Feudal cuſtoms, a kind of right of the lords to lie, and feaſt themſelves, and their followers, at their tenants houſes.

COSINE, in trigonometry, is the right ſine of an arch, which is the complement of another to 90 degrees.

COMETIC, from κοσμειν, to *adorn*, a term in phyſic, uſed for any medicine, preparation, or means, employed to beautify and embelliſh the face, and preſerve or improve the complexion; as ceruſs, waſhes, cold creams, &c. The Indians uſe the water of green cacao-nuts as a grand coſmetic, which wonderfully improves their complexion.

COSMICAL, ſomething that refers, or has a relation to the world; in Greek κοσμος.

COSMICAL, a term in aſtronomy, expreſſing one of the poetical riſings of a ſtar: thus a ſtar is ſaid to riſe coſmically when it riſes with the ſun, or with that point of the ecliptic in which the ſun is at that time: and the coſmical ſetting is when a ſtar ſets in the weſt at the ſame time that the ſun riſes in the eaſt.

COSMOGONY, or Cosmology, a knowledge of the original formation of the different parts of this viſible ſyſtem.

COSMOGRAPHY, a deſcription of the ſeveral parts of the viſible world. It is divided into two parts, Astronomy and Geography.

COSMOPOLITE, or Cosmopolitan, a term ſometimes uſed to ſignify a perſon who has no fixed living, or place of abode; or a man who is a ſtranger no where. The word comes from κοσμος, *mundus*, ϖολις, *city*. One of the ancient philoſophers being interrogated what countryman he was, anſwered he was a coſmopolite, i. e. an inhabitant or citizen of the world. "I prefer, ſays another philoſopher, my family to myſelf, my country to my family, and the human kind to my country."

COSSART, or Cosset, among farmers, a colt, calf, lamb, &c. brought up by hand, without the dam.

COSTAL, an appellation given by anatomiſts to ſeveral parts belonging to the ſides: thus we meet with coſtal muſcles, vertebræ, &c.

COSTIVENESS, *Obſtructio Alvi*, in medicine, a preternatural detention of the excrements, with an unuſual hardneſs and dryneſs thereof; and, thence, a difficulty of diſcharging them. This is oppoſite to a diarrhœa, or looſeneſs. There is no other diſeaſe concurring to it: ſometimes it is ſymptomatic, and depends entirely on other diſeaſes, as on fevers, congeſtions, and the like. See Syſtem of Medicine.

COSTS, in law, imply the expences of a ſuit recovered by the plaintiff, together with damages. Coſts were not allowed by the common law, the amercement of the vanquiſhed party being his only puniſhment; but they are given by ſtatute. Coſts are allowed.

COSTUME, a rule or precept in painting, by which the artiſt is enjoined to make every perſon and thing ſuſtain it's proper character; and not only obſerve the ſtory, but the circumſtances, the ſcene of action, the country or place, and take care that the habits, arms, manners, proportions, and the like, exactly correſpond.

COSTUS, a genus of the monogynia order, belonging to the monandria claſs of plants. There is but one ſpecies, viz. the arabicus, a native of the Indies. The root was formerly in ſome eſteem as an attenuant, and ſerviceable in venereal complaints; but is now rarely preſcribed or met with in the ſhops.

COTANGENT, is the tangent of an arch, which is the complement of another arch to 90 degrees. See Geometry.

COTE, a term uſed in courſing, to expreſs the advantage of one greyhound has over another, when he runs by the ſide of it, and, putting before, gives the hair a turn.

COTERIE, a term adopted from the French trading aſſociations or partnerſhips, where each perſon advances his quota of ſtock, and receives his proportion of gain; and which retains its original meaning when applied to little aſſemblies or companies aſſociated for mirth and good humour; where each one furniſhes his quota of pleaſantry.

COTILLION, the name of a well known briſk dance, in which eight perſons are employed. The term is French, and ſignifies an under petticoat.

COTT, in ſea language, a ſort of bed frame, ſuſpended from the beams of a ſhip, in which the officers ſleep.

COTTAGE, *Cottagium*, is properly a little houſe for habitation, without lands belonging to it.

COTTON, in commerce, a ſoft downy ſubſtance found on the goſſypium, or cotton-tree, a genus of the polyandria order belonging to the monodelphia claſs of plants. See Gossypium. Cotton is ſeparated from the ſeeds of the plant by a mill, and then ſpun and prepared for all ſorts of fine works, as ſtockings, waiſtcoats, quilts, tapeſtry, curtains, &c. With it they likewiſe make muſlin; and ſometimes it is mixed with wool, ſilk, &c. The fineſt ſort comes from Bengal and the coaſt of Coromandel. Cotton makes a very conſiderable article in commerce, and is diſtinguiſhed into cotton-wool and cotton-thread. The firſt is brought moſtly from Cyprus, St. John d'Acre, and Smyrna: the moſt eſteemed is white, long, and ſoft. Thoſe who buy it in bales ſhould ſee that it has not been wet, moiſture being very prejudicial to it. The price of the fineſt is uſually from ſix to ſeven piaſters the quintal of 44 ocos.

Of cotton-thread, that of Damas, called *cotton d'ounce*, and that of Jeruſalem, called *bazas*, are the moſt eſteemed; as alſo that of the Antilles iſlands. It is to be choſen white, fine, very dry, and evenly ſpun. The other cotton-threads are the half bazas, the rames, the beledin and gondezel; the payas and montaſiri, the geneguins, the baquins, the joſſelaſſars, of which there are two ſorts. Thoſe of India, known by the name of Tutucorin, Java, Bengal, and Surat, are of four or five ſorts, diſtinguiſhed by the letters A, B, C, &c. They are ſold in bags, with a deduction of one pound and a half on each of thoſe of Tutucorin, which are the deareſt, and two pounds on each bag of the other ſorts. For thoſe of Fielebas, Smyrna, Aleppo, and Jeruſalem, the deduction at Amſterdam is eight in the hundred for the tare, and two in the hnndred for weight, and on the value one *per cent.* for prompt payment,

Cotton of Siam, is a kind of ſilky cotton in the Antilles, ſo called becauſe the grain was brought from Siam. It is of an extraordinary fineneſs, even ſurpaſſing ſilk in ſoftneſs. They make hoſe of it there preferable to ſilk ones, for their luſtre and beauty. They ſell from 10 to 12 and 15 crowns a pair, but there are very few made unleſs for curioſity.

Cotton-wool, not of the Britiſh plantations, pays on importation, $\frac{77}{100}$d. the pound, and draws back on exportation $\frac{67\frac{1}{2}}{100}$d. Cotton-yarn the pound, not of the Eaſt Indies, pays $2\frac{87\frac{1}{4}}{100}$d. and draws back $2\frac{58\frac{3}{4}}{100}$d. Cotton-yarn the pound of the Eaſt Indies pays $4\frac{56}{100}$d. and draws back $4\frac{27}{100}$d.

COTTONIAN *Library*, conſiſting of curious manuſcripts, &c. was founded by Sir Robert Cotton, who was forty years in collecting it: and at his death, in 1631, left the property of it to his family, though deſigned for public uſe. A large acceſſion was made to this library by private benefactions, before the death of the founder, and afterwards by the purchaſers of his heirs, and donations of others, who added to it a great number of books, chiefly relating to the hiſtory and antiquities of our own nation. An act of parliament was obtained, at the requeſt of Sir John Cotton, in 1700 for preſerving it after his deceaſe, under the above denomination, for public uſe. Is now fixed in the Britiſh Muſeum.

COTTUS, or bull-head, in ichthyology, a genus belonging to the order of thoracici. The head is broader than the body, and the gill-membrane has ſix rays. There are ſix ſpecies; the moſt remarkable are,

1. The gobio, or river bull-head, is very common in all our clear brooks; it lies almoſt always at the bottom, either on the gravel, or under a ſtone: it depoſits its ſpawn in a hole which it forms among the gravel, and quits it with great reluctance. The colour of this fiſh is as diſagreeable as its form, being duſky, mixed with a dirty yellow; the belly is whitiſh. The taſte, however, is excellent.

2. The cataphractus, armed bull-head, or pogge, is pretty common on moſt of the Britiſh coaſts. It ſeldom exceeds five inches and an half in length; and even ſeldom arrives at that ſize.

3. The ſcorpius, or father-laſher, is not uncommon on the rocky coaſts of this iſland; it lurks under ſtones, and will take a bait. It ſeldom exceeds 8 or 9 inches in length. The head is large, and has a moſt formidable appearance, being armed with vaſt ſpines, which it can oppoſe to any enemy that attacks it, by ſwelling. This ſpecies is very frequent in the Newfoundland ſeas, where it is called ſcolping: it is alſo as common on the coaſt of Greenland, in deep water near the ſhore. It is a principal food of the natives, and the ſoup made of it is ſaid to be agreeable as well as wholeſome. See Bull-Head.

COTULA, may-weed; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants. There are ſix ſpecies, all of them herbaceous annuals, riſing ſix or eight inches high, and adorned with yellow flowers. There are none of them natives of this country, and moſt of them require artificial heat.

COTURNIX, in ornithology, See Tetrao.

COTYLEDON, navel-wort; a genus of the pentagynia order, belonging to the decandria claſs of plants. There are eight ſpecies, moſt of them hardy ſucculent perennials.

COTYLEDONES, in botany, the periſhable porous ſide-lobes of the ſeed, which involve, and for ſome time furniſh nouriſhment to the embryo plant. The lobes in queſtion, which are generally two in number, are very conſpicuous in the bean, and moſt of the leguminous tribe. Of plants which have only one ſeminal leaf, we muſt carefully diſtinguiſh thoſe in which the lobe forms a ſort of ſheath, ſurrounding the whole body of the plant, as in the palms, graſſes, and liliaceous vegetables; from thoſe in which the lobe is only extended in length, as in dodder. Pine, and fir-trees, ſays Linnæus, have ten; cypreſs, five; flax, four lobes: in fact, however, theſe plants have only two lobes, each of which is differently divided, almoſt to the baſe: the lobes only being perfectly diſtinct. The lobes being in the vegetable œconomy what the placenta is in the animal, their diſpoſition at the time when the ſeed begins to grow, is termed very properly, by Linnæus, Placentation.

In the muſhrooms, ferns, and other imperfect plants, the ſeminal leaves are not ſufficiently aſcertained. The ſeeds of the moſſes want only the proper coverings and lobes.

Cotyledones, in anatomy, little glands diſperſed throughout the outermoſt membrane of the fœtus, called chorion, and ſuppoſed to ſeparate a nutritious juice for the ſubſiſtence of the fœtus.

Cotyledones, in this ſenſe, are only found in ſheep, goats, and ſome other animals; the placenta in the womb ſupplying the place thereof in women.

COUCH, in heraldry, a term uſed to expreſs the ſhield of a coat of arms, when it does not ſtand erect, but hangs downward.

COUCHANT, in heraldry. is underſtood of a lion, or other beaſt, when lying down: but with his head lifted up; which diſtinguiſhes the poſture of *couchant* from *dormant*, wherein he is ſuppoſed quite ſtretched out, and aſleep. See Plate V. in Heraldry.

COUCHE', in heraldry, denotes any thing laid all along: thus a *chevron couché*, is a chevron lying ſidewiſe, or *couched*, with the two ends on one ſide of the ſhield, which ſhould properly reſt on the baſe. See Plate III. HERALDRY.

COUDOU, or KU-DU, in tetrapodology, a ſpecies of deer, ſo called at the Cape of Good Hope. It is diſtinguiſhed by the length of its body, which is diſproportioned to its height: the delicate ſlenderneſs of its limbs: the uncommon ſtatelineſs and beauty of its horns, which are ſmooth, hollow, and as beautifully tranſparent as tortoiſe-ſhell; the ſtripes of white upon its ſkin: a black horny ſubſtance in its upper jaw, inſtead of teeth; a ſtripe of hair paſſing from the midſt of the horns to the tail, which is white from the ſhoulder downwards; and a tuft of hair reaching from the neck to the breaſt. There are alſo animals of the ſame name, though different from each other, in Aſia and America

COVE, a ſmall creek or bay, where boats and ſmall veſſels may ride at anchor, ſheltered from the wind and ſea.

COVENANT, the conſent or agreement of two or more parties to do or perform ſomething. A covenant ſeems to be much the ſame with a pactum, or conventum, among the civilians.

COVENANT, in law, is that which the law intends to be made, though it be not expreſſed in terms: as, if the leſſor demiſe, and grant a tenement to the leſſee for a certain term: the law intends a covenant on the leſſor's part, that the leſſee ſhall, during the term, quietly enjoy the leaſe againſt all lawful incumbrances.

COVENANT *to ſtand ſeiſed to Uſes*, is when a man that hath a wife, children, brother, ſiſter, or kindred both by covenant in writing under hand and ſeal, agree that for their or any of their proviſion or preferment, he and his heirs will ſtand ſeiſed of land, to their uſe, either in fee ſimple, fee tail, or for life.

COVENANT, in theology, is much uſed in connection with other terms. Thus, the covenant of grace is that which is made between God and thoſe who believe the goſpel, whereby they declare their ſubjection to him, and he declares his acceptance of them and favour to them. The goſpel is ſometimes denominated a covenant of grace, in oppoſition to the Moſaic law.

COVERTURE, in law, is particularly applied to the ſtate and condition of a married woman; who, by the laws of our realm, is under covert baron, or *ſub proteſtate viri*, and called a femme couvert; and therefore diſabled to make bargains with any, to the prejudice of herſelf, or her huſband.

COUGH, in medicine, a diſeaſe affecting the lungs, occaſioned by a ſharp ſerous humour, vellicating the fibrous coat thereof, and urging it to a diſcharge by ſpitting, &c. See Syſtem of MEDICINE.

COUGH, in farriery, is a diſeaſe to which horſes are very ſubject. Some of theſe are ſymptomatic of a conſumption, when they have been of long continuance, and are attended with loſs of appetite, waſting of fleſh, and weakneſs. Other coughs proceed from phlegm and ſlimy matter that ſtuff up the veſſels of the lungs: in this caſe, which is of the aſthmatic kind, the horſe's flanks have a quick motion; he breathes quick; his cough is ſometimes dry and huſky, ſometimes moiſt, before which he wheezes, rattles in the throat, and throws out of his noſe and mouth a quantity of white phlegm. See FARRIERY.

COUGH, called the huſk, is a diſeaſe to which cows and bullocks are ſubject. In this diſorder, the wind-pipe and its branches are loaded with ſmall taper worms. Farmers count the diſeaſe incurable; but fumigations with mercurials, as cinnabar, or with fœtids, as tobacco, might prove ſerviceable. Phil. Tranſ. vol. xlix. part ii. p. 247.

COVING, in building. When houſes are built projecting over the ground plot, and the turned projecture arched with timber, lathed and plaſtered; the work is called coving.

COUL, or COWL, a ſort of monkiſh habit worn by the Bernardines, and Benedictines. There are two kinds of couls; the one white, very large, worn in ceremony, and when they aſſiſt at the office: the other black worn on ordinary occaſions, in the ſtreets, &c.

COULTER, in huſbandry, an iron inſtrument, fixed in the beam of a plough, and ſerving to cut the edge of each furrow. The moſt modern and uſeful implement to which coulters are affixed, is the Rev. Mr. COOKE's Drill Machine, to which ſix or nine coulters may be affixed at one time. Theſe may be removed at pleaſure, and the ſame machine may be converted into a horſe-hoe with ſix or nine hoes. See Syſtem of AGRICULTURE, Sect. XXX. and Plate II.

COUNCIL, in a general ſenſe, an aſſembly met together to conſider, examine, or deliberate on any ſubject.

COUNCIL, an aſſembly of divers conſiderable perſons to concert meaſures relating to the ſtate.

In Britain, the law, in order to aſſiſt the king in the diſcharge of his duties, the maintenance of his dignity, and the exertion of his prerogative, hath aſſigned him a diverſity of councils to adviſe with.

1. The firſt of theſe is the high court of parliament. See PARLIAMENT.

2. The peers of the realm are by their birth hereditary counſellors of the crown; and may be called together by the king, to impart their advice in all matters of importance to the realm, either in time of parliament, or, which hath been their principal uſe, when there is no parliament in being. Accordingly Bracton, ſpeaking of the nobility of his time, ſays they might properly be called, "conſules a conſulendo; reges enim tales ſibi aſſocians ad conſulendum." And in the law books it is laid down, that the peers are created for two reaſons: 1. *Ad conſulendum.* 2. *Ad defendendum, regem:* for which reaſons the law gives them certain great and high privileges; ſuch as freedom from arreſts, &c. even when no parliament is ſitting; becauſe the law intends, that they are always aſſiſting the king with their counſel for the common wealth, of keeping the realm in ſafety by their proweſs and valour. Inſtances of conventions of the peers, to adviſe the king, have been in former times very frequent; though now fallen into diſuſe, by reaſon of the more regular meetings of parliament.

However, in caſes of emergency, our princes have at ſeveral times thought proper to call for, and conſult as many of the nobility as could eaſily be brought together: as was particularly the caſe with king James II. after the landing of the prince of Orange; and with the prince of Orange himſelf, before he called the convention parliament which afterwards called him to the throne.

Beſide this general meeting, it is uſually looked upon to be the right of each particular peer of the realm, to demand an audience of the king, and to lay before him with decency and reſpect ſuch matters as he ſhall judge of importance to the public weal. And therefore, in the reign of Edward II. it was made an article of impeachment in parliament againſt the two Hugh Spencers, father and ſon, for which they were baniſhed the kingdom, "that they by their evil council would not ſuffer the great men of the realm, the king's good counſellors, to ſpeak with the king, or to come near him; but only in preſence and hearing of ſaid Hugh the father, and Hugh the ſon, or one of them, and at their will, and according to ſuch things as pleaſed them."

3. A third council belonging to the king, are, according to Sir Edward Coke, his judges of the courts of law, for law-matters. Here, by the expreſſion of king's council, were underſtood the king's judges of his courts of juſtice, the ſubject matter being legal; this being the general way of interpreting the word council.

4. But the principal council belonging to the king is his privy council, which is generally, by way of eminence, called the council. And this, according to Sir Edward Coke's deſcription of it, is a noble, honourable, and reverend aſſembly, of the king, and ſuch as he wills to be of his privy council, in the king's court or palace. The king's will is the ſole conſtituent of a privy counſellor; and this alſo regulates their number. In the time of Charles II. the ancient office of lord preſident of the council was revived in the perſon of Anthony earl of Shafteſbury; an officer that by the ſtatute of 31 Henry VIII. c. 10. has precedence next after the chancellor and lord treaſurer. Privy counſellors are made by the king's nomination, without either patent or grant; and, on taking the neceſſary oaths they become immediately privy counſellors during the life of the king that chooſes them, but ſubject to removal at his diſcretion.

The diſſolution of the privy council depends upon the king's pleaſure; and he may, whenever he thinks proper, diſcharge any particular member, or the whole of it, and appoint another.

COUNCIL *of War*, is an aſſembly of the principal officers of an army, or fleet, occaſionally called by the general, or admiral, to conſider of the preſent ſtate of things, and concert meaſures for their conduct, with regard to ſieges, retreats, engagements, &c.

COUNSELLOR, in general, a perſon who adviſes another: thus we ſay, a counſellor at law, a privy counſellor, &c.

COUNSELLOR *at Law*, a perſon retained by a client to plead his cauſe in a public court of judicature.

COUNT, a nobleman who poſſeſſes a domain erected into a county. See VISCOUNT.

COUNT, a title of foreign nobility, which anſwers to that of earl among us. Counts palatine were formerly ſuch as had an office in the king's palace, as appears by their titles; but counts palatine in England were ſuch as had regal power within their own juriſdiction. Counts were originally lords of the court, or of the emperor's retinue; and had their name *comites a comitando.*

COUNT *Wheel*, in clock work, a wheel which moves round in twelve hours; called alſo the locking wheel.

COUNTER, a term which enters into the compoſition of diverſe words of our language, and generally implies oppoſition; but when applied to deeds, means an exact copy kept of the contrary party, and ſometimes ſigned by both parties.

COUNTER, from *computare*, is the name of two priſons in London, for the uſe of the city, to confine debtors, breakers of the peace, &c.

COUNTER APPROACHES, in fortification, lines or trenches made by the beſieged, when they come out to attack the lines of the beſiegers in form

COUNTER BOND, is a bond given to ſave a perſon harmleſs, who has given his bond for another. This is alſo called counter-ſecurity.

COUNTER CHANGED, in heraldry, is when there is a mutual changing of the colours of the field and charge in an eſcutcheon, by means of one or more lines of partition. Thus, in the coat of the famous Chaucer: he beareth, party per pale argent and gules, a bend counter-charged: that is, that part of the bend, which is in that ſide of the eſcutcheon which is argent, is gules; and that part of it which is on the other, is argent. See Heraldry, Plate V.

COUNTER CHARGE, is a reciprocal charge, or recrimination brought againſt an accuſer.

COUNTER CHEVRONED, denotes a ſhield chevronny, or parted by ſome line of partition. See Heraldry, Plate III.

COUNTER COMPONED, or Contre-Componé, or Counter Compony, or Gobony, is when a bordure is compounded of two ranks of panes. See Heraldry, Plate III.

COUNTERFEITS, in law, are perſons that obtain any money or goods by counterſeit letters or falſe tokens, who being convicted before juſtices of aſſize or of the peace, &c. are to ſuffer ſuch puniſhment as ſhall be thought fit to be inflicted under death, as impriſonments, pillory, &c.

COUNTER FORTS, *Buttreſſes*, or *Spurs*, are pillars of maſonry, ſerving to prop or ſuſtain walls, or terraces, ſubject to bulge, or be thrown down.

COUNTER GAGE, in carpentry, a method uſed to meaſure the joints, transferring, v. gr. the breadth of a mortiſe to the place in the timber where the tenon is to be, in order to make them fit each other.

COUNTERMAND, in a general ſenſe, a revocation of an order; or an excuſe for ſetting aſide, or deferring, a thing ordered to be done.

COUNTER MARCH, in military affairs, a change of the face or wings of a battalion, by which means thoſe that were in the front come to be in the rear. It alſo ſignifies returning, or marching back again.

COUNTER MARK, a ſecond or third mark, put on any thing marked before. The word is applied, in commerce, to the ſeveral marks put on a bale of goods belonging to ſeveral merchants; that it may not be opened but in the preſence of them all, or their agents.

COUNTER MINE, in war, a ſubterraneous vault, running the whole length of a wall, three feet abroad, and ſix deep, with ſeveral holes and apertures therein: contrived to prevent the effect of mines, in caſe the enemy ſhould make any to blow up the wall.

COUNTER PALED, Contre-Paled, in heraldry, is when the eſcutcheon is divided into twelve pales parted per feſſe, the two colours being counter changed; ſo that the upper are of one colour, or metal, and the lower of another.

COUNTER PART, a part of ſomething oppoſite to another part. Thus, in muſic the baſe and treble are two counter parts, or oppoſite parts.

Counter Part, in law, is the duplicate, or copy, of an indenture, or deed. That executed by the grantor is called the original, the reſt are counter parts; though it is better for all the parties to execute all, which renders them originals.

COUNTER PLEA, in law, a replication to a plea, or prayer. When a tenant by courteſy, in dower, or other real action, prays the view or aid of the king, or him in the reverſion, for his better defence; or if a ſtranger to the action begun deſire to be admitted to ſay what he can for the ſafeguard of his eſtate: that which the demandant alleges againſt this requeſt, why it ſhould not be admitted, is called a counter plea.

COUNTER PLOT, a plot, or intrigue, contrived to thwart and overthrow another.

COUNTER POINT, in muſic, the art of compoſing harmony; or of diſpoſing and concerting ſeveral parts ſo together, as that they make an agreeable whole. See Syſtem of Music.

COUNTER POINTED, by the French called *contre pointé* is when two chevrons in one eſcutcheon meet in the points; the one riſing, as uſual, from the baſe; and the other inverted, falling from the chief: ſo that they are counter, or oppoſite one another in the points. They may alſo be counter-pointed the other way: that is, when they are founded on the ſides of the ſhield, and the points meet that way; *counter pointed in feſſe*.

COUNTER-POISE, any thing ſerving to weigh againſt another. Rope dancers uſe a pole by way of counterpoiſe, to keep their bodies in equilibrio.

COUNTER-POTENT, or Potent Counter-Potent, by the French heralds called *contre-potence*, is reckoned a fur, as well as vair and ermine; but compoſed of ſuch pieces as repreſent the tops of crutches, called in French *potences*, and in old Engliſh *potents*.

COUNTER-QUARTERED, by the French called *contre-écſcarte*, denotes the eſcutcheon, after being quartered, to have each quarter divided again into two: ſo that there are in it eight quarters, or diviſions.

COUNTER-SALIENT, is when two beaſts are borne in a coat of arms in a poſture of leaping from each other, directly the contrary way. See Heraldry, Plate V.

COUNTER-SCARP, in fortification, the exterior ſlope, or acclivity of the ditch, looking towards the champagne. See Heraldry, Plate V.

COUNTER-SIGNING, the ſigning an order, or patent of a ſuperior, in quality of ſecretary; to render the thing more authentic. Charters, &c. are ſigned by the king, and counter-ſigned by a ſecretory of ſtate, of the lord chancellor.

COUNTER-TENOR, is one of the mean or middle parts of muſic: ſo called, as being oppoſite to the tenor. It is likewiſe applied to a voice which is of higher pitch than the tenor, but lower than the treble.

COUNTER-TRENCH, in fortification, a trench of twelve or fifteen feet wide, made againſt the beſiegers, and which, of conſequence, has its parapet turned towards them. There are uſually a great many communications between this and the place, to prevent the enemy from making any uſe of it, in caſe they render themſelves maſters thereof.

COUNTER-TRIPPING, or Counter Trippant, in heraldry, is when two beaſts are borne in a coat of arms tripping, i. e. in a walking poſture, and the head of the one to the tail of the other. See Plate III.

COUNTER-VAIR, in heraldry, is when bells or cups of the ſame tincture are placed baſe againſt baſe, and point againſt point.

COUNTER-WORKING, in the military art, the raiſing of works, in order to oppoſe thoſe of the enemy.

COUNTRY, among geographers, is uſed indifferently to denote either a kingdom, province, or leſſer diſtrict. But its moſt frequent uſe is in contradiſtinction to town.

COUNTRIES, among the miners, a term or appellation they give to their works under ground. Phil. Tranſ. N° 198.

COUNTRY-DANCE is of Engliſh origin, though tranſplanted into almoſt all the countries and courts of Europe. There is no eſtabliſhed rule for the compoſition of tunes to this dance, becauſe there is in muſic no kind of time whatever which may not be meaſured by the motions common in dancing; and there are few ſong tunes of any note within the laſt century, that have not been applied to country dances.

Country, *Trial by*, the ſame with trial by jury.

COUNTY, originally ſignifies the territory of a count, or earl. But now it is uſed in the ſame ſenſe with ſhire; the one word coming from the French, the other from the Saxon. In this view, a county is a circuit, or portion of the realm; into fifty two of which, the whole land, England and Wales, is divided, for its better government, and the more eaſy adminiſtration of juſtice.

For the execution of the laws in the ſeveral counties, excepting Cumberland, Weſtmoreland, and Durham, every Michaelmas term, officers are appointed, under the denomination of ſheriffs. This officer has a double function: firſt, miniſterial, to execute all proceſſes and precepts of the courts of law directed to him: and ſecondly, judicial; whereby he has authority to hold two courts, the one called the ſheriff's tourn, the other the county court. Other officers of the ſeveral counties are, a lord lieutenant, who has the command of the militia of the county: *cuſtodes rotulorum, juſtices of Peace, bailiffs, high-conſtable, and coroner*. See farther under Lord Lieutenant, Militia, Custos *Rotulorum*, Justice *of the peace*, *High* Constable, Bailiff, and Coroner. Of the fifty two counties, there are three of ſpecial note, which are therefore termed counties palatine, as Lancaſter, Cheſter, and Durham. The two latter are ſuch by preſcription, or immemorial cuſtom, at leaſt as old as the Norman conqueſt; the former was created by Edward III. in favour of Henry Plantagenet, firſt Earl and duke of Lancaſter. Pembroke alſo, and Hexham, were antiently counties palatine; which laſt belonged to the archbiſhop of York, and was ſtripped of its privilege in the reign of queen Elizabeth, and reduced to be part of the county of Northumberland: the former was aboliſhed in 27 Henry VIII. the latter in 14 Eliz.

The chief governors of theſe counties palatine, heretofore, by a ſpecial charter from the king, ſent out all writs in their own names; and touching juſtice, did all things as abſolutely as the king himſelf in other counties; only acknowledging him their ſuperior and governor: whence palatine, a *palatio*, becauſe the owners of them had *jura regalia* as fully as the king hath in his palace. Theſe privileges were probably granted to them becauſe they bordered on enemies countries, viz. Wales and Scotland. But in Henry the Eighth's time, the ſaid power was much abridged; though ſtill all writs are witneſſed in their names, and all forfeitures for treaſon by the common law accrue to them. The iſle of Ely has been ſometimes reckoned among the counties palatine, though it is properly only a royal franchiſe; the biſhop having, by grant of king Henry I. *jura regalia* within the iſle of Ely, whereby he exerciſes a juriſdiction over all cauſes, criminal and civil.

County Corporate, is a title given to ſeveral cities, or ancient boroughs, on which the Engliſh monarchs have thought fit to beſtow extraordinary privileges; annexing to them a particular territory, land, or juriſdiction; and making them counties of themſelves, to be governed by their own ſheriffs and magiſtrates. The chief of theſe is the city of London; with York, Canterbury, Briſtol, Cheſter, Norwich; the towns of Kingſton upon Hull, Newcaſtle upon Tyne, and Haverford Weſt in Wales, &c.

County *Rates*, are thoſe ordered by juſtices of peace at their quarter ſeſſions; collected by high conſtables of hundreds, and paid to treaſurers appointed by the juſtices, for repairing bridges. &c. 12 Geo. II. c. 29.

COUPED, Coupee', in heraldry, expreſſes a head, limb, or other thing in an eſcutcheon, which is borne as if cut clear and even off, from the trunk; in oppoſition to its being forcibly torn off, which they call eraſed. Thus, the arms of Ulſter, which all baronets carry, is a texter hand couped, or cut off at the wriſt.

Couped, *Coupeē*, is alſo uſed to denote ſuch croſſes, bars, bends, chevrons, &c. as do not touch the ſides of the eſcutcheon, but are, as it were, cut off from them.

COUPLE *Cloſe*, in heraldry, the fourth part of a chevron: never borne but in pairs, except a chevron be between, ſaith Guillim; though Bloom gives an inſtance to the contrary.

COUPLET, a diviſion of an hymn, ode, ſong, or the like, wherein an equal number, or equal meaſure, of verſes is found in each part. The word is French, formed from the Latin *copula*.

COURAGE, in ethics, is that quality of the mind, derived either from conſtitution or principle, or both, that enables men to encounter difficulties and danger.

COURANT, or Current, a term uſed to expreſs the preſent time: thus, the year 1789 is the courant year; the fifteenth courant, the fifteenth day of the month now running. The term is French, and properly ſignifies running.

Courant is alſo uſed for any thing that has courſe, or is received, in commerce: in which ſenſe, we ſay, courant, or current coin, &c.

COURAP, the modern name for a diſtemper very common in Java and other parts of the Eaſt Indies. It is a ſort of herpes or itch on the arm pits, groins, breaſt, and face: the itching is almoſt perpetual; and the ſcratching is followed by great pain, and a diſcharge of matter, which makes the linen ſtick ſo to the ſkin as not eaſily to be ſeparated without tearing off the cruſt. Courap is a general name for any ſort of itch; but this diſtemper is thus called by way of eminence. It is ſo contageous that few eſcape it. Yet the inhabitants imagine it is attended with this advantage, that while a perſon is affected with it, he is ſure to be troubled with no other dangerous diſtemper: and they look upon the diſappearing of this, as a prognoſtic of ſome worſe diſorder. They are therefore very eaſy under it for years together, without being very ſolicitous about curing it. It is remarkable that the vulgar in Scotland are poſſeſſed of the ſame opinion with reſpect to the itch: and even carry it ſo far as to affirm, that the catching this diſtemper proves a cure for any other previous to it; conſidering it in the ſame light as others do the gout, and perhaps with equal foundation. See Syſtem of Medicine.

COURIER, or Currier, from the French *courir, to run*, a meſſenger ſent poſt, or expreſs, to carry diſpatches. Under the Weſtern empire, they were called viatores; and under that of Conſtantinople, curſores.

COURSE, *Route*, in navigation, the angle contained between the neareſt meridian and that poiht of the compaſs upon which a ſhip ſails in any particular direction.

Course, the time ordinarily ſpent in learning the principles of a ſcience, or the uſual points and queſtions therein. Thus, a ſtudent is ſaid to have finiſhed his courſe in the humanities, in philoſophy, &c.

Course *of Lectures* is alſo uſed for the elements of an art exhibited and explained, either in writing, or by actual experiment. Hence our courſes of philoſophy, anatomy, chymiſtry, mathematics, &c. probably ſo called, as going throughout, or running the whole length or courſe of the art, &c.

COURSES, in ſea language, is uſed for a ſhip's main ſail and fore ſail. When ſhe ſails under them only, without lacing on any bonnets, they ſay ſhe goes under *a pair of courſes*. Or more generally all the principal ſails, viz. the main ſail, fore ſail, and mizen, are thus diſtinguiſhed.

COURSING. There are three ſeveral courſes with greyhounds. 1. At the hare. 2. At the fox. And, 3. At the deer. For the deer there are two ſorts of courſes, the one in the paddock courſe, there muſt be the greyhound and the terrier, and the mungril greyhound, whoſe buſineſs it is to drive away the deer before the greyhounds are ſlipped; a brace, or a leaſh, are the uſual number ſlipped at a time, ſeldom at the utmoſt more than two brace. In courſing the deer in the foreſt or purlieu, there are two ways in uſe, the one is courſing from wood to wood, and the other upon the lawns by the keeper's lodge. In the courſing from wood to wood, the way is to throw in ſome young hounds into the wood, to bring out the deer; and if any deer come out that is not weighty, or a deer or antler, which is buck, ſore, or ſorrel, then you are not to ſlip your greyhounds, which are held at the end of the wood, where the keepers, who can gueſs very well on theſe occaſions, expect that the deer will come out. If a proper deer come out, and it is ſuſpected that the brace or leaſh of greyhounds ſlipped after him, will not be able to kill him, it is proper to waylay him with a couple of freſh greyhounds. The courſing upon the lawn is the moſt agreeable of all other ways. When the keeper has notice of this, he will lodge a deer for the courſe, and then by coming under the wind, the greyhound may be brought near enough to be ſlipped for a fair courſe. The beſt method of courſing the hare, is to go out and find a hare ſitting, which is eaſily done in the ſummer, by walking acroſs the lands, either ſtuble, fallow, or corn grounds; for in ſummer they frequent theſe places for fear of the ticks, which are common in the woods at that ſeaſon; and in autumn, the rains falling from the trees offend them. The reſt of the year there requires more trouble, as the buſhes and thickets muſt be beat to rouſe them, and often they will lie ſo cloſe, that they will not ſtir till the pole almoſt touches them: the ſportſmen are always pleaſed with this, as it promiſes a good courſe.

If a hare lies near any cloſe or covert, and with her head that way, it is always to be expected that ſhe will take to that immediately on being put up, and place themſelves between her and the covert before ſhe is put up, that ſhe may take the other way, and run on an open ground. When a hare is put up, it is always proper to give her ground or law, as it is called, that is to let her run twelve ſcore yards, or thereabouts, before the greyhounds are ſlipped at her, otherwiſe ſhe is killed too ſoon, and the greateſt part of the ſport thrown away, and the pleaſure of the ſeveral windings and turnings that the creature will make to get away, is all loſt. A good ſportſman had rather ſee a hare ſave herſelf, after a fair courſe, than ſee her murdered by the greyhounds as ſoon as ſhe is up. In courſing the fox, no other art is required than ſtanding cloſe, and on a clear wind, on the outſide of ſome grove, where it is expected he will come out; and when he is come out, he muſt have head enough allowed him, elſe he will turn back to the covert. The ſloweſt greyhound will be able to overtake him after all the odds of diſtance neceſſary; and the only danger is the ſpoiling the dog by the fox, which too often happens; for this reaſon, no greyhound of any value ſhould be run at this courſe, but the ſtrong hard-bitten dogs, that will ſeize any thing.

For the laws of courſing eſtabliſhed by the duke of Norfolk, and the ſportſmen of the kingdom in the reign of queen Elizabeth, ſee Sportſman's Dict. in voc.

COURT, an appendage to a houſe or habitation; conſiſting of a piece of ground incloſed with walls, but open upwards.

Court is alſo uſed for the palace, or place where a king or ſovereign prince reſides.

Court, in a law ſenſe, is defined to be a place wherein juſtice is judicially adminiſtered. And, as by our excellent conſtitution the ſole executive power of the laws is veſted in the perſon of the king, it will follow that all courts of juſtice, which are the medium by which he adminiſters the laws, are derived from the power of the crown. For whether created by act of parliament, or letters patent, or ſubſiſting by preſcription (the only methods by which any court of judicature can exiſt) the king's conſent in the two former is expreſsly, and in the latter impliedly, given. In all theſe courts, the king is ſuppoſed in contemplation of law to be always preſent; but as that is in fact impoſſible, he is there repreſented by his judges, whoſe power is only an emanation of the royal prerogative.

For the more ſpeedy, univerſal, and impartial adminiſtration of juſtice between ſubject and ſubject, the law hath appointed a prodigious variety of courts, ſome with a more limited, others with a more extenſive juriſdiction; ſome conſtituted to inquire only, others to hear and determine; ſome to determine in the firſt inſtance, others upon appeal and by way of review. One diſtinction may be here mentioned, that runs throughout them all, viz. that ſome of them are courts of record, others not of record. A court of record is that where the acts and judicial proceedings are enrolled in parchment for a perpetual memorial and teſtimony: which rolls are called the records of the court, and are of ſuch high and ſupereminent authority, that their truth is not to be called in queſtion. For it is a ſettled rule and maxim, that nothing ſhall be averred againſt a record, nor ſhall any plea, or even proof, be admitted to the contrary. And if the exiſtence of a record be denied, it ſhall be tried by nothing but itſelf; that is, upon bare inſpection whether there be any ſuch record or no; elſe there would be no end of diſputes. But, if there appear any miſtake of the clerk in making up ſuch record, the court will direct him to amend it. All courts of record are the king's courts, in right of his crown and royal dignity, and therefore no other court hath authority to fine or impriſon; ſo that the very erection of a new juriſdiction with power or impriſonment makes it inſtantly a court of record.

A court not of record is the court of a private man; whom the law will not intruſt with any diſcretionary power over the fortune or liberty of his fellow ſubjects. Such are the courts baron incident to every manor, and other inferior juriſdictions: where the proceedings are not enrolled or recorded; but, their exiſtence as well as the truth of the matters cognizable by the common law, unleſs under the value of 40s.; nor of any forcible injury whatſoever, not having any proceſs to arreſt the perſon of the defendant.

In every court there muſt be at leaſt three conſtituent parts, the *actor*, *reus*, and *judex*; the *actor*, or plaintiff, who complains of an injury done; the *reus*, or defendant, who is called upon to make ſatisfaction for it; and the *judex*, or judicial power, which is to examine the truth of the fact, to determine the law ariſing upon that fact, and, if any injury appears to have been done, to aſcertain and by its officers to apply the remedy. It is alſo uſual in the ſuperior courts to have attorneys, and advocates or counſel, as aſſiſtants. See ATTORNEY, and COUNSEL.

COURT *Baron*, in Engliſh law, a court incident to every manor in the kingdom, to be holden by the ſteward within the ſaid manor. This court baron is of two natures: the one is a cuſtomary court, appertaining entirely to the copyholders, in which their eſtates are transferred by ſurrender and admittance, and other matters tranſacted relative to their tenures only. The other is a court of common law, and it is the court of the barons, by which name the freeholders were ſometimes anciently called: for that it is held before the freeholders who owe ſuit and ſervice to the manor, the ſteward being rather the regiſtrar than the judge. Theſe courts, though in their nature diſtinct, are frequently confounded together. The court we are now conſidering, viz. the freeholder's court, was compoſed of the lord's tenants, who were the pares of each other, and were bound by their feodal tenure to aſſiſt their lord in the diſpenſation of domeſtic juſtice. This was formerly held every three weeks; and its moſt important buſineſs is to determine, by writ of right, all controverſies relating to the right of lands within the manor. It may alſo hold plea of any perſonal actions, of debt, treſpaſs on the caſe, or the like, where the debt or damages do not amount to 40s. which is the ſame ſum, or three marks, that bounded the juriſdiction of the ancient Gothic courts in their loweſt inſtance, or *fierding courts*, ſo called becauſe four were inſtituted within every ſuperior diſtrict or hundred. But the proceedings on a writ of right may be removed into the county-court by a precept from the ſheriff called a *tolt*, "*quia tollit atque eximit cauſam e curia baronum.*" And the proceedings in all other actions may be removed into the ſuperior courts by the king's writ of *pone*, or *accedas ad curiam*, according to the nature of the ſuit. After judgment given, a writ alſo of falſe judgment lies to the courts at Weſtminſter to rehear and review the cauſe, and not a writ of error; for this is not a court of record: and therefore, in ſome of theſe writs of removal, the firſt direction given is to cauſe the plaint to be recorded, *recordari facias loquelam.*

Baron COURT, in Scots law. See LAW, N° clviii. 12, 13, 14.

COURT *of Admiralty*, is a court held by the high admiral, or commiſſioners of the admiralty; to which belongs the deciſion or all maritime controverſies, trials of malefactors, and the like. The proceedings in this court, in all civil matters, are according to the civil law; becauſe the ſea is without the limits of the common law, and under the admiral's juriſdiction.

COURT *of Arches, Curia de Arcubus*, the chief and moſt ancient conſiſtory court belonging to the archbiſhop of Canterbury, for the debating of ſpiritual cauſes. It is ſo called from the church in London, commonly called St. Mary le bow, where it was formerly held, which church had its name from the ſteeple, which was raiſed by pillars built archways, like bent bows.

The judge of this court is ſtyled dean of the arches, or official of the arches court. He hath extraordinary juriſdiction in all eccleſiaſtical cauſes, except what belong to the prerogative court; alſo all manner of appeals from biſhops, or their chancellors or commiſſaries, deans and chapters, &c. The perſons concerned in this court, are the judge, advocate, regiſters, proctors, &c. and the foundation of a ſuit in theſe courts, is a citation for the defendant to appear; then the libel is exhibited, which contains the action, to which the defendant muſt anſwer; whereupon the ſuit is conteſted, proofs are produced, and the cauſe determined by the judge, upon hearing the advocates on the law and fact; when follows the ſentence and decree thereupon.

This court, as alſo the court of peculiars, the admiralty court, the prerogative court, and the court of delegates, for the moſt part is now held in the hall belonging to the college of civilians, commonly called Doctors Commons. Floy. 21. From this court, the appeal is to the king in Chancery, by 25 Hen. VIII. c. 19.

Biſhops COURT, an eccleſiaſtical court held in the cathedral of each dioceſe; the judge whereof is the biſhop's chancellor, anciently called *eccleſiaſticus*, and *eccleſiæ cauſidicus*, q. d. the church lawyer; who judges by the civil and canon law; and, if the dioceſe be large, has his commiſſaries in remote parts, who hold what they call conſiſtory courts, for matters limited to them by their commiſſion.

COURT *of Chancery*, the grand court of equity, and conſcience, inſtituted to moderate the rigour of the other courts that are tied to the ſtricteſt letter of the law. The judge of this court is the lord high chancellor, whoſe function ſee under CHANCELLOR.

The proceedings of this court are either ordinary, like other courts, according to the laws, ſtatutes, and cuſtoms of the nation, by granting out writs remedial and mandatory, writs of grace, &c. or extraordinary, according to equity and conſcience, by bills, anſwers, and decrees, to examine frauds, combinations, truſts, ſecret uſes, &c. to ſoften the ſeverity of common law, and reſcue people from oppreſſion; to relieve them againſt cheats, unfortunate accidents, breaches of truſt, &c. Out of the court of chancery, are iſſued writs of ſummonſes for parliaments and convocations, edicts, proclamations, charters, protections, patents, ſafe-conducts, and writs of *moderata miſericordia, &c.*

Here are alſo ſealed and enrolled letters patent, treaties and leagues, deeds, writs, and commiſſions. The officers of this court, beſide the lord chancellor, who is ſupreme judge, are, the maſter of the rolls, who, in the chancellor's abſence, hears cauſes, and gives decrees; and twelve maſters of chancery, one of whom is the maſter of the rolls, who are aſſiſtants, and ſit by turns on the bench.

For the equity part of this court there are ſix clerks, and their deputies, who have under them a number of others, called the ſixty ſworn clerks, in the nature of attorneys of the court; two chief examiners, four examining witneſſes, who have each five or ſix clerks apiece; one principal regiſter, who has four or five deputies; clerk of the crown, who makes out writs, commiſſions, &c. warden of the Fleet; ſerjeant at arms, who bears the mace before the chancellor; and the uſher and crier of the court. Appeals from the decrees of the court of chancery may be brought into the Houſe of Lords. All matters of truſt are particularly within the juriſdiction of the court of chancery.

COURT *of Chivalry*, or the Marſhal's Court, a court whereof the judges are, the lord high conſtable, and the earl marſhal of England. This court is the fountain of marſhal law; and the earl marſhal is not only one of the judges, but alſo to ſee execution done. 4 Inſt. 123. See CHIVALRY.

COURT *of Common Pleas, Communia placita*, or *Bancus communis*, one of the king's courts, held in Weſtminſter Hall. The juriſdiction of this court is founded on original writs, iſſuing out of the chancery, which are the king's mandates for them to proceed on to determine ſuch and ſuch cauſes. But this is to be underſtood when the cauſe is between common perſons; for when an attorney, or any perſon belonging to the court, is plaintiff, he ſues by writ of privilege, and is ſued by bill, which is in nature of a petition; both which originally commence in the common pleas, and have no foundation in the chancery. 4 Inſt. 99.

All civil cauſes, both real, perſonal, and mixed, are tried in this court, according to the ſtrict law of the realm. The chief juſtice hereof is called the lord chief juſtice of the common pleas, whoſe ſalary is 2500l. a year; who is accompanied with three of his aſſociates, at a ſalary of 2000l. each, created by letters patent, and as it were judges inſtalled or placed on the common bench by the lord chancellor, and the lord chief juſtice of the court.

COURT *of Conſcience, Curia conſcientiæ.* In the 9th of Henry VIII. the court of conſcience in London was erected: there was then made an act of common council, that the lord mayor and aldermen ſhould aſſign monthly two aldermen and four commoners, to be commiſſioners to ſit in this court twice a week, to hear and determine all matters brought before them between party and party, between citizens and freemen of London, in all caſes where the debt or damage was under forty ſhillings.

There are many other courts of conſcience eſtabliſhed by act of parliament, of a ſimilar nature; as that for Southwark, for Weſtminſter, the Tower Hamlets, &c. &c.

COURT *of Exchequer*, is a court wherein are tried all cauſes relating to the king's treaſury, or revenue: as, touching accounts, diſburſements, cuſtoms, fines, &c. It conſiſts of ſeven judges, viz. the lord treaſurer, the chancellor of the exchequer, the lord chief baron with a ſalary of 3000 l. a year, and three other barons of the exchequer at a ſalary, of 2000 l. a year each, with one curſitor baron. The lord chief baron is the principal judge of the court. See BARONS *of the Exchequer*.

The court of exchequer is divided into two: the one of law, the other of equity. All judicial proceedings according to law, are ſtyled, *coram baronibus* only: but the court of equity held in the exchequer chamber, is *coram theſaurario, cancellario, & baronibus*; before the treaſurer, chancellor, and barons. For a long time after the conqueſt, there ſat in the exchequer, both ſpiritual and temporal barons of the realm: but of later times, there have ſat in their places other judges, who, though no peers of the realm, yet retain the original denomination.

The immediate profits of the crown, as of franchiſes, lands, tenements, hereditaments, debts, duties, accounts, goods, chattels, all diſburſements, ſeizures, and fines impoſed on the ſubjects, &c. are all within the juriſdiction of the exchequer. And the king's attorney may exhibit bills, for any matter concerning the king inheritance, or profits; ſo alſo may any perſon who finds himſelf aggrieved in any cauſe proſecuted againſt him on behalf of the king, or any patent by grant of the king, exhibit his bill againſt the king's attorney, &c. to be relieved by equity in this court.

To this court belong two officers; the king's remembrancer's office, and that of the lord treaſurer's remembrancer.

The court of exchequer in Scotland has the ſame power, authority, privilege, and juriſdiction over the revenue of Scotland, as the court of Exchequer in England has over the revenues there.

COURT *of Huſtings*, a court of common pleas, held before the lord mayor and aldermen of London, in Guildhall. 4 Inſt. 247.

The court of huſtings is the principal and higheſt of all the courts of the city. This court determines all pleas, real, perſonal, and mixt: and here all lands, tenements, and hereditaments, rents, and ſervices within the city of London, and ſuburbs of the ſame, are pleadable in two huſtings; the one called huſtings of the plea of lands, and the other called huſtings of the common pleas. Error or attaint lies there of a judgment or falſe verdict in the ſheriff's courts. Other cities and towns had alſo courts of the ſame name; as Wincheſter, Lincoln, York, &c.

Court *of King's Bench, Bancus Regius,* a court, or judgment-ſeat, ſo called, becauſe the king is ſuppoſed to ſit in perſon as judge of the court, which was formerly the caſe, and may do ſo whenever he pleaſes; for which reaſon all writs, and other proceſs in this court, are made returnable *coram nobis,* that is, before the king himſelf, and not *coram juſticiariis noſtris,* as is the form in the common pleas. 4 Inſt. 73.

The judges of this court are the lord chief juſtice, whoſe annual ſalary is 4000*l.* and three other puiſne juſtices at 2000*l.* a year each. In this court are principally determined matters relating to the crown, and the peace. When any perſon is aggrieved by an order of juſtices, or quarter ſeſſions, they have recourſe thither; the rights of elections of mayors, bailiffs, conſtables, &c. are often upon mandamuſes, brought before this court to be ſettled; and prohibitions are hence iſſued out to ſtay proceedings in the eccleſiaſtical, admiralty, or any inferior court, where the matter appears to be triable at common law. The ſubject has alſo a right to ſue in this court for any debt or contract, as well as in any other court, and may as advantageouſly and expeditiouſly proceed. The chief juſtice preſides under his majeſty in this court; but when the court divides, in giving judgment upon any ſpecial argument, he hath but one voice; ſo that if the opinion of the court ſhould be equally divided, the matter muſt reſt till one of the judges ſhall ſee juſt reaſon to alter his opinion. He makes a return of all writs of error in parliament directed to this court: and with his own hand delivers the writ of error, and a tranſcript of the proceedings in the cauſe into the houſe of lords. This court has not only a power to reverſe erroneous judgments, for ſuch errors as appear the defect of the underſtanding; but alſo to puniſh all inferior magiſtrates, and all officers of juſtice, for wilful and corrupt abuſes of their authority againſt the obvious principles of natural juſtice.

This court is often termed the *cuſtos morum* of all the realm; and wherever it meets with an offence contrary to the firſt principles of juſtice, and of dangerous conſequence, if not reſtrained, it may adapt a proper puniſhment to it. For the better reſtraining ſuch offences, it has a diſcretionary power of inflicting exemplary puniſhment on offenders, either by fine, impriſonment, or other infamous puniſhment, as the nature of the crime, conſidered in all its circumſtances, ſhall require.

Court *of Marſhalſea,* a court of record to hear and determine cauſes, between the ſervants of the king's houſhold, and others within the verge: and hath juriſdiction of all matters within the verge of the court, and of pleas of treſpaſs, where either part is of the king's family; and of all other actions perſonal, wherein both parties are the king's ſervants. This is the original juriſdiction of the court of marſhalſea.

Court *Marſhal, Curia Martialis,* is a court for puniſhing the offences of officers and ſoldiers, in time of war: and it appears by our books, that if any perſon in commiſſion, in time of peace, put to death any man by martial law, it is againſt Magna Charta, and murder.

Mayor's Courts. To the lord mayor and city of London, belong ſeveral courts of judicature. The higheſt and moſt ancient is that called the huſtings, deſtined to ſecure the laws, rights, franchiſes, and cuſtoms of the city. The ſecond is a court of requeſt, or of conſcience. The third is the court of the lord mayor and aldermen, where alſo the ſheriffs ſit: to which may be added, two courts of ſheriffs; and the court of the city orphans, whereof the lord mayor and aldermen have the cuſtody. Alſo, the court of common council, which is a court or aſſembly, wherein are made all bye-laws which bind the citizens of London. It conſiſts, like the parliament, of two houſes: an upper, conſiſting of the lord-mayor and aldermen; and a lower, of a number of common councilmen, choſen by the ſeveral wards, as repreſentatives of the body of the citizens. In the court of common council, are made laws for the advancement of trade; and committees yearly appointed, &c. But acts made by them are to have the aſſent of the lord mayor and aldermen, by ſtat. 11 Geo. I. Alſo, the chamberlain's court, where every thing relating to the rents and revenues of the city, as alſo the lord mayor the affairs of ſervants, &c. are tranſacted. Laſtly, to the lord mayor belong the courts of coroner, and of eſcheator; another court for the conſervation of the river of Thames; another of gaol delivery, held uſually eight times a year, at the Old Bailey, for the trial of criminals, whereof the lord mayor is himſelf the chief judge. There are other courts called wardmotes, or meetings of the wards: and courts of halymote, or aſſemblies of the ſeveral guilds and fraternities.

Prerogative Court, is a court belonging to the archbiſhop of Canterbury; wherein all wills are proved, and all adminiſtrations granted, that belong to the archbiſhop by his prerogative; that is, where the party at his death had *bona notabilia,* five pounds or upwards, out of the dioceſe where he died, and within the archbiſhop's province. All citations and decrees of this court run in the name of the archbiſhop. This court, for the province of Canterbury, is kept in the common hall in Doctors Commons, in the afternoon, next day after the arches. The judge is attended by the regiſter, who ſets down the decrees and acts of court; and keeps records, &c. all original wills and teſtaments of parties dying, having *bona notabilia.* The place is uſually called the prerogative office: it is now kept in Dean's court; where, for a moderate fee, a copy may be had of any ſuch will. Appeal lies from this court to the king in chancery, who appoints delegates. The archbiſhop of York hath alſo the like court, called his exchequer.

Univerſity Court. The courts of the univerſities of Oxford and Cambridge, are of a particular nature: they were granted by charters, and confirmed by authority of parliament. See ſtat. 13 Eliz. 4 Inſt. 227. Theſe courts are called the chancellor's courts, and are kept by the vice chancellors of the univerſities. Their juriſdiction extends to all cauſes eccleſiaſtical and civil (except for maihem, felony, and relating to freeholds); where a ſcholar, ſervant, or miniſter of the univerſities, is one of the parties to the ſuit.

Courts *of Wales,* are eſtabliſhed over the principality chiefly by 12 Edward I. and 34 and 35 Henry VIII. c. 26. Beſides courts baron, hundred and county courts, like thoſe in England, a ſeſſion is held twice every year in each county, by judges appointed by the king; in which pleas and perſonal actions ſhall be held in the ſame manner, and with the ſame extent, as in the court of common pleas at Weſtminſter; and writs of error ſhall lie from judgment in them to the court of king's bench. And the proceedings are according to the laws of England.

COURT DAYS, are days when the courts of judicature are open, and pleas held.

COURT ROLL, a roll which contains an account of the number, &c. of lands depending on the lord of the manor; with the names of the tenants, &c. Tenants holding by copy of this roll, are denominated by copyholders.

COURTESY, or Curtesy *of England,* a tenure, whereby a man marrying an heireſs, or a woman poſſeſſed of lands in fee ſimple, or fee tail general, or poſſeſſed as heir of tail ſpecial, and getting a child by her which cometh alive into the world, though both wife and child die; yet, if ſhe were in poſſeſſion, he ſhall keep the land during his life, and be called *tenant by the courteſy of England;* this privilege being not allowed in any other country, except Scotland, where it is called *curialitas Scotiæ.*

COURTESAN, a term of infamy, applied to women who expoſe their perſons to men of rank, and make a trade of proſtitution. Laias, the famous Theban courteſan, ſtands on record for requiring no leſs than ten thouſand crowns for a ſingle night. Of all places in the world, Venice is that where courteſans abound the moſt; it is near three centuries, ſince the ſenate, which had expelled them, was obliged to recall them, to provide for the ſecurity of women of honour, and to keep the nobles employed, leſt they ſhould make innovations in the ſtate.

COUSIN, a term of relation and kinſhip, applied to thoſe who are deſcended from two brothers or two ſiſters. The word is derived from *conſanguineus.* In the firſt generation they are called *couſin germans,* i. e. next *couſins,* in the ſecond, *ſecond couſins:* in the third and fourth, *couſins in the third and fourth degrees.*

Cousin is alſo a title of honour, which kings beſtow on peers, or nobles, foreign princes of the blood, cardinals, and the principal perſons of their ſtate.

COUSU, in heraldry, is uſed in the ſame ſenſe as remply, viz. for a piece of another colour, or metal, placed on an ordinary as if it were ſewed on; which the word, in the French language, naturally implies: becauſe the additional piece is not properly on the field, but in the nature of a thing ſewed on, *adjutus.* This is generally of colour on colour, or metal on metal, contrary to the general rule of heraldry.

COUVERT, in heraldry, denotes ſomething like a piece of hanging, or pavillion, falling over the top of a chief, or other ordinary; ſo as not to hide, but only be a ſhading thereto.

COW, in zoology. See Bull, and Bos.

Sea Cow. See Trichecus.

Cow *Weed.* See Chervil.

COWARD, in heraldry. A lion borne, in an eſcutcheon, with his tail doubled, or turned in between his legs, is called a *lion coward.* See Heraldry. Plate V.

COWITCH. See Cowage.

COWL, or Coul, *Cuculla,* a ſort of hood, wore by certain monks. See Coul.

COWPER's *Glands,* in anatomy, a pair of glands diſcovered by Mr. Cowper in 1699, and lying upon each ſide of the *perinæum.*

COWSLIP, in botany. See Primula.

COXÆ *Os.* See Coccygis.

Coxæ, Coxendicis, *Oſſa,* and in Engliſh, the *hip bones,* called alſo *oſſa innominata,* are two large bones, ſituate on either ſide the *os ſacrum.* See Plate I. Osteology, Fig. I. letters *f.g.h.*

In infants, each of theſe conſiſts of three diſtinct bones, ſeparated

rated by cartilages; which in adults, grow up, and conſtitute one firm, ſolid bone; whoſe parts, however, retain three diſtinct names, according to their former diviſion, viz. the *os ilium*, *os iſchium*, by ſome peculiarly called *os coxendicis*, and the *os pubis*.

COXSWAIN, on board a ſhip. See COCKSWAIN.

CRAB, in icthyology, a genus of aptera in the claſs of inſects in the Linnæan ſyſtem, comprehending no leſs than eighty-ſeven ſpecies. Its characters are, that it has eight or ten feet, rarely ſix, two of the feet are clawed; the two eyes are remote, generally placed on a ſtalk, and moveable: the two feelers are cheliferous; and the tail is articulated. To this genus belong the crabs properly ſo called, cray-fiſh, ſhrimp, lobſter, &c.

The cancer major, or common large crab fiſh, has its abode from twenty to forty fathom water. Theſe animals herd together in diſtinct tribes, and have their ſeparate haunts for feeding and breeding, and will not aſſociate with their neighbours. This has been carefully tried, by marking the ſhell of a crab, and carrying it to two or three miles diſtance, and there leaving it among the ſame ſpecies; this crab has, after this, found its way home, and been caught in its old abode by the ſame fiſhermen. The fiſhermen find the crabs of this ſpecies from the ſize of a cheſnut to twelve pounds weight.

The cancer major, and all ſpecies of crabs, caſt their ſhells; though at what ſeaſon of the year, or how frequently, is not exactly to be determined; but it is believed to be annually, at the beginning of the ſummer, ſooner or later, according to the greater or leſs ſtrength of the crab. A membrane, like wet parchment, with which the carcaſe is enveloped, hardens by degrees into a new ſhell. Nothing, in the hiſtory of the crab, is ſo ſingular as its breaking off its own limbs, which it occaſionally does, in the following manner: the creature is able to do this in any poſition, but the moſt advantageous way of making the experiment is to lay it on its back; then, with a pair of iron pincers, break the ſhell, and bruiſe the fleſh of one of the outer joints of a ſmall leg: the wound will bleed, and the creature ſhew ſigns of pain, by moving it about: afterwards it holds it quite ſtill, in a direct and natural poſition, without touching any part of its body, or other legs with it; then, on a ſudden, with a gentle crack, the wounded part of the leg drops off, at the internodium of the ſecond joint from the body. If a hole be pierced in the great claws, or legs, and an iron put in to lacerate the muſcle, the effect is the ſame, and this large limb is thrown off in the ſame manner, only with more violence. When the leg is off, a mucus overſpreads the wound, and ſtops the bleeding; and a ſmall leg is by degrees, produced, which afterwards attains to the ſize of the former. Nature ſeems to have given this ſingular power to this creature for the preſervation of its life, in the mutual quarrels it very frequently has with others of its own ſpecies: in theſe one crab lays hold of the claws of another, and cruſhes it in ſuch a manner, that it would bleed to death, had it not this power of giving up the limb, and healing the wound. Phil. Tranſ. N° 478. S. 14. and vol. xlvii. N° 8.

CRAB's *Claws*, in the materia medica, are the tips of the claws of the common crab broken off at the verge of the black part, ſo much of the extremity of the claws only being allowed to be uſed in medicine as is tinged with this colour. The blackneſs, however, is only ſuperficial; they are of a greyiſh white within, and when levigated furniſh a tolerable white powder.

Crab's claws are of the number of the alkaline abſorbents, but they are ſuperior to the generality of them in ſome degree, as they are found on a chymical analyſis to contain a volatile urinous ſalt.

CRAB's *Eyes*, in pharmacy, are a ſtrong concretion in the head of the cray-fiſh. They are rounded on one ſide, and depreſſed and ſinuated on the other, conſiderably heavy, moderately hard, and without ſmell. We have them from Holland, Muſcovy, Poland, Denmark, Sweden, and many other places.

Crab's eyes are much uſed both in the ſhop-medicines and extemporaneous preſcriptions, being accounted not only abſorbent and drying, but alſo diſcuſſive and diuretic.

CRAB *Lice*, a troubleſome kind of vermin, which ſtick ſo faſt with their claws to the ſkin, as to render it difficult to diſlodge them. Being viewed with a glaſs, they nearly reſemble the ſmall crab fiſh; whence they obtained their popular name. They are alſo called *pluctulæ*, *morpiones*, *petolæ*, and *peſſolatæ*: they uſually infeſt the arm-pits, eye-lids, eye-brows, and pudenda. They will be quickly deſtroyed, and drop off dead, upon the application of a rag wet with the milk of ſublimate.

CRAB *Tree*, in botany. See PYRUS.

CRAB *Yaws*, a name in Jamaica for a kind of ulcer on the ſoles of the feet, with hard callous lips, ſo hard that it is difficult to cut them.

CRACKER, or ſea-pheaſant, in ornithology, the Engliſh name of the anas acuta. See ANAS.

CRADLE, a well known machine, in which children are rocked to ſleep. It alſo denotes that part of the ſtock of a croſs bow, in which the bullet is put.

CRADLE, in engraving, is the name of an inſtrument uſed in ſcraping mezzotintoes, and preparing the plate. It is formed of ſteel, reſembling a chiſſel, with one ſloping ſide, upon which are cut hollow lines very near each other, and at equal diſtances. The acting part of this tool is made circular, and the corners are rounded. After being properly tempered, it muſt be ſharpened on the whetſtone. There are various ſizes of this inſtrument.

CRADLE, in ſurgery, a caſe in which a broken leg is laid after being ſet.

CRAFT, a general name for all ſorts of veſſels employed to load or diſcharge merchant ſhips, or to carry alongſide or return the ſtores of men of war. Such are lighters, hoys, barges, prames, &c.

CRAKE, in ornithology. See RALLUS.

CRAMBE, SEA-CABBAGE, SEA-BEACH, KALE, or SEA-COLEWORT, a genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants. There are three ſpecies, all of them herbaceous eſculents, with perennial roots, producing annually large leaves, reſembling thoſe of cabbage, ſpreading on the ground with ſtrong flower ſtalks, and yellowiſh flowers; only one of the ſpecies is a native of Britain; it grows wild on the ſhores of many of the maritime counties of England; but is cultivated in many gardens, as a choice eſculent, and the young robuſt ſhoots of its leaves and flower ſtalks, as they iſſue from the earth after the manner of aſparagus ſhoots, are then in the greateſt perfection for uſe. At this period they appear white as if blanched, and when boiled, eat very ſweet and tender. Its principal ſeaſon for uſe is in April and May.

CRAMP, in medicine, a convulſive contraction of any muſcular part of the body. It is commonly removed by ſtretching, and rubbing the part affected. The word comes from the German *krampſe*, which ſignifies the ſame.

CRAMP *Fiſh*, in ichthyology, a ſpecies of the raja. See RAJA.

CRAMP *Iron*, a piece of iron, bent at each extreme, ſerving to bind together pieces of wood, ſtones, or other things.

CRAMPONEE', in heraldry. A croſs cramponeé, is that which at each end has a cramp, or ſquare piece coming from it.

CRANAGE, the liberty of uſing a crane at a wharf, and alſo the money paid for drawing up wares out of a ſhip, &c. with a crane.

CRANBERRY, in botany. See WHORTLE *Berry*.

CRANE, in the Linnæan Syſtem of Ornithology, a ſpecies of ardea. See ARDEA.

CRANE, a machine uſed in building and in commerce, for raiſing large ſtones, and other weights. See Syſtem of MECHANICS.

CRANE's *Bill*, a kind of forceps uſed by ſurgeons, and ſo named from its figure.

CRANE's *Bill*, in botany, &c. See GERANIUM.

CRANE *Fly*, in entomology. See TIPULA.

CRANIOLARIA, in botany, a genus of the angioſpermia order, belonging to the didynamia claſs of plants. There are two ſpecies, both natives of hot climates, and neither of them poſſeſſed of any remarkable property.

CRANIUM, in anatomy, an aſſemblage of ſeveral bones, which cover and encloſe the brain and cerebellum; popularly called the ſkull. See Syſtem of ANATOMY, Section XIII.

The word comes from the Greek κρανιον, of κρανος, *galea*, *helmet*; becauſe it ſerves to defend the brain, like a head-piece.

CRANIUM, in natural hiſtory, the name of a ſpecies of the echinus marinus, of the genus of the Briſſoides.

CRANK, a contrivance in machines, in manner of an elbow, only of a ſquare form; projecting out from an axis, or ſpindle; and ſerving, by its rotation, to raiſe and fall the piſtons of engines for raiſing water, or the like.

CRANK, in ſea language. A ſhip is ſaid to be crank-ſided, when, for want of a ſufficient quantity of ballaſt or cargo, ſhe cannot bear her ſails, or can bear but ſmall ſail for fear of overſetting. She is ſaid to be crank by the ground, when her floor is ſo narrow, that ſhe cannot be brought on ground without danger.

CRANNY, in the glaſs trade, a round iron, whereon the workmen in the glaſs houſes roll the glaſs, to make the neck ſmall.

CRAPE, a light tranſparent ſtuff, in manner of gauze; made of raw ſilk, gummed and twiſted on the mill; woven without croſſing, and much uſed in mourning.

CRASIS *of the Blood*, denotes a due temperament or conſtitution of that humour; wherein the ſeveral principles, viz. ſalt and oil, whereof it is compoſed, are found in their juſt proportion and purity: in contradiſtinction to dyſcraſy, which conſiſts in an improper mixture of the principles, or an unnatural ſtate of ſome of the ingredients thereof.

CRASIS, in grammar, is a figure, whereby two different letters are either contracted into one long letter, or a diphthong. Such, e. gr. is οφις for οφιας; αληθη for αληθεα, &c. τυχȣς for τυχεος, &c. where ι and α are contracted into ι; ε and α into η; and ε and ο into ȣ.

CRASSIROSTRÆ, in ornithology, the name of a genus of ſmall birds, diſtinguiſhed by the thickneſs of their beaks; as the ſparrow, greenfinch, and the like.

CRASSULA, LESSER ORPINE, or LIVE-EVER; a genus of the pentagynia order, belonging to the pentandria claſs of plants. There are 17 ſpecies, all of them natives of warm climates. Several of them are cultivated in this country, but require the aſſiſtance of artificial heat for their preſervation.

CRATÆGUS, WILD-SERVICE TREE, HAWTHORN, &c.

a genus of the digynia order, belonging to the icoſandria claſs of plants. There are nine ſpecies; all of the tree and ſhrub kind, hardy and deciduous; valuable for œconomical and ornamental purpoſes in gardening.

CRATERA, in botany, the garlic pear, a genus of the monogynia order, belonging to the polyandria claſs of plants. There are two ſpecies both of them natives of ſeveral parts of India. It has a ſtrong ſmell of garlic, and communicates the ſame to ſuch animals as feed upon it. The tender buds from the young branches being bruiſed and applied to the naked ſkin, will bliſter as effectually as cantharides. From the flowers of this plant is obtained by diſtillation, a water highly odoriferous and cordial. The pulpy part of the fruit is prepared into various kinds of marmalades, which are exceedingly agreeable to the taſte, and much uſed by the grandees in thoſe countries where the trees are natives; they are alſo reckoned ſerviceable in dyſenteries. Both ſpecies may be propagated in this country by ſeeds. They are to be ſown upon a hot bed in the ſpring, and when the plants come up, they are to be treated in the manner directed for the annona.

CRAW, *Crop*, or *Ingluvies*, a part in granivorous fowls which ſerve for the immediate reception of the food; where it remains ſome time for maceration, before it be tranſmitted to the ſtomach. This ingluvies is furniſhed with glands, which the patrons of fermentation maintain, convey a menſtruum thither, that impregnates the aliment, and ſerves inſtead of maſtication. See COMPARATIVE ANATOMY, Sect. II.

CRAX, in ornithology, a genus of birds, belonging to the order of Gallinæ. The baſe of the beak of each mandible is covered with wax, and the feathers of the head are curled. There are five ſpecies, viz. 1. The Alecator, or Indian hen of Sloane, is about the ſize of a common hen, and found in the warm parts of America. 2. The Rubea, or Peruvian hen, is red, with a bluiſh head; it is a native of Peru. 3. The Mitiu, or Braſilian pheaſant, is black, with a duſky belly and red wax; it is a native of Guinea and Brazil. 4. The Globicera has a yellow protuberance between the noſtrils, and is likewiſe a native of Brazil. 5. The Pauxi, or Mexican pheaſant, is of a bluiſh colour with blue wax, and the tip of the tail and belly white; it is a native of Mexico.

CRAY *Fiſh*, in entomology, a ſpecies of the cancer.

Cray *Fiſh*, or *Cancer Aſtacus* of Linnæus, are found in rivers and freſh water; their fleſh is cooling, moiſtening, and adapted to nouriſh ſuch as labour under atrophies. There are various methods of preparing theſe animals; they may be either boiled or fried, and then taken out of their ſhells and made up in variety of diſhes; but no parts of them are eatable except their claws and tail. Preparations and broths of cray fiſh are celebrated not only for a palatable aliment, but alſo for anſwering ſome medicinal intentions as being of a moiſtening quality, and ſheathing up and correcting acrimony. They abound in the river Don in Muſcovy, where they are laid in heaps to putrefy; after which the ſtones, called crab's eyes, are picked out. Theſe animals are very greedy of fleſh, and flock in great numbers about carcaſes thrown into the water where they are, and never leave it while any remains. They alſo feed on dead frogs when they come in their way. In Swiſſerland, there are ſome cray fiſh which are red, while they are alive, and others bluiſh. Some kinds of them alſo will never become red, even by boiling, but continue blackiſh. The cray fiſh diſcharges itſelf of its ſtomach, and as M. Geoffroy thinks, of its inteſtines too. Theſe, as they putrefy and diſſolve, ſerve for food to the animal; during the time of the reformation, the old ſtomach ſeems to be the firſt food the new one digeſts. It is only at this time, that the ſtones are found called crab's eyes; they begin to be formed when the old ſtomach is deſtroyed, and are afterwards wrapped up in the new one, where they decreaſe by degrees till they entirely diſappear.

CRAYON, a general name for all coloured ſtones, earths, or other minerals and ſubſtances, uſed in deſigning, or painting in paſtel; whether they have been beaten and reduced to a paſte, or are uſed in their primitive conſiſtence, after ſawing or cutting them into long narrow ſlips. In this laſt manner are red crayons made, of blood-ſtone, or red chalk; black ones, of charcoal and black lead. The beſt charcoal is that of willow, on account of its ſoftneſs. Crayons of all other colours are compoſitions of earths reduced to paſte.

[*We ſhall not here introduce any directions reſpecting crayon-painting, but reſerve that ſubject till we come to the* Art of Drawing, *not only becauſe it may be ſaid to appertain to that article ſyſtematically conſidered, but, becauſe it depends upon it as a fundamental principle.*]

CREAM is a name applicable to all ſubſtances, which ſeparate from a liquor, and collect on its ſurface: but it is particularly applied to the following.

Cream *of Lime*, is that matter which ſeparates from limewater by cryſtallization, during the evaporation of the water; forming on the ſurface a ſemi-tranſparent pellicle, which gradually thickens, till at length it ſubſides in the form of ſcales. This is a calcareous earth, which, having once loſt its gas or fixed air by calcination, is recombined with it after being diſſolved in water, and expoſed again to the air, and hereby becomes mild, cryſtallizable, unſoluble in water, and recovers its original ſtate before calcination. Macquer, Dict. Chem. Eng. ed. 1777.

Cream *of Milk*, generally called ſimple cream, is the moſt oily part of the milk; which being naturally only mixed, and not diſſolved in the reſt, ſoon ſeparates from them, as being ſpecifically lighter; after which it collects on the ſurface; from which it is generally ſkimmed, to complete the diſengagement of the oily from the caſeous and ſerous parts, that is to make butter. Cream of milk is not only an agreeable aliment when recent, but is alſo uſeful in medicine as a lenient, when applied to tetters and eryſipelas attended with pain and proceeding from an acrid humour.

Cream *of Tartar*, *cremor tartari*, is that part of the concrete acid of tartar which cryſtallizes firſt, and forms a pellicle on the ſurface of the water in which tartar has been boiled. This has been a general name comprehending this ſaline pellicle and the cryſtal of tartar.

CREATION, is commonly applied to the original formation of the materials whereof the viſible ſyſtem of nature is formed. It is reckoned to be an abſolute and incommunicable prerogative of divine power, as by creation all things were produced out of nothing; the ſubſequent creations being only transformations or changes of ſhape in what was already made.

There is no ſubject concerning which there have been more diſputes than this of creation. It is certain that none of the ancient philoſophers had the ſmalleſt idea of its being poſſible to produce a ſubſtance out of nothing, or that even the power of the deity himſelf could work without any materials to work upon. Hence ſome of them, among whom was Ariſtotle, aſſerted that the world was eternal, both as to its matter and form. Others, though they believed that the gods had given the world its form, yet imagined the materials whereof it is compoſed to have been eternal. Indeed, the opinions of the ancients, who had not the benefit of revelation, were on this head ſo confuſed and contradictory, that nothing of any conſequence can be deduced from them. The free-thinkers of our own and of former ages have denied the poſſibility of creation, as being a contradiction to reaſon, and of conſequence have taken the opportunity from thence to diſcredit revelation. On the other hand, many defenders of the ſacred writings have aſſerted, that creation out of nothing is ſo far from being a contradiction to reaſon, that it is not only probable but demonſtrably certain. Nay, ſome have gone ſo far as to ſay, that from the very inſpection of the viſible ſyſtem of nature, we are infallibly certain that it was once in a ſtate of non-exiſtence. It would be impoſſible for us, however, to enter into the multiplicity of arguments uſed on both ſides; nor can we pretend to ſettle it, as the ſubject is confeſſedly above human comprehenſion. See CORPUSCULAR *Philoſophy*.

CREDENTIALS, letters of credit and recommendation; eſpecially ſuch as are given to ambaſſadors, plenipotentiaries, &c. ſent to foreign courts.

CREDIBILITY, a ſpecies of evidence, leſs indeed than abſolute certainty or demonſtration, but greater than mere poſſibility: it is nearly allied to probability, ſeems to be a means between poſſibility and demonſtration.

CREDIT, from *credo*, belief of a thing as a truth. Figuratively, eſteem, teſtimony, or reputation for honeſty; the lending and expectation of money lent within ſome limited time; the faith repoſed in the government by lending money at intereſt, which may be transferred, though not redeemable, or is promiſed to be repaid at a certain time. In commerce, it ſignifies ſomething ſold upon truſt; and the credit of a perſon's account, is that on which his payments, whether in caſh, or other commodities, are regiſtered.

Letters of CREDIT, are thoſe given to perſons in whom a merchant, &c. can truſt, to take money of his correſpondent abroad, in caſe he happens to need it.

CREDITOR, one who lets another have any thing on truſt; one to whom a debt is owing. In book-keeping, that ſide of an account wherein all things which are delivered are entered: in the caſh book, it contains a perſon's payments.

CREDITOR, in book-keeping. See BOOK-KEEPING.

CREDULITY, denotes a weakneſs of mind, by reaſon of which a perſon yields his aſſent to propoſitions or facts, before he has conſidered their evidence.

CREED, *Credo*, a ſhort, or ſummary account of the chief articles of the Chriſtian faith; thus called from the firſt word thereof in Latin, *credo, I believe*. The principal of theſe are the Apoſtles, the Athanaſian, and the Nicene creeds.

CREEK, a part of a haven, where any thing is landed from the ſea. So many landing places as there are in a harbour or port, ſo many creeks there are.

CREEPER, in ſea language, a ſort of grapnel, having a ſhank and four hooks or claws, but without flooks; uſed for recovering things that may be caſt overboard.

CREMASTERS, in anatomy, an epithet given to two muſcles, otherwiſe called ſuſpenſores; ſerving to raiſe, or draw up the teſticles. The word comes from the Greek κρεμαω, *ſuſpendo, I ſuſpend*. See Syſtem of ANATOMY, Part. III. Sect. II.

CRENELLE', *Embattled*, in heraldry, is when any honourable ordinary is dented, after the manner of battlements of a wall.

The French word comes from *crena, a notch*, or *interval*; the Engliſh from its being a place of fighting, or battle.

CREOLES, a name given to the families deſcended from the Spaniards who firſt ſettled at Mexico, in America. Theſe are much more numerous than the Spaniards properly ſo called, and the Mulattoes, which two other ſpecies of inhabitants they diſtinguiſh; and are excluded from all conſiderable employments.

CREPITATION, that noiſe which ſome ſalts make over the fire in calcination; called alſo detonation.

Crepitation, is alſo uſed in ſurgery, for the noiſe made by the ends or pieces of bones, when the ſurgeon moves a limb to aſſure himſelf by his ear of the exiſtence of a fracture. This is one of the evident indications of a fracture of bones; and to judge by it with the greater eaſe to the patient, it is neceſſary that the upper part of the limb be held faſt, while the lower part is gently moved. The jars of the bones will likewiſe be ſometimes felt by the hand, when nothing is heard.

CREPUSCULUM, in aſtronomy, twilight; the time from the firſt dawn or appearance of the morning, to the riſing of the ſun: and again, between the ſetting of the ſun, and the laſt remains of days. See Twilight.

CRESCENT, the new moon, which, as it begins to recede from the ſun, ſhews a little rim of light, terminating in points, or horns, which are ſtill increaſing, till it become full and round in the oppoſition. The word is formed from *creſco, I grow*. The term is alſo uſed for the ſame figure of the moon in its wane, or decreaſe, but improperly; becauſe points or horns are then turned towards to the weſt, whereas they look to the eaſt in the juſt creſcent.

Crescent, in heraldry, a bearing in form of a new moon. It is uſed either as an honourable bearing; or as the difference to diſtinguiſh between elder and younger families, this being generally aſſigned to the ſecond ſon and thoſe that deſcend from him. The figure of the creſcent is the Turkiſh ſymbol, with its points looking towards the top of the chief, which is its moſt ordinary repreſentation, called *creſcent montant*. Se Heraldry, Plate V.

CRESCENTIA, the Calabash Tree; a genus of the angioſpermia order, belonging to the didynamia claſs of plants. There are two ſpecies.

1. The cujete, with oblong narrow leaves and a large oval fruit, is a native of Jamaica and the Leeward Iſlands.

2. The latifolia, or broad leaved calabaſh, ſeldom riſes more than 15 or 20 feet high, with an upright trunk, covered with a white ſmooth bark, ſending out many lateral branches at the top, garniſhed with leaves three inches in length, and one and a quarter broad, ranged alternately.

CRESSES, or Water Cress, in botany. See Sisymbrium.

CREST, in armoury, the uppermoſt part of the defenſive armoury of the head; riſing over the reſt, in manner of the comb or tuft of a cock; to ſuſtain the effort of very keen ſcimitars, &c. It has its name from criſta, cock's comb. Hence, alſo,

Crest, in heraldry, denotes the uppermoſt part of an armoury, or that part riſing over the caſk, or helmet. Next to the mantle, ſays Gullim, the creſt or cognizance claims the higheſt place, being ſeated on the moſt eminent part of the helmet; yet ſo, as to admit an interpoſition of ſome eſcrol, wreath, chapeau, crown, &c. The ancient warriors wore creſts to ſtrike terror in their enemies, as the ſight of the ſpoils of animals they had killed; or to give them the more formidable mien, by making them appear taller, &c. Creſt of the arms of England is a lion paſſant gardant, crowned with an imperial crown; that of France, a fleur-de-lys.

CRESTED, in heraldry, is a term applied to a cock, or other bird, whoſe creſt is of a different tincture from other parts.

CRETA, in natural hiſtory, and in medicine. See Chalk.

CREW, the company of ſailors belonging to a ſhip, boat, or other veſſel. In a ſhip of war there are ſeveral particular crews, or gangs, as the boatſwain's crew, the carpenter's crew, the gunner's crew, &c.

CREX, in ornithology, a ſpecies of rallus. See Rallus.

CRIB, in the Engliſh ſalt works, the name given to a ſort of caſe uſed in ſome places inſtead of the drab, to put the ſalt into as it is taken out of the boiling pan.

CRIBBAGE, a game at cards, wherein the players endeavour to make pairs, ſequents, pairs royal, and one and thirty at playing, and to hold in their hands as many fifteens, pairs and ſequents as they can.

CRIBRATION, in pharmacy, ſifting; the act of ſeparating the finer parts of a medicine, whether dry or humid, from the groſſer; the latter by means of a pulping ſieve, the former by a fine ſearch.

CRICKET, in entomology, the name of a genus of inſects of the hemiptera claſs, nearly allied to the locuſt kind. For generic character and different ſpecies, ſee them reſpectively deſcribed under Grillus.

CRICOARYTANOIDÆUS, in anatomy, a name given to two pair of muſcles, ſerving to open the larynx. See Syſtem of Anatomy, Part III. Sect. XI.

CRICOIDES, in anatomy, a cartilage of the larynx; ſo called as being round, like a ring, and encompaſſing the whole larynx. The word is formed from κρικος, uſed by tranſpoſition κιρκος, *circle*, and ειδος, *form*. See Syſtem of Anatomy, Part III. Sect. XI.

CRICOPHARINGEI, in anatomy, muſcles which ariſe from the lower part of the ſide of the cricoid cartilage. See Syſtem of Anatomy, Part III. Sect. XI.

CRICOTHYROIDÆUS, in anatomy, a name given to the firſt pair of muſcles proper to the larynx. See Syſtem of Anatomy, Part III. Sect. XI.

CRIER, *Common*, an officer in the city of London, whoſe duty is to attend the lord mayor on ſet days, and at the courts held weekly by the mayor and aldermen.

CRIME, a breach or tranſgreſſion of a law, or an action contrary to the purport of a law, either natural or divine, civil, or eccleſiaſtic; to which a penalty is annexed. The term crime includes in it the idea of determination and deſign formed to do an injury. It is derived from the Latin *crimen*, of κρινω, *judico, I judge*.

Crimes are diſtinguiſhed into capital; as treaſon, murder, robberies, &c. and common, as perjuries, &c. They are again divided into crimes cognizable by the king's judges; as thoſe above mentioned: and ſuch as are only cognizable in the ſpiritual courts, as ſimple fornication.

CRIMINAL *Law*, is that which diſcuſſes the nature of crimes and inflicts ſuitable penalties; or, as it is more uſually denominated in England, the doctrine of the pleas of the crown.

CRIMSON, one of the ſeven red colours of the dyers. The word comes from the Arabic *kermiſi*, of *kermes, red*. See Treatiſe on the Art of Dying.

CRINUM, aſphodel lilly; a genus of the monogynia order, belonging to the hexandria claſs of plants. They are very beautiful green-houſe plants, riſing two or three feet high, each of them crowned by a large umbellate cluſter of ſpathaceous, monopetalous, long funnel ſhaped flowers, blue, white, or ſtriped, having a very fragrant ſmell. They are propagated by off-ſets.

CRISIS, from κρινω, *I judge*, in medicine, a change, or turn, in acute diſeaſes; it is uſed in different ſenſes, both by the ancient and modern phyſicians. With ſome it means frequently no more than the excretion of any noxious ſubſtance from the body. Others take the word for a ſecretion of the noxious humours made in a fever. Others uſe it for the critical motion itſelf; and Galen defines a criſis in fevers, a ſudden and inſtantaneous change, either for the better or the worſe, productive of recovery or death.

CRISTA *Galli*, in anatomy, an eminence in the middle of the os ethmoides, advancing within the cavity of the cranium; and to which is faſtened that part of the dura mater which divides the brain, called *falx*.

It has its name from its figure, which reſembles that of a cock's comb. In adults, this proceſs appears of a piece with the *ſeptum narium*. See the Plate of the Organs of Senſe, in the Syſtem of Anatomy. *Figure* 3.

CRITERION, or Criterium, formed of κρινω, *I determine*, a rule or ſtandard, whereby to compare propoſitions and opinions, in order to diſcover their truth or falſhood. The doctrine of criteria, and the characters and rules thereof, make the firſt part of the Epicurean philoſophy. Evidence is the grand criterion of truth.

CRITHE, in ſurgery, commonly called the *ſtye*, is a ſort of tubercle that grows on the eye lids. When they do not ſuppurate, they become wens. They are apt to diſappear and return.

CRITHMUM, ſamphire; a genus of the digynia order, belonging to the pentandria claſs of plants. There are two ſpecies, the principal of which is the maritimum, or common maritime ſamphire. It is produced naturally on the ſea coaſts among the gravel and rocks. Its leaves are an excellent pickle uſed for ſauces, and are by many eaten raw in ſalads.

CRITICISM, the art of judging with propriety concerning any object or combination of objects. But, in a more limited ſenſe, the ſcience of criticiſm is confined to the fine arts. The principles of the fine arts are beſt unfolded by ſtudying the ſenſitive part of our nature, and by learning what objects are naturally agreeable, and what are naturally diſagreeable. The man who aſpires to be a critic in theſe arts, muſt pierce ſtill deeper: he muſt clearly perceive what objects are lofty, what low, what are proper or improper, what are manly, and what are mean or trivial. Hence a foundation for judging of taſte, and for reaſoning upon it: where it is conformable to principles, we can pronounce with certainty that it is correct; otherwiſe, that it is incorrect, and perhaps whimſical. Thus the fine arts, like morals, become a rational ſcience; and, like morals, may be cultivated to a high degree of refinement.

CROCODILE, in amphibiology, a ſpecies of lizard, with a two edged tail, and triangular feet, the fore ones having five, and the hinder only four toes. A ſpecies of the genus lacerta or lizard. See Lacerta.

Foſſile Crocodile. One of the greateſt curioſities in the foſſile world, which the late ages have produced, is the ſkeleton of a large crocodile, almoſt entire, found at a great depth under ground, bedded in ſtone. This was in the poſſeſſion of Linkius, who wrote many pieces in natural hiſtory, and particularly an accurate deſcription of this curious foſſile. It was found in the ſide of a large mountain, in the midland part of Germany, and in a ſtratum of a black foſſile ſtone, ſomewhat like our common ſlate, but of a coarſer texture, the ſame with that in which the foſſile fiſh of many parts of the world are found. This ſkeleton had the back and ribs very plain, and was of much deeper black than the reſt of the ſtone, as is alſo the caſe in the foſſile fiſhes, which are preſerved in this manner. The part of the ſtone where the head lay was not found, this being broken off juſt at the ſhoulders, but that irregularly, ſo that, in one place, a part of the back of the head was viſible in its natural form. The two ſhoulder-bones were very fair, and three of the feet were well preſerved; the legs were of their natural ſhape and ſize, and the feet preſerved, even to the extremities of the five toes of each.

CROCUS Saffron; a genus of the monogynia order, belonging to the triandria claſs of plants. Modern botaniſts allow only one ſpecies of this genus, which, however, comprehends many beautiful varieties. The varieties may be divided into two claſſes, the vernal and autumnal flowering.

The varieties of the firſt are the crocus officinalis, or ſaffron of the ſhops; for the properties of which, and its cultivation for ſale, ſee the article Saffron.

The autumnal crocuſes flower about the beginning of October, but never ripen their ſeeds in this country. They alſo are very ornamental, and are ſo hardy that they will grow almoſt any where. They are propagated by ſeeds, which the plants produce in plenty.

Crocus, in chymiſtry, denotes any metal calcined to a red or deep yellow colour.

Crocus *Antimonii*, or *Metallorum*, in pharmacy and chymiſtry, the name given in the late London diſpenſatory, to the preparation of antimony and nitre commonly known by the name of *crocus metallorum*. It is made of equal parts of antimony and nitre, powdered fine, and thrown gradually into a red hot crucible, and, when thoroughly melted, poured out, and ſeparated from its ſcoriæ. This looks more yellow the longer it has been melted: it is but little uſed, except among horſes; but when intended for internal uſe among men, ſhould be procured faithfully prepared in this manner: for our chymiſts generally abate of the nitre to ſave charges, and render the medicine of a very different effect. Pemberton's Lond. Diſ. p. 230.

With reſpect to the following article which occupies ſuch a conſiderable ſpace in the work, and to appearance ſtretches beyond our limits; we take the liberty to obſerve, that we have cited it at large as a memorable event, in which the whole Chriſtian world and the fate of many potent kingdoms have been involved, and which has been productive of conſequences equally aſtoniſhing and affecting. In this inſtance, as in others of a curious nature, we have acted agreeably to the opinion and advice of our ſubſcribers, and thoſe who have contributed to the furtherance of the work, by being copious on ſubjects intereſting and entertaining, in preference to the practice of the compilers of other Dictionaries, in being verboſe on ſubjects trivial and unimportant.

CROISADE, or **Crusade**, a name given to the expeditions of the Chriſtians againſt the Infidels for the conqueſt of Paleſtine.

Theſe expeditions commenced in the year 1091. The foundation of them was a ſuperſtitious veneration for thoſe places where our Saviour performed his miracles, and accompliſhed the work of man's redemption. Jeruſalem had been taken, and Paleſtine conquered, by Omar the ſucceſſor of Abu Becr, who ſucceeded Mahomet himſelf. This proved a conſiderable interruption to the pilgrims, who flocked from all quarters to perform their devotions at the holy ſepulchre. They had, however, ſtill been allowed this liberty, on paying a ſmall tribute to the Saracen caliphs, who were not much inclined to moleſt them. But, in 1065, this city changed its maſters. The Turks took it from the Saracens; and being much more fierce and barbarous than the former, the pilgrims now found they could no longer perform their devotions with the ſame ſafety they did before. An opinion was about this time alſo prevalent in Europe, which made theſe pilgrimages much more frequent than formerly. It was imagined, that the thouſand years mentioned in the 20th chapter of the revelations, were fulfilled; that Chriſt was ſoon to make his appearance in Paleſtine, to judge the world; and conſequently that journeys to that country were in the higheſt degree meritorious, and even abſolutely neceſſary. The multitudes of pilgrims which now flocked to Paleſtine, meeting with a very hoſtile reception amongſt the Turks filled all Europe with complaints againſt thoſe infidels who profaned the holy city by their preſence, and derided the ſacred miſteries of Chriſtianity, even in the place where they were fulfilled.

Pope Gregory the VIIth had formed a deſign of uniting all the princes of Chriſtendom againſt the Mahometans. But his exorbitant encroachments on the civil power of princes created him many enemies, and rendered his ſchemes ſo ſuſpicious, that he was not able to make great progreſs in this undertaking. The work was reſerved for a meaner inſtrument.

Peter, commonly called the hermit, a native of Amiens in Picardy, had made the pilgrimage to Jeruſalem; and being deeply affected with the dangers to which that act of piety now expoſed the pilgrims, as well as with the oppreſſion under which the Eaſtern Chriſtians now laboured, formed the bold, and, in all appearance, impracticable deſign of leading into Aſia, from the fartheſt extremities of the Weſt, armies ſufficient to ſubdue thoſe potent and warlike nations that now held the holy land in ſlavery. He propoſed his ſcheme to Martin II. who then filled the papal chair; but he, though ſenſible enough of the advantages which muſt accrue to himſelf from ſuch an undertaking, reſolved not to interpoſe his authority till he ſaw a greater probability of ſucceſs. He ſummoned, at Placentia, a council conſiſting of 4000 eccleſiaſtics, and 30,000 ſecular. As no hall could be found large enough to contain ſuch a multitude, the aſſembly was held in a plain. Here the pope himſelf, as well as Peter, harangued the people, repreſenting the diſmal ſituation of their brethren in the Eaſt, and the indignity offered to the Chriſtian name in allowing the holy city to remain in the hands of the infidels. Theſe ſpeeches were ſo agreeable to thoſe who heard them, that the whole multitude ſuddenly and violently declared for the war, and ſolemnly devoted themſelves to perform this ſervice, which they believed to be ſo meritorious in the ſight of God.

The fame of this great and pious deſign being now univerſally diffuſed, procured the attendance of the greateſt prelates, nobles, and princes; and when the Pope and the hermit renewed their pathetic exhortations, the whole aſſembly, as if impelled by an immediate inſpiration, exclaimed with one voice, "It is the will of God! it is the will of God!" Theſe words were deemed ſo memorable, and ſo much the effect of a divine impulſe, that they were employed as the ſignal of rendezvous and battle in all future exploits of theſe adventurers. Men of all ranks now flew to arms with the utmoſt ardour, and a croſs was affixed to their ſhoulder by all who inliſted in this holy enterprize.

At this time Europe was ſunk in the moſt profound ignorance and ſuperſtition. The eccleſiaſtics had gained the greateſt aſcendant over the human mind; and the people, who committed the moſt horrid crimes and diſorders, knew of no other expiation than the obſervances impoſed on them by their ſpiritual paſtors.

But amidſt the abject ſuperſtition which now prevailed, the military ſpirit had alſo univerſally diffuſed itſelf; and, though not ſupported by art or diſcipline, it has become the general paſſion of the nations governed by the feudal law. All the great lords, poſſeſſed a right of peace and war. They were engaged in continual hoſtilities with one another: the open country was become a ſcene of outrage and diſorder: the cities ſtill mean and poor, were neither guarded by walls, nor protected by privileges. Every man was obliged to depend for ſafety on his own force, or his private alliances; and valour was the only excellence which was held in eſteem, or gave one man the pre-eminence above another. When all the particular ſuperſtitions, therefore, were here united in one great object, the ardour for private hoſtilities took the ſame direction; "and all Europe, (as the princeſs Anna Comnena expreſſes herſelf), torn from its foundations, ſeemed ready to precipitate itſelf in one united body upon Aſia."

All orders of men now deeming the croiſade the ready road to heaven, were impatient to open the way with their ſwords to the holy city. Noble partiſans, peaſants, and even prieſts enrolled their names; and thoſe who declined this ſervice were branded with impiety and cowardice. The nobles who enliſted themſelves were moved, by the romantic ſpirit of the age, to hope for opulent eſtabliſhments in the Eaſt, the chief ſeat of arts and commerce at that time. In purſuit of theſe chimerical projects, they ſold at the loweſt price, their ancient caſtles and inheritances, which had now loſt all value in their eyes. The very women concealing their ſex under the diſguiſe of armour attended. The moſt enormous diſorders were, during the courſe of theſe expeditions, committed by men inured to wickedneſs, encouraged by example, and impelled by neceſſity. The multitude of adventurers ſoon became ſo great, that their more ſagacious leaders became apprehenſive leſt the greatneſs of the armament would be the cauſe of its own diſappointment. For this reaſon they permitted an undiſciplined multitude, computed at 300,000 men, to go before them under the command of Peter the Hermit.

Suppoſing that heaven by a preternatural aſſiſtance would ſupply all their neceſſities, they made no proviſion for ſubſiſtence on their march. They ſoon found themſelves obliged to obtain by plunder what they vainly expected from miracles; and the enraged inhabitants of the countries through which they paſſed, attacked the diſorderly multitude, and ſlaughtered them without reſiſtance. The more diſciplined armies followed after; and, paſſing the ſtraits at Conſtantinople, they were muſtered in the plains of Aſia, and amounted in the whole to 700,000 men.

Nor need we wonder at the multitude who flocked to the ſtandard of the croſs, when we conſider the natural operation of frantic zeal, and the numberleſs privileges which the croiſaders acquired; ſuch as exemptions from proſecutions for debt, from paying intereſt for money, and from taxes; the power of alienating their lands without conſent of their lord, the protection of St. Peter, the immunities of eccleſiaſtics, and the plenary remiſſion of their ſins.

This rage for conquering the Holy Land did not ceaſe with this expedition. It continned for very near two centuries, and nine different croiſades were ſet on foot, one after another. Thoſe who engaged to go on this ſervice, diſtinguiſhed themſelves by croſſes of different colours, worn on their cloaths; ordered, it is ſaid, by the council of Clermont; and were thence called croiſes, or croſs bearers, of whom, contemporary authors tell us, there were ſix millions; the Engliſh wore them white; the French, red; the Flemiſh, green; the Germans black; and the Italians, yellow.

The following are the principal croiſades for the conqueſt of the Holy Land: the firſt undertaken in 1095, at the council of Clermont; the ſecond in 1147, under Louis VII. and the pontificate of Eugenius III. the third in 1189, and 1190, by Frederic I. ſurnamed Barbaroſſa, emperor of Germany, Henry II. of England, and Philip Auguſtus of France; the fourth in 1195, by pope Celeſtin III. and the emperor Henry VI. the fifth publiſhed in 1198, by order of Innocent III. wherein the French, Germans, and Venetians, engaged; the ſixth undertaken in the year 1217, under the pontificate of Honorius III. by the confederate armies of Italy and Germany, which ended in the rout of the Chriſtians; the ſeventh under Frederic II. emperor of Germany: who ſet out in the year 1228, and concluded a truce of ten years with the ſultan of Egypt in 1229, which was ſucceeded by inconſiderable and very unſucceſsful expeditions in 1239, under Theobald VI. king of Navarre; and in 1240, under Richard Earl of Cornwall, brother to Henry III. of England; the eighth under Louis IX. of France, in conſequence of a vow which he had made in 1248; and the ninth, and laſt renewed by the ſame valiant, but unfortunate monarch, who died of a peſtilential diſeaſe in the harbour of Tunis, in the year 1270. Theſe expeditions coſt Europe at leaſt two millions of its inhabitants, and an immenſe ſum of money.

The abbot Juſtiniani makes an order of knighthood of the croiſes, who ſerved in the croiſades.

Thus the barbariſm in which Europe had been ſo long immerſed, began to wear off ſoon after this time. The princes alſo who remained at home, found means to avail themſelves of the frenzy of the people. By the abſence of ſuch numbers of reſtleſs and martial adventurers, peace was eſtabliſhed in their dominions.

With regard to the bad ſucceſs of the croiſaders, it was ſcarce poſſible that any other thing could happen them. The emperors of Conſtantinople, inſtead of aſſiſting, did all in their power to diſconcert their ſchemes, They were jealous, and not without reaſon, of ſuch an inundation of barbarians. Yet, had they conſidered their true intereſt, they would rather have aſſiſted them, or at leaſt ſtood neuter, than entered into alliances with the Turks. They followed the latter method, however, and were often of very great diſſervice to the Weſtern adventurers, which at laſt occaſioned the loſs of their city. But the worſt enemies the croiſaders had, were their own internal feuds and diſſentions. They neither could agree while marching together in armies with a view to conqueſt, nor could they unite their conqueſts under one government after they had made them. They ſet up three ſmall ſtates, one at Jeruſalem, another at Antioch, and another at Edeſſa. Theſe ſtates, inſtead of aſſiſting, made war upon each other, and on the Greek emperors; and thus became an eaſy prey to the common enemy. The horrid cruelties they committed alſo were ſuch as muſt have inſpired the Turks with the moſt invincible hatred againſt them, and made them reſiſt with the greateſt obſtinacy. They were ſuch as could have been committed only by barbarians inflamed with religious enthuſiaſm. When Jeruſalem was taken, not only the numerous garriſon were put to the ſword, but the inhabitants were maſſacred without mercy, and without diſtinction. No age nor ſex was ſpared, not even ſucking children. According to ſome accounts, many Chriſtians, who had been ſuffered by the Turks to live in that city, led the conquerors into the moſt private caves where women had concealed themſelves with their children, and not one of them was ſuffered to eſcape. What eminently ſhews the enthuſiaſm by which theſe conquerors were animated, is their behaviour after this terrible ſlaughter. They marched over heaps of dead bodies towards the holy ſepulchre; and while their hands were yet polluted with the blood of ſo many innocent perſons, ſung anthems to the common Saviour of mankind. Nay, ſo far did their religious enthuſiaſm overcome their fury, that theſe ferocious conquerors now burſt into tears. If the abſurdity and wickedneſs of this conduct can be exceeded by any thing, it muſt be by what follows. In the year 1204, the frenzy of croiſading ſeized the children, who are ever ready to imitate what they ſee their parents engage themſelves in. Their childiſh folly was encouraged by the monks and ſchoolmaſters; and thouſands of thoſe innocents were conducted from the houſes of their parents on the faith of theſe words, "Out of the mouth of babes and ſucklings haſt thou perfected praiſe." Their baſe conductors ſold a part of them to the Turks, and the reſt periſhed miſerably.

We were favoured with the following remarks on the memorable ſubject of Cruſades by the Rev. Mr. Bankes, author of the Chriſtian's Complete Family Bible.

We cannot but obſerve how blindly the miſtaken zeal of theſe church militant monarchs hurried them on, even to oppoſe the accompliſhment of one of the moſt remarkable prophecies againſt the Jews. Our Lord himſelf ſays, "Jeruſalem ſhall be trodden down by the Gentiles until the fullneſs of the Gentiles be fulfilled, (Luke xxi. v. 24.) In other words, Jeruſalem ſhall continue in poſſeſſion of unbelievers, until not only the converſion of Iſrael ſhall take place, but Chriſtianity become the univerſal religion of the Gentiles. The Saracens are at this moment the inſtruments in the hand of God, for the ſecurity and accompliſhment of this prophecy delivered by Chriſt himſelf. How much innocent blood might have been ſaved, if theſe Chriſtian warriors had peaceably ſtudied their Scriptures at home, inſtead of waſting the lives and properties of their ſubjects in a blind oppoſition to the will of heaven itſelf.

CROISES, or CROIZES, in our ancient cuſtoms, pilgrims bound for the Holy Land, or who had already been there: ſo called from a badge which they wore on their garments, repreſenting a croſs. The word croiſes is alſo extended to the knights of St. John of Jeruſalem, created for the defence and protection of pilgrims; and all thoſe of the nobility, gentry, &c. who in the reigns of king Henry II. Richard I. Henry III. and Edward I. were *cruce ſignati*, i. e. dedicated themſelves to the wars, for the recovery of the Holy Land.

CROISSANTE', in heraldry, *Croix croiſſanté* is a croſs creſcented; that is, having a creſcent, or half moon fixed on each end thereof.

CROP, the craw or firſt ſtomach of birds, wherein their food is prepared for digeſtion.

CROP, the higheſt part, end, or top of a thing; figuratively, corn collected in harveſt; the product of a field; any thing cut off. To crop, to cut off the top or ends of any thing; to mow, reap, or lop. Figuratively, to ſhorten or conſume in eating. Neuterly, to yield a harveſt.

CROSIER, or CROZIER, a ſhepherd's crook; a ſymbol of paſtoral authority, conſiſting of a gold or ſilver ſtaff, crooked at the top, carried occaſionally before biſhops and abbots, and held in the hand when they give the ſolemn benedictions. The cuſtom of bearing a paſtoral ſtaff before biſhops is very ancient. Regular abbots are allowed to officiate with a mitre and croſier. Among the Greeks none but a patriarch had a right to the croſier.

CROSIER, in aſtronomy, four ſtars, in form of a croſs; by help whereof, thoſe who ſail in the ſouthern hemiſphere find the antarctic pole.

CROSS, CRUX, a ſort of inſtrument, compoſed of two pieces of wood, traverſing and cutting each other, ordinarially at right angles. The croſs was uſed amongſt the ancients as a puniſhment for malefactors and ſlaves; and was planted at ſeveral places, *in terrorem*, as our gallows, &c. This puniſhment was only inflicted on malefactors and ſlaves, and thence called *ſervile ſupplicium*. The moſt uſual method was to nail the criminal's hands and feet to this machine, in an erect poſture; though there are inſtances of criminals ſo nailed with their head downward.

Pectoral CROSS, is a croſs of gold or ſilver, or other precious materials, often enriched with diamonds, which the biſhops, archbiſhops, &c. and regular abbeſſes, wear hanging from the neck.

CROSS, in heraldry, is defined by Guillim, an ordinary compoſed of fourfold lines; whereof two are perpendicular, and the other two tranſverſe; for ſo we muſt conceive of them, though they be not drawn throughout but meet by couples, in four right angles, near the feſs-point of the eſcutcheon. This bearing was firſt beſtowed on ſuch as had performed or at leaſt undertaken, ſome ſervice for Chriſt, and the Chriſtian profeſſion; and is held, by divers, the moſt honourable charge in all heraldry. What brought it into ſuch frequent uſe, was the ancient expeditions into the Holy Land; and the holy war pilgrims, after their pilgrimage, taking the croſs for their cognizance; and the enſign of that war being the croſs. In thoſe wars, ſays Mackenzy, the Scots carried St. Andrew's croſs; the French a croſs *argent*; the Engliſh a croſs *or*; the Germans, *ſable*; the Italians, *azure*; the Spaniards, *gules*. St. George's croſs, or the red croſs, in a field argent, is now the ſtandard of England; that ſaint being the reputed patron of this nation.

CROSS *Bar Shot*, in the military art, a round ſhot, or great bullet, with a bar of iron put through it, coming out at both ends ſix or eight inches. It is of good uſe in fight, for cutting and ſpoiling ropes, ſails, &c.

CROSS *Bill*, in ornithology. See LOXIA.

CROSS *Bows*. See BOWS and ARCHERY.

CROSS, inſtead of a ſignature to a deed, &c. is derived from the Saxon practice of affixing the ſign of the croſs whether they could write or not.

CROSS *Trees*, in a ſhip, croſs pieces of timber ſet on the head of the maſt, and bolted, and let into one another very ſtrongly.

CROSSELET, little croſs, a diminutive of croſs, uſed in heraldry, where we frequently ſee the ſhield covered with croſſelets;

alſo feſſes, or other honourable ordinaries charged or accompanied with croſſelets. Croſſes themſelves frequently terminate in croſſelets: as in Plate IV. HERALDRY.

CROTALARIA, rattle wort; a genus of the decandria order, belonging to the diadelphia claſs of plants. There are 11 ſpecies, all of them natives of warm climates.

CROTALUS, or RATTLE *Snake*, in zoology, a genus belonging to the order of amphibia ſerpentes; the characters of which are theſe: the belly is furniſhed with ſcuta, and the tail has both ſcuta and ſcales; but the principal characteriſtic of this genus, is the rattle at the end of the tail. The rattles conſiſt of ſeveral articulated cruſtaceous, or rather horny, bags, which make a conſiderable rattling noiſe when the creature moves, and ſerve to warn people of their approach. There are five ſpecies; and the bite of every one of them is ſo highly poiſonous, that it generally kills in a ſhort time. The rattle is of a brown colour, compoſed of ſeveral horny, membranous cells, of an undulated pyramidal figure. Theſe are articulated within one another in ſuch a manner that the point of the firſt cell reaches as far as the baſis of the protuberant ring of the third, and ſo on; which articulation, being very looſe, gives liberty to the parts of the cells that are incloſed within the outward rings to ſtrike againſt the ſides of them, and ſo to cauſe the rattling noiſe which is heard when the ſnake ſhakes its tail. The Indians know their deſtiny the moment they are bit; and if the bite happens to be on any of the large veins, they apply no remedies, as knowing them to be entirely uſeleſs.

CROTCHET, in muſic, one of the notes or characters of time, marked thus ♩, equal to half a minim, and double of a quaver.

CROTCHETS are alſo marks or characters, ſerving to incloſe a word or ſentence which is diſtinguiſhed from the reſt, being generally in this form [ ].

CROTON, wild ricinus; a genus of the polyandria order, belonging to the monœcia claſs of plants. There are 21 ſpecies; the only remarkable one of which is the tinctorium, or plant from which the French turnſole is made. From this plant is made the turnſole uſed for colouring wines and jellies. It is made of the juice which is lodged between the empalement and the ſeeds; which, if rubbed on cloths, at firſt appears of a lively green, but afterwards changes to a bluiſh purple colour. If theſe cloths are put into water, and afterwards wrung, they will dye the water to a claret colour. The rags thus dyed are brought to this country, and ſold in the druggiſt's ſhops under the name of turnſole.

CROUP, in medicine, *ſuffocatio ſtridula*, is a diſeaſe to which children, chiefly under twelve years of age, are ſubject in cold and wet ſeaſons, and moſt commonly on the ſea coaſt, and in low marſhy countries. See Syſtem of MEDICINE.

CROUTE, *Sour Croute*, or KROUTE. As this preparation of cabbage has been found of ſovereign efficacy as a preſervative in long voyages from the ſea ſcurvy, it may not be unacceptable to give a conciſe account of the proceſs for making it, according to the information communicated by an ingenious German gentleman.

The ſoundeſt and moſt ſolid cabbages are ſelected for this uſe, and cut very ſmall, commonly with an inſtrument made for this purpoſe; not unlike the plane which is uſed in this country for ſlicing cucumbers. A knife is uſed, when the preparation is made with greater nicety. The cabbage thus minced is put into a barrel in layers, hand high, and over each is ſtrewed a handful of ſalt and carraway ſeeds; in this manner it is rammed down with a rammer *ſtratum ſuper ſtratum*, till the barrel be full; when a cover is put over it, and preſſed down with a heavy weight. After ſtanding ſome time in this ſtate, it begins to ferment; and it is not till the fermentation has entirely ſubſided, that the head is fitted to it, and the barrel is finally ſhut up, and preſerved for uſe. There is not a drop of vinegar employed in this preparation. The Germans write this preparation in the following manner: *Sauer kraut*, or *ſaurer kohl*, that is, in their language, ſour herb, or ſour cabbage.

CROW, in ornithology. See CORVUS.

CROW, in mechanics, an iron lever, furniſhed with a ſharp point at one end, and two claws at the other. It has various uſes, in heaving or purchaſing great weights.

CROW's *Bill*, an inſtrument uſed by ſurgeons, in their operations; eſpecially for drawing bullets and other bodies out of wounds.

CROW's *Feet*, in the military art, machines of iron, having four points, each about three or four inches long, ſo made, that whatever way they fall, there is ſtill a point up: they are thrown upon breaches, or in paſſes where the enemy's cavalry are to march, proving very troubleſome, by running into the horſe's feet and laming them.

CROWD, a great number of people ſqueezed or cloſe together; a great number of any thing of the ſame ſort adjacent to each other. Figuratively, the vulgar or lower ſort of people.

CROWD, to fill a place with a great and confuſed multitude of people; to force a great many things in a confuſed manner into the ſame place; to preſs cloſe together; to incumber, or oppreſs by multitudes. In the marine, *to crowd ſail*, is to ſpread all the ſails wide upon the yard for the ſake of expedition, or quickening the motion of a ſhip. Neuterly, to go in great multitudes; to thruſt among a multitude of others.

CROWN, *Corona*, a mark of regal dignity; being an ornament worn on the head by kings and ſovereigns, as a ſymbol of their authority. For a repreſentation of the reſpective crowns, coronets, &c. ancient and modern, ſee Plate V. of HERALDRY.

CROWN is alſo uſed to ſignify the poſſeſſions and dignity of a king. The crown of England, according to Sir William Blackſtone, is, by common law and conſtitutional cuſtom, hereditary; and this in a manner peculiar to itſelf: but the right of inheritance may from time to time be changed or limited by act of parliament, under which limitations the crown ſtill continues hereditary.

CROWN, in architecture, denotes the uppermoſt member of the corniche; called alſo Corona and Larmier.

CROWN, in commerce, is a general name for coins both foreign and domeſtic, of or near the value of five ſhillings ſterling.

CROWN, or CORONET, in heraldry, is uſed for the repreſentation of that ornament, in the mantling of an armoury; to expreſs the dignity of the perſon who bears it. The crown here is of more antiquity even than the helmet; and it was uſed as a ſymbol of victory and triumph.

CROWN *Glaſs*, denotes the fineſt ſort of window glaſs. See GLASS.

CROWN *Imperial*, in botany. See FRITILLARIA.

CROWN *Office*, a court or office under the king's bench, ſo called, becauſe the crown is more immediately concerned in what is therein tranſacted. See COURT of *King's Bench*.

CROWN *Work*, in fortification, is an out-work running into the field; deſigned to keep off the enemy, gain ſome hill, or advantageous poſt, and cover the other works of the place. The crown work conſiſts of two demi baſtions at the extremes, and an entire baſtion in the middle, with curtins.

CROWNED *Horn Work*, is a horn work, with a crown work before it.

CROWNING, in architecture, is underſtood, in the general, of any thing that terminates or finiſhes a member or decoration. Thus, a corniche, a pediment, a croteria, &c. are called crownings. Thus, alſo, the Abacus is ſaid to crown the capital; and thus any member or moulding is ſaid to be crowned; when it has a fillet over it; and a niche is crowned, when it is covered with a capital.

CRUCIAL *Inciſion*, in ſurgery, an inciſion, or cut, into ſome fleſhy parts, in form of a croſs.

CRUCIAN, in ichthyology, the ciprinus caraſſius of Linnæus, is common in many of the fiſh ponds about London, and other parts of the South of England, though probably not a native fiſh. The meat of it is coarſe, and little eſteemed. For the characters, ſee CARASSIUS

CRUCIANELLA, Petty madder, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants. There are five ſpecies, natives of the ſouthern parts of Europe, but none of them poſſeſſed of any remarkable quality.

CRUCIBLE, in chymiſtry, &c. a little veſſel, ordinarily of earth, ſometimes of iron, without any handle; wherein chymiſts, coiners, goldſmiths, glaziers, and other artificers, uſe to melt and calcine gold, ſilver, or other metals, whereon they work. See Syſtem of CHYMISTRY, Part II. Article FUSION, alſo the Plate *Fig.* 19.

CRUCIFIX, a croſs upon which the body of Chriſt is faſtened in effigy, uſed by the Roman catholics to excite in their minds a ſtrong idea of our Saviour's paſſion.

CRUCIFIXION, an ancient form of execution, by faſtening the criminal to an erected croſs. See CROSS.

CRUDE, ſomething that has not paſſed the fire, or has not had the degree of concoction, i. e. of heat, requiſite to prepare it for eating, or ſome other uſe.

Crude, or raw ſilk, is that which has not been put in boiling water, to unwind it from off the cod; nor boiled in water and ſoap, to fit it for dying.

CRUDE *Antimony*, is that which comes immediately from the mines, without any preparation, except once melting.

CRUDE *Humours*, in medicine, are thoſe which want that preparation and elaboration which they ordinarily receive from a thorough digeſtion.

CRUDITY, among phyſicians, is applied to undigeſted ſubſtances in the ſtomach; to humours in the body which are unconcocted, and not prepared for expulſion; and to the excrements.

CRUISE, in the ſea language, ſignifies to ſail back and fore within a certain ſpace of the ſea, as well to annoy the enemy, as to protect our own trading veſſels.

CRUISERS, in the navy, are ſmall men of war made uſe of to and fro in the channel, and elſewhere, to ſecure our merchant ſhips and veſſels from the enemy's ſmall frigates and privateers. They are generally ſuch as ſail well, and are commonly well manned: and indeed the ſafety of the trade in the channel, and up and down the ſoundings, and other places, abſolutely requires the conſtant keeping out ſuch ſhips at ſea.

CRUMENA, from *κρεμαω*, *pendo*, *I hang*, in tetrapodology, the name given by Cardan, and ſome others, to the purſe, or pouch, which the opoſſum has under its belly, and into which it receives the young in time of danger. Scaliger, ſuppoſing there might be other animals, as well the opoſſum, to which nature might have given this ſort of pouch, has erected a general diſtinction, under the name of *animalia crumentara*; but the opoſſum is the only ſpecies yet known to belong to this genus. The only inſtance that naturaliſts ſeem to afford us of a like proviſion of nature for the care of the young, is what is related of ſome of the fiſh kind. Oppian, in his Halieutics, mentions this property of receiving the young into the body, in time of danger, to be in the dog fiſh, and in the ſquatina, and ſome others; and Tyſon obſerves, that, in the anatomy of a female dog fiſh, he ſaw two ſlits under the belly, cloſed up in their natural ſtate, but eaſily diſtenſible, ſo as to be capable of receiving the young fiſh; and that theſe went not into the womb, nor any other peculiar part, but only into the cavity of the abdomen. The account given by Oppian is, that, in time of danger from a ſtorm, or from any fiſh of prey purſuing the young fry, they go into their parent's belly. If therefore, after this account of Tyſon's, any young fiſh ſhould ever be found looſe in the cavity of the mother's belly, it will prove the truth of this paſſage in Oppian, which has been ſo much diſputed. Phil. Tranſ. N° 239, p. 120.

CUMENTATA, a term uſed to expreſs ſuch animals as have a pouch, or bag under their belly, into which young ones may be received in time of danger. See DIDELPHIS.

CRUOR, from *κρυος*, *cold*, according to Ainſworth, ſometimes ſignifies the blood in general; ſometimes only the venus blood; and ſometimes extravaſated or coagulated blood; but is moſt frequently uſed for the red globules of the blood, in contradiſtinction to the limpid or ſerous part.

CRUPPER, that part of horſe furniture, which reaches from the ſaddle to the tail.

CRURA *Clitordis*, in anatomy. Between the *corpora nervoſa* of the *clitoris*, runs a *ſeptum*, or membranous partition, from the glans to its divarication at the *os pubis*; dividing the *clitoris* into two parts, called the *crura* of the *clitoris*. Theſe are three times as long as the ordinary trunk of the *clitoris* itſelf. See Female Organs of Generation. Plate X. Fig. 1. K.

CRURA *of the medulla, oblongata* are two of the four roots, whence the *medulla oblongata* ſprings in the brain. The crura are the larger roots; the two ſmaller are called *pedunculi*. See the Plate on the Organs of Senſe. Letter H. H.

CRURÆUS, in anatomy. See Part III. Sect. XIII.

CRURAL, in anatomy, an epithet given to the large artery and vein of the thigh. The crural artery ariſes from the iliac artery; or rather, it is the iliac itſelf, under another name; being called crural, from the place of its entrance into the thigh. See Plate of ANGIOLOGY; the lower extremity A A.

CRUS, among anatomiſts, denotes all that part of the body which reaches from the buttocks to the toes; and is divided into thigh, leg, and foot.

CRUSTA *Lactea*, *Achor*, in ſurgery, ſignifies a cruſt of ſcabby ulcers, apt to affect the faces of children.

CRUSTA *Villoſa*, in anatomy, the fourth tunic or coat of the ſtomach. See. Part V. Sect. V.

CRUSTACEOUS *Animals*, in entomology, are thoſe covered with ſhells, conſiſting of ſeveral pieces or ſcales; as thoſe of crabs, lobſters, &c. See SQUILLA. Theſe are uſually ſofter than the ſhells of the teſtaceous kind, which conſiſt of a ſingle piece, and much thicker and ſtronger than the former; ſuch as thoſe of the oyſter, ſcallop, cockle, &c. See TESTACEOUS *Animals*. Dr. Woodward obſerves, in his natural hiſtory, that of all the ſhells found in beds of all the different matters dug out of the earth, there are ſcarce any of the cruſtaceous kind: the reaſon he gives for it is, that theſe being much lighter than the reſt, muſt have floated on the ſurface at the time of the deluge, when all the ſtrata were formed; and there have corrupted and periſhed.

CRUSTULA, in medical writers, the ſame as *ecchymoma*, in the eye, being a deſcent of the blood from the arteries into the *tunica conjunctiva*, occaſioned by a wound, ſtroke, &c.

CRUYSHAGE, in ichthyology, the name of a fiſh of the ſhark kind, ſomewhat approaching to that ſtrange fiſh, the zygæna, but much leſs monſtrous, its head being only triangular, or ſomething like the figure of a heart.

CRUZADO, or CROISADE, an expedition to the Holy Land. See CROISADE.

CRUZITA, in botany, a genus of the tetandria digynia claſs, with a four leaved calyx, corolla, and a ſingle ſeed.

CRYMODES, from *κρυος*, *cold*, in medical writers, a cold ſhivering fever, but often accompanied with an inflammation of the inner parts.

CRYPTOGAMIA, in botany, the 24th claſs of plants in the Linnæan ſyſtem, whoſe flowers are either wholly inviſible, or ſcarce diſcernible by the eye. The word is formed from *κρυπτος*, *hidden*, and *γαμος*, *marriage*. Theſe are a claſs of plants whoſe fructification is concealed, and under it are comprehended thoſe plants which either flower, as is generally ſuppoſed, within the fruit, or have the organs of their fructification ſo minute as to eſcape our obſervation. This claſs comprehends four orders, viz. the *filices*, or *ferns*, the *muſci*, or *moſſes*, the *algæ*, or *flags*, and he *fungi*, or *muſhroom*. See 24th claſs in the Syſtem of BOTANY, and Plate VI.

CRYPTOGRAPHY, the art of ſecret writing, or writing in cipher. The word is compounded of *κρυπτω*, *I hide*, and *γραφω*, *I deſcribe*.

CRYSTALLI, among phyſicians, denote puſtules diſperſed all over the body, white and tranſparent, and of the bigneſs of a lupine: much the ſame with what are otherwiſe called phlyctanæ.

CRYSTALLINE *Humour*, is a thick compact humour of the eye, in form of a flattiſh convex lens, ſituate in the middle of the eye: ſerving to make that refraction of the rays of light, neceſſary to have them meet in the retina, and form an image thereon, whereby viſion may be performed. The cryſtalline humour, when dried, appears to conſiſt of a vaſt number of thin, ſpherical laminæ, or ſcales, lying over one another. Leewenhoeck reckons there may be two thouſand of them in one cryſtalline: each of theſe he ſays, he has diſcovered to conſiſt of a ſingle fibre, or fine thread, wound up in a ſtupendous manner, this way and that, ſo as to run ſeveral courſes, and meet in as many centres; and yet not interfere nor croſs in any place. Phil. Tranſ. N° 165, and 293.

CRYSTALLIZATION, in general, ſignifies the natural formation of any ſubſtance into a regular figure, reſembling that of natural cryſtal. Hence the phraſes of cryſtallized ores, cryſtallized ſalts, &c. and even the baſaltic rocks are now generally reckoned to be effects of this operation. The term, however, is moſt commonly applied to bodies of the ſaline kind, and their ſeparation in regular figures from the water, or other fluid in which they were diſſolved, is called their cryſtallization. The word cryſtallization is never applied to the freezing of water, or to the conſolidation of metals after they have been melted; though it might certainly be applied with as much juſtice to theſe ſubſtances as to any others; for all of them concrete into a certain regular form, from which they never deviate, unleſs diſturbed. When water freezes ſlowly, it always forms regular cryſtals of ice, which are conſtantly of the ſame form. They are long, needle-like maſſes, flattened on one ſide, and joined together in ſuch a manner, that the ſmaller are inſerted into the ſides of the greater; and thus theſe compound cryſtals have the appearance of feathers, or branches of trees with leaves. The moſt remarkable circumſtance attending this cryſtallization is, that the angle formed by the inſertion of the ſmaller pieces into the larger is either 60, or 120 degrees. The ordinary method of cryſtallization is performed by diſſolving the ſaline body in water, filtering it, and letting it evaporate ſlowly, till a film appears at the top; and laſtly, letting it ſtand to ſhoot.

The method of cryſtallizing ſalts, is by adding to a ſolution of ſalt, a ſubſtance which has no action on that ſalt, but which has a greater affinity with the water: and this will ſerve to take away from the ſalt a portion of water, which keeps it diſſolved. Spirit of wine will anſwer this purpoſe with regard to many ſalts. This ſhooting is accounted for, on Sir Iſaac Newton's principles, from that attractive force which is in all bodies, and particularly in ſalt, by reaſon of its ſolidity: whereby, when the menſtruum or fluid, in which ſuch particles float, is ſated enough, or evaporated (which brings it to the ſame,) ſo that the ſaline particles are within each other's attractive powers, and can draw one another more than they are drawn by the fluids, they will run into cryſtals. This is peculiar to ſalts; that, let them be ever ſo much divided and reduced into minute particles, yet, when they are formed into cryſtals, they each of them re-aſſume their proper figures; ſo that one might as eaſily diveſt and deprive them of their ſaltneſs, as of their figure. Saline cryſtals retain part of the water with which they were united in ſolution; and to this they owe their form, tranſparency, and even the coheſion of their parts. This is called by chymiſts *the water of cryſtallization*; the quantity of it varies in different ſalts, being greater or leſs, as the acid in them is leſs or more firmly combined with its baſis. M. Baume has diſcovered, that, when the cryſtallization is properly conducted, this water is perfectly pure, without the mixture of any ſubſtance foreign to the cryſtallized ſalt. This being an immutable and perpetual law, by knowing the figure of the cryſtals, we may underſtand what the texture of the particles ought to be, which can form thoſe cryſtals: and, on the other hand, by knowing the texture of the particles, may be determined the figures of the cryſtals. For ſince the figures of the moſt ſimple parts remain always the ſame, it is evident, that the figures they run into, when compounded and united, muſt be uniform and conſtant; and ſince the force of attraction may be ſtronger on one ſide of a particle than on another, there will conſequently be a greater accretion of ſalts upon thoſe ſides which attract more ſtrongly; from which it may eaſily be demonſtrated, that the figure of the leaſt particles is entirely different from that which appears in the cryſtal: ſee Macquer's Chem. Dict.

Melted metals and other bodies, which become ſolid after fuſion, aſſume a regular arrangement, whenever they are cooled ſlowly enough for that purpoſe; and thus all kinds of earths, and metallic and mineral water, are cryſtallized, by ſlowly evaporating the watery fluid that ſeparates their parts, and allowing them to approximate and unite by the moſt ſuitable ſides, forming maſſes of a determinate figure.

A great number of pigments or colours are obtainable by cryſtallization from metalline bodies; but theſe are ſubject to corrode and eat the canvas, &c, and are not capable of waſhing, by which ſome naturally corroſive colours are rendered mild and harmleſs. The blue and green vitriols, or cryſtals of copper, cannot be deprived of their aqueous, or ſaline parts, by a dry air, or by waſhing, without ſuffering extreme alterations, or being left in the form of a dry, groſs, terreſtrial matter, differently coloured from what they were before: and thus the fine green cryſtals of iron, being expoſed to the air, become white; and when well waſhed in water, loſe their greenneſs, and turn to a reddiſh or yellow, ochreous earth; and if deprived of their ſaline and aqueous parts, by a ſtrong diſtillation, they leave behind a brown, or red caput mortuum, which being waſhed in water, affords not a green, but a brown coloured pigment; and as this holds proportionably of other colours obtained by cryſtallization, there are little hopes of procuring durable pigments by this operation, which ſhall be of the ſame colour with themſelves, though, after waſhing, ſome other colours may be thus procured. Shaw's Lectures, p. 187.

Mr. Henry Baker, in exploring the ſecrets of nature by means of the microſcope, has thrown great light on this ſubject. He makes a nice diſtinction between the large cryſtals produced in the common way, and the ſmall ones produced from a ſingle drop of the ſaline ſolution, which he calls *configurations*: but this term ſeems inaccurate, and the diſtinction may well enough be preſerved by calling the large ones the common, and the ſmall ones the microſcopical cryſtals of the ſalt. In the microſcope cryſtallizations deſcribed by Mr. Baker, he endeavours in ſome meaſure to account for them; but neither he, nor any other perſon, hath as yet been able to ſay any thing ſatisfactory on the ſubject. It hath never been ſhewn with any degree of plauſibility why ſalts ſhould aſſume any regular figure at all; much leſs why every one ſhould have a form peculiar to itſelf. Sir Iſaac Newton endeavoured to account for this, by ſuppoſing the particles of ſalt to be diffuſed through the ſolvent fluid at equal diſtances from each other; and conſequently he thought the power of attraction between the ſaline particles could not fail to bring them together in regular figures, as ſoon as the diminution of the heat ſuffered them to act upon each other. But it is certain that ſome other agent muſt be concerned in this operation than mere attraction, otherwiſe all ſalts would cryſtallize in the ſame manner. Others therefore have had recourſe to ſome kind of polarity in the particles of each ſalt, which determined them to arrange themſelves in ſuch a certain form. But unleſs we give a reaſon for this polarity, we only explain cryſtallization by itſelf when we give that as the cauſe. One thing which ſeems to have been entirely overlooked by thoſe who attempt to inveſtigate this ſubject is, that the ſaline particles do not only attract one another, but alſo ſome part of the water which diſſolves them. Did they only attract each other, the ſalt, inſtead of cryſtallizing, would fall to the bottom as a powder. But inſtead of this, a ſaline cryſtal is compoſed of ſalt and water as certainly as the body of an animal is compoſed of fleſh and blood, or a vegetable of ſolid matter and ſap; if a ſaline cryſtal is deprived of its aqueous part, it will as certainly loſe its cryſtalline form as if it was deprived of the ſaline part. The moſt probable conjecture therefore on this ſubject would ſeem to be, that cryſtallization is a ſpecies of vegetation, and is accompliſhed by the ſame powers to which the growth of plants and animals are to be aſcribed.

CHRISTINE, a ſilver coin in Sweden, equal to fourteen ſols and eleven deniers French. They have alſo demi-cryſtines.

CUB, denotes a bear's whelp; a fox and martin of the firſt year are alſo called by this name.

CUBATURE, or CUBATION, of a ſolid; the meaſuring of a ſpace comprehended in a ſolid. See Syſtem of GEOMETRY.

CUBE, in geometry, a regular or ſolid body, conſiſting of ſix ſquare and equal faces, or ſides; and its angles all right, and therefore equal. See Syſtem of GEOMETRY.

CUBEBS, in pharmacy, a fruit brought from the iſland of Java, in grains, or ſeeds, reſembling pepper, both in form and ſize; whence ſome call it *wild pepper*.

CUBIC *Equation*. See Syſtem of ALGEBRA, Article 25.

CUBIC *Hyperbola*, in conics. See Syſtem of GEOMETRY.

CUBIDIA, in natural hiſtory, the name of a genus of ſpars. The word is derived from κυβος, *a die*, and is given them from their being of the ſhape of a common die, or of a cubic figure. Theſe bodies owe this ſhape to an admixture of particles of lead, and there are only two known ſpecies of the genus. 1. A colourleſs cryſtalline one, with thin flakes, found in the lead mines of Yorkſhire, and ſome other parts of the kingdom. And, 2. A milky white one, with thicker cruſts. This is found in the lead mines of Derbyſhire and Yorkſhire.

CUBIT, in the menſuration of the ancients, the Roman cubit equal to 1 foot 5.406 inches; and the cubit of the ſcripture equal to 1 foot, 9.888 inches.

CUBITUS, in anatomy, a bone of the arm, reaching from the elbow to the wriſt; otherwiſe called ulna, or the greater focile. Some uſe the word for all that part of the arm between the elbow and the wriſt; including the ulna, or cubitus. The lower part of the arm, which is called the cubitus, contains two bones, the radius and ulna. See Syſtem of ANATOMY, Part II. Sect. XIV.

CUBOIDES, or OS CUBIFORME, in anatomy, the ſeventh bone of the foot, ſo called, from its being in form of a cube, or die. See Syſtem of ANATOMY, Part II. Sect. XII.

CUCKING-STOOL, CUKESTOOL, or CASTIGATORY, anciently called tumbrel, and trebucket; an engine for the puniſhment of ſcolds, and unquiet women, by ducking them in the water. Kitchen ſays, "every one having a view of frank pledge, ought to have a pillory and a tumbrel." This machine was much in uſe, even among our Saxon anceſtors, who called it *ſcealding ſtole*, or *ſcolding ſtool*. The puniſhment was anciently alſo inflicted on brewers, and bakers, tranſgreſſing the law; who were thereupon, in ſuch a ſtool or chair, to be ducked in ſtercore, ſome muddy or ſtinking pound. This was anciently written gagging ſtool; in domeſday it is called *cathedra ſtercoris*.

CUCKOW. See CUCULLUS.

CUCKOW *Flower*, or *Lady's Smock*. See CARDAMINE.

CUCKOW *Spit*, a frothy ſubſtance found on ſeveral plants.

CUCULARIS, a muſcle of the ſcapula, ſo called from the reſemblance it is ſuppoſed to bear to a monk's cowl; and trapezius, from its reſemblance to a geometrical figure called a trapezium. See Syſtem of ANATOMY, Part III. Sect. XII.

CUCULLATE *Flowers*, among botaniſts, are ſuch as reſemble a cucullus, or monk's hood, or cowl.

CUCULLUS was anciently a traveller's cap; called alſo *cowl*, *goul*, or *gula*: whence the name paſſed to the monks, among whom it ſignified their frock and cap, which were of one piece.

CUCULLUS, the cuckow, in ornithology, a genus belonging to the order of picæ. This ſingular bird appears in our country early in the ſpring, and makes the ſhorteſt ſtay with us of any bird of paſſage. It is very probable that theſe birds, or at leaſt part of them, do not quit this iſland during the winter; but that they ſeek ſhelter in hollow trees and lie torpid, unleſs animated by unuſually warm weather. Mr. Pennant gives two inſtances of their being heard in February; one in 1771, in the end of that month; the other in 1769, on the 4th day; but after that, they were heard no more, being probably chilled again into torpidity. There is a remarkable coincidence between the ſong of theſe birds and the mackarel's continuing in full roe; that is, from about the middle of April to the latter end of June. The cuckow is ſilent for ſome time after his arrival; his note is a call to love, and uſed only by the male, who ſits perched generally on ſome dead tree or bare bough, and repeats his ſong, which he loſes as ſoon as the amorous ſeaſon is over.

A water-wagtail, a yellow-hammer, or hedge-ſparrow, is generally the nurſe of the young cuckows; who, if they happen to be hatched at the ſame time with the genuine offspring, quickly deſtroy them by over-laying them, as their growth is ſoon ſo greatly ſuperior. The reaſon of this ſeeming want of natural affection in the cuckow, hath been long a queſtion. It ſeems moſt probably to ariſe from the difference between the ſituation of the ſtomach in the cuckow and in other birds. The ſtomach of birds is ſituated quite in a different manner from what it is in other animals; being almoſt joined to the back, ſecured by the bones of the reins, and covered before by the inteſtines, behind which it lies ſecurely defended and concealed. The ſtomach of a cuckow, on the contrary, lies far forward, juſt under the integuments, and actually covers the inteſtines, the very reverſe of what takes place in other birds. The cuckow's ſtomach is a large bag of uncommon capacity, adhering by a cellular tiſſue to all the parts that environ it, reaching all the way from the breaſt-bone to the vent. From ſuch a ſtructure and ſituation of the ſtomach, it naturally follows, that it is as difficult for a cuckow as it is eaſy for other birds to ſit upon her eggs and young; for the thin membranes of its large ſtomach charged ſo long with the weight of its whole body, together with the aliments contained therein, would prove an intolerable compreſſion both to it and its tender young. It alſo follows from the peculiar ſtructure of this bird, that its young do not ſtand in need of being covered like thoſe of other birds; their large and capacious ſtomachs being better ſecured from cold by means of lying covered under the maſs of inteſtines.

Linnæus enumerates no fewer than 22 ſpecies of this genus, which inhabit different parts of the globe, and are chiefly diſtinguiſhed by the ſhape of the tail, and variations in colour. The moſt remarkable are,

1. The Americanus, or cuckow of Carolina. It is about the ſize of a blackbird: the bill a little hooked and ſharp; the tail long and narrow, compoſed of ſix long and four ſhorter feathers; their legs ſhort and ſtrong, having two back toes, and two before. Their note is very different from the cuckow of this country, and not ſo remarkable to be taken notice of. It is a ſolitary bird, frequenting the darkeſt receſſes of woods and ſhady thickets. They retire on the approach of winter.

2. The indicator, or honey-guide, is a native of Africa. The following deſcription is given of it by Dr. Sparrman in the Philoſophical Tranſactions for 1777. "This curious ſpecies of cuckow is found at a conſiderable diſtance from the Cape of Good Hope, in the interior parts of Africa, being entirely unknown at that ſettlement. The firſt place I heard of it was in a wood called the *Groot-vaader's Boſch*, "the Grand-father's Wood,"

ſituated in a deſert near the river which the Hottentots call *T'kaut'kai.* The Dutch ſettlers thereabouts have given this bird the name of *honiguyzer*, or "honey-guide," from its quality of diſcovering wild honey to travellers. Its colour has nothing ſtriking or beautiful. Its ſize is conſiderably ſmaller than that of our cuckow in Europe: but in return, the inſtinct which prompts it to ſeek its food in a ſingular manner is truly admirable. Not only the Dutch and Hottentots, but likewiſe a ſpecies of quadruped named *ratel*, (probably a new ſpecies of badgers) are frequently conducted to wild bee-hives by this bird, which, as it were, pilots them to the very ſpot. The honey being its favourite food, its own intoreſt prompts it to be inſtrumental in robbing the hive, as ſome ſcraps are commonly left for its ſupport.

Whilſt the hunters are buſy in taking the honey, the bird is ſeen looking on attentively to what is going forward, and waiting for its ſhare of the ſpoil. The bee-hunters never fail to leave a ſmall portion for their conductor; but commonly take care not to leave ſo much as would ſatisfy its hunger. The bird's appetite being whetted by this parſimony, it is obliged to commit a ſecond treaſon, by diſcovering another bee's neſt, in hopes of a better reward.

CUCUMIS, *Cucumber*, in botany, a genus of the monœcia ſyngeneſia claſs. Its characters are theſe: it hath male and female flowers on the ſame plant, which are bell-ſhaped, of one petal, which adheres to the empalement, and is cut into five oval rough ſegments. The male flowers have three ſhort ſtamina, which are inſerted in the empalement; the female flowers have no ſtamina, but have three ſmall pointed filaments, without ſummits. The germen is ſituated under the flower, which afterward becomes an oblong fleſhy fruit with three cells, including many oval, flat, pointed ſeeds.

The varieties of this genus are, 1. The common rough green prickly cucumber; a middle-ſized fruit, about ſix or ſeven inches long, having a dark-green rough rind, cloſely ſet with very ſmall prickles; the plant is of the hardieſt ſort, but does now ſhew its fruit early. 2. The ſhort green prickly cucumber is about three or four inches long; the rind rather ſmooth, and ſet with ſmall black prickles. It is valuable chiefly for being one of the earlieſt and hardieſt ſorts. 3. The long green prickly cucumber, grows from ſix to nine inches in length, and is rather thinly ſet with prickles. And as there is an early and late cucumber, it is conſiderably the beſt variety for the main crops, both in the frames and hand-glaſs, as well as in the open ground for picklers. Of this there is another variety with white fruit. 4. The early green cluſter cucumber is a ſhortiſh fruit, remarkable for growing in cluſters, and appearing early. 5. The long ſmooth green Turky cucumber, is a ſmooth green-rinded fruit, growing from 10 to 15 inches in length, without prickles. The plants are ſtrong growers, with very large leaves. 6. The long ſmooth white Turky cucumber, is a ſmooth-rinded fruit, from 10 to 15 inches long, without prickles. 7. The large ſmooth green Roman cucumber, is a very large and long ſmooth green fruit produced from a ſtrong growing plant. 8. The long white prickly Dutch cucumber, is a white fruit 8 or 10 inches long, ſet with ſmall black prickles; the plants are but bad bearers in this country.

The four firſt varieties of this genus, are thoſe chiefly cultivated in this country. They are raiſed at three different ſeaſons of the year: 1. on hot-beds, for early fruit; 2. under bell, or hand-glaſſes, for the middle crop; 3. on the common ground, which is for a late crop, or to pickle. The cucumbers which are ripe before April are unwholeſome; being raiſed wholly by the heat of the dung without the aſſiſtance of the ſun. Thoſe raiſed in April are good, and are raiſed in the following manner. For the cultivation, ſee Treatiſe on GARDENING.

CUCURBITA, the gourd and pompion; a genus of the ſyngeneſia order, belonging to the monœcia claſs of plants. There are four ſpecies. 1. The paps or pompion, commonly called pumkin. 2. The verrucoſa or watered gourd. 3. The melopepo, erect gourd or ſquaſh. 4. The lignoſa, ligneous ſhelled gourd, often called calabaſh.

CUCURBITACEÆ, the name of the 34th order in Linnæus's fragments of a natural method, conſiſting of plants which reſemble the gourd in external figure, habit, virtues, and ſenſible qualities. This order contains the following genera, viz. gronovia, melothria, paſſiflora, anguria, bryonia, cucumis, cucurbita, fevillea, momordica, ſicyos, trichoſanthes.

CUCURBITINI *Lumbrici*, are broad worms that breed in the inteſtines, like the ſeed of a gourd.

CUCURUCU, the name of a ſerpent found in America, growing to ten or twelve foot long. It is very thick alſo in proportion to its length, and is of a yellowiſh colour, ſtrongly variegated with black ſpots, which are irregularly mixed among the yellow, and often have ſpots of yellow within them, and are plainly black. It is a very poiſonous ſpecies, and greatly dreaded by the natives; but its fleſh is very rich food, and greatly eſteemed among them, when properly prepared.

CUD, ſometimes means the inſide of the throat in beaſts; but generally the food that they keep there, and chew it over again. See COMPARATIVE ANATOMY.

CUDWEED, in botany. See GNAPHALIUM.

CUE, an *item*, or *inuendo*, given to the actors on the ſtage, what, or when, to ſpeak.

CUIRASSE, a piece of defenſive armour, made of an iron plate well hammered; ſerving to cover the body, from the neck to the girdle, both before and behind.

CUIRASSIERS, cavalry armed with cuiraſſes, as moſt of the Germans are: the French have a regiment of the cuiraſſiers; but we have had none in the Britiſh army ſince the revolution.

CULDEES, in church hiſtory, a deſignation given to the monks, or prieſts, in Scotland, in the firſt ages of Chriſtianity, whence the term paſſed into Ireland. They were called *culdees*, quaſi *culteres dei*, from their great piety and devotion.

CULEX, in entomology, the name of a genus of two-winged flies, comprehending the gnats and humble-bee flies. The diſtinguiſhing characteriſtic of this genus is, that their head is furniſhed with a ſiphon, or ſucker, very ſlender, oblong, and filiform.

CULLIAGE, or CULLAGE, a right uſurped by the ancient lords, and eſtabliſhed by a ſhameful cuſtom, which gave them the firſt night with their vaſſals brides. The word is formed from the French *cul*, *podex*, the *breech*. It is ſaid this right was eſtabliſhed by Evenus III. king of Scotland, and finally aboliſhed by Malcolm III. a compenſation being ſettled in its ſtead; as occaſioning frequent revolts of the vaſſals againſt their lords.

CULM, or CULMUS, among botaniſts, a ſtraw, or haulm; defined by Linnæus to be the proper trunk of the graſſes, which elevates the leaves, flower, and fruit. This ſort of trunk is tubular, or hollow, and has frequently knots, or joints, diſtributed at proper diſtances through its whole length. The leaves are long, ſleek, and placed either near the root in great numbers, or proceed ſingly from the different joints of the ſtalks, which they embrace at the baſe, like a ſheath or glove. There are but few graſſes that the ſtalk is not interrupted with joints, as in the greater part. The ſpace contained betwixt every two knots, or joints, is termed by botaniſts *internodium* and *articulus culmi*. This ſpecies of trunk often affords certain marks of diſtinction, in diſcriminating the ſpecies. Thus in the genus eriocaulon, the ſpecies are ſcarce to be diſtinguiſhed but by the angles of the culmus, or ſtalks. Theſe in ſome ſpecies are in number 5, in others 6, and in others 10.

CULMIFEROUS PLANTS (from *culmus*, a ſtraw or haulm): plants ſo called, which have a ſmooth jointed ſtalk, uſually hollow, and wrapped about at each joint with ſingle, narrow, ſharp pointed leaves, and the ſeeds contained in chaffy huſks; ſuch are oats, wheat, barley, rye, and other plants of the natural family of the graſſes.

CULMINATION, in aſtronomy, the paſſage of any heavenly body over the meridian, or its greateſt altitude for that day.

CULPRIT, in law, a term uſed by the clerk of the arraignments, when a perſon is indicted for a criminal matter.

CULTIVATION, the act of improving ſoils by huſbandry. Figuratively, the improvement of the underſtanding by education and ſtudy; improvement in any ſcience.

CULVERIN, in war, a long ſlender piece of ordnance and artillery, ſerving to carry a ball to a great diſtance.

CUMINUM, CUMIN; a genus of the digynia order, belonging to the pentandria claſs of plants. There is but one ſpecies, viz. the cyminum. It is an annual plant, periſhing ſoon after the ſeed is ripe. Theſe ſeeds have a bitteriſh warm taſte, accompanied with an aromatic flavour, not of the moſt agreeable kind. They are accounted good carminatives; but not very often made uſe of. An eſſential oil of them is kept in the ſhops.

CUN, or CUNNING, at ſea. See CON.

CUNEIFORMIA *Oſſa*, in anatomy, denote the fourth, fifth, and ſixth bones of the foot; thus called from their wedge like ſhape, being large above, and narrow below. See Bones of the lower extremity in OSTEOLOGY.

CUNICULUS, in mining, a term uſed by authors, in diſtinction from *puteus*, to expreſs the ſeveral ſorts of paſſages and cuts in theſe ſubterranean works. The *cuniculi* are thoſe direct paſſages in mines, where they walk on horizontally; but the *putei* are the perpendicuar cuts or deſcents.

CUNILA, in botany, a genus of the monogynia order, belonging to the diandria claſs of plants. There are three ſpecies, none of which has any remarkable property.

CUNNING, learned, knowing, or of extenſive knowledge. "To cunning men I will be very kind." *Shak.* Performed with art or ſkill; curious. "Thou *cunning'ſt* pattern of excellent nature." *Shak.* Figuratively, ſly; deſigning; crafty; over-reaching another by ſuperior wit and underſtanding.

CUNNUS, the *Pudendum Muliebre*; or the anterior parts of the genitals of a woman, including the *labia pudendi* and *mons Veneris*.

CUP, a ſmall veſſel, with a foot, to drink in. Figuratively, the liquor contained in a cup. In the plural, a merry bout, or entertainment of drinking. Any thing hollow like a cup, as the huſk of an acorn, the bell of a flower. Cup and can, familiar companions, the can being the larger veſſel, from whence the cup is filled. "You and he are cup and can." *Swift.*

CUPS, among herbaliſts, are thoſe ſhort green huſks in which flowers grow; ſome being divided into two, three, four, five, or ſix leaves. See CALYX.

CUP *Galls*, in entomology, a name given by authors to a very ſingular kind of galls found on the leaves of the oak, and ſome other trees. They are of the figure of a cup, or drinking glaſs, without its foot, being regular cones, adhering by their point or apex to the leaf; and the top, or broad part, is allowed a little way. Beſide this ſpecies of gall, the oak leaves furniſh us with ſeveral others; ſome of which are oblong, ſome round, and others flatted; theſe are of various ſizes, and appear on the leaves at various ſeaſons of the year. They all contain the worm of ſome ſmall fly; and this creature paſſes all its changes in this its habitation, being ſometimes found in the worm, ſometimes in the nymph, and ſometimes in the fly ſtate, in the cavity of it.

CUPANIA, in botany, a genus of the monogynia order, belonging to the pentandria claſs of plants. There is but one ſpecies a native of America, which poſſeſs no remarkable property.

CUPEL, in metallurgy, a ſmall veſſel which abſorbes metallic bodies when changed by fire into a fluid ſcoria; but retains them as long as they continue in their metallic ſtate. One of the moſt proper materials for making a veſſel of this kind is the aſhes of animal bones; there is ſcarcely any other ſubſtance which ſo ſtrongly reſiſts vehement fire, which ſo readily imbibes metallic ſcoriæ, and which is ſo little diſpoſed to be vitrified by them. In want of theſe, ſome make uſe of vegetable aſhes, freed by boiling in water from their ſaline matter, which would cauſe them to melt in the fire.

CUPELLATION, the act of refining gold or ſilver by means of a cupel. For this purpoſe another veſſel, called a mufflle is made uſe of, within which one or more cupels are placed.

CUPPING, an operation in ſurgery, for the diſcharge of blood, and other humours, by the ſkin. It is performed by collecting the humours into a tumor under the cutis; and letting them out thence, by ſcarification; i. e. by ſeveral inciſions made with a ſcarification. See Syſtem of SURGERY.

CUPRESSUS, the cyprus tree; a genus of the monodelphia order, belong to the monœcia claſs of plants. There are ſix ſpecies; the moſt remarkable are the following.

1. The ſempervirens, with an upright ſtraight ſtem, cloſely branching all around, almoſt from the bottom upwards, into numerous quadrangular branches; riſing in the different varieties from 15 to 40 or 50 feet in height, and very cloſely garniſhed with ſmall, narrow, erect evergreen leaves, placed imbricatim; and flowers and fruit from the ſides of the branches.

2. The thyodies, or evergreen American cypreſs, commonly called white cedar, it is ornamented with flat evergreen leaves imbricated like arbor vitæ, and ſmall blue cones the ſize of juniper berries.

3. The diſticha, or deciduous American cypreſs, garniſhed with ſmall ſpreading deciduous leaves, arranged diſtichous, or along two ſides of the branches. Theſe ſpecies are raiſed from ſeeds, and will ſometimes alſo grow from cuttings; but thoſe raiſed from ſeeds prove the handſomeſt plants. The ſeaſon for ſowing them is any time in March, if in April and May the weather proves warm and dry, a very moderate watering will now and then be neceſſary, and the plants will riſe in ſix or eight weeks. During the ſummer they muſt be kept clear from weeds, and in dry weather they muſt gently be watered twice a week. In winter they muſt be occaſionally ſheltered with mats in the time of hard froſt. In two years they will be fit for tranſplanting from the ſeed-bed, when they may be ſet in nurſery rows two feet aſunder; and in three or four years they will be fit for the ſhrubbery. The wood of the firſt ſpecies is ſaid to reſiſt worms, moths, and putrefaction, and to laſt many centuries. The coffins in which the Athenians were wont to bury their heroes were made, ſays Thucydides, of this wood; as were likewiſe the cheſts containing the Egyptian mummies. The doors of St. Peter's church at Rome were originally of the ſame materials. Theſe, after laſting upwards of 600 years, at the end of which they did not diſcover the ſmalleſt tendency to corruption, were removed by order of pope Eugenius IV. and gates of braſs ſubſtituted in their place. Noah's ark is commonly ſuppoſed to have been made of this kind of wood.

CURATE, the loweſt degree in the church of England; he who repreſents the incumbent of a church, parſon or vicar, and officiates divine ſervice in his ſtead: and in caſe of pluralities of livings, or where a clergyman is old and infirm, it is reuqiſite there ſhould be a curate to perform the cure of the church. He is to be licenſed and admitted by the biſhop of the dioceſe, or by an ordinary having epiſcopal juriſdiction: and when a curate hath the approbation of the biſhop, he uſually appoints the ſalary too; and in ſuch caſe, if he be not paid, the curate hath a proper remedy in the eccleſiaſtical court, by a ſequeſtration of the profits of the benefice; but if the curate is not licenſed by the biſhop, he is put to his remedy at common law, where he muſt prove the agreement, &c. A curate having no fixed eſtate in his curacy, not being inſtituted and inducted, may be removed at pleaſure by the biſhop or incumbent. But there are perpetual curates as well as temporary, who are appointed where tithes are impropriate, and no vicarage endowed: theſe are not removeable, and the impropriators are obliged to find them, ſome whereof have certain portions of the tithes ſettled on them. Every clergymen that officiates in a church, (whether incumbent or ſubſtitute), in the liturgy is called a curate. Curates muſt ſubſcribe the declaration according to the act of uniformity, or are liable to impriſonment, &c.

CURATELLA, in botany, a genus of the polyandria digynia claſs; having a five leaved calyx, four petals, two ſtyles, a bipartite capſule, with double ſeeded cells.

CURATIVE *Indication*, among phyſicians, that which directs what is to be done for the cure of a diſeaſe.

CURATOR, in civil law, a truſtee, or perſon, regularly appointed to manage the affairs of minors, or perſons mad, deaf, dumb, &c.

CURCAS, in botany, a name given in Egypt to an eſculent root, approaching to the taſte and virtues of the colocaſia. It is alſo a name, uſed in Malabar for a ſmall fruit of the ſhape and ſize of a hazel nut. Both theſe things have the credit of being great provocatives: and it is very probable that the curcas of the Eaſt Indies may be the fruit called *bell* by Avicenna, and ſaid to poſſeſs the ſame famous virtues. Garcias has been led into a very great error by this ſimiliarity of names and virtues, and ſuppoſes the curcas of Egypt the ſame with the curcas of the Eaſt Indies.

CURCULLIO, in entomology, a genus of inſects belonging to the order of coleoptera. The feelers are ſubclavated, and reſt upon the ſnout, which is prominent and horny. There are no leſs than ninety five ſpecies, principally diſtinguiſhed by their colour.

CURCUMA, turmeric; a genus of the monogynia order, belonging to the monandria claſs of plants. The ſpecies are two, the round and the long. The plants grows naturally in India, from whence the roots are brought to Europe for uſe. They are very tender; ſo will not live in this country unleſs kept conſtantly in a ſtove. They are propagated by parting the roots. The root communicates a beautiful but periſhable yellow dye, with alum, to woolen, cotton, or linen. In medicine it is eſteemed aperient, and emmenagogic; and of ſingular efficacy in the jaundice.

CURDLING, the coagulating or fixing any fluid body; particularly milk. At Florence they curdle the milk for the making of cheeſe with artichoke leaves, in lieu of the rennet uſed for the ſame purpoſe among us.

CUREMA, in ichthyology, the name of a fiſh of the mullet kind, but of a remarkable ſize, growing to two feet long, and having a very large moveable upper lip; the under one being ſmall, triangular in figure, and ſcarce viſible, being ſomething ſhorter than the upper. Its eyes are large, and its fins of a fine ſilvery white; in all other reſpects it reſembles the common mullet.

CURFEU, q. d. *Couvre-feu*, a ſignal of retreat, given in cities taken in war, &c. to advertiſe the inhabitants to go to bed, and not to ſtir out any more. The curfeu-bell, wherewith the ſignal was anciently given, was ſometimes hung up as a puniſhment of ſedition. Paſquier ſays, it was called *carfou*, and *garefou*; as being intended to advertiſe the people to ſecure themſelves from the robbers and debauchees of the night. The moſt ancient *curfeu* was that eſtabliſhed in England by William the Conqueror; who appointed, under ſevere penalties, that, at the ringing of a bell at eight o'clock in the evening, every one ſhould put out their lights, cover, or rake up their fires, and go to bed. Whence, to this day, where a bell is accuſtomed to be rung about bed-time it is called *curfeu-bell*. It was aboliſhed by Henry I.

CURING, is uſed for the preſerving fiſh, fleſh, and other animal ſubſtances, by means of certain additions of things, to prevent putrefaction. One great method of doing this, is by ſmoaking the bodies; that is, the making them imbibe a great quantity of vegetable fumes; for this is uſually done where wood is burnt. The reaſon of this ſort of preſervation is eaſily ſeen by the curious enquirer, ſince wherever wood, or any vegetable of the acid tribe is burnt, the acid particles go off with the ſmoke, and in this form penetrate into, and lodge themſelves in animal ſubſtances expoſed thereto; by which means this ſmoke acts upon them in the ſame manner that the fumes of ſpirit of nitre would do; and whether it be not a nitrons acid that tinges hams, herrings, &c. to a redneſs in the drying, is a ſubject worth enquiry. Shaw's Lectures, p. 152.

CURLEW, in ornithology, the Engliſh name of the arquata, numenius. Curlews frequent our coaſts in winter in large flocks, but retire to breed in ſummer on the more mountainous parts of the country. Their fleſh is rank and fiſhy, though ſome have highly commended it. See SCOLOPAX.

CURRANT *Tree*, in botany, a genus of the pentandria monogynia claſs. See RIBES.

CURRANTS, in commerce, a kind of little raiſins, or dried grapes of different colours, black, white, or red; brought from ſeveral places of the Archipelago, and among others from the Iſthmus of Corinth; whence their name, currants, q. d. Corinths.

To barrel them for ſending abroad, they have people who greaſe their feet and legs, and tread them cloſe, that they may keep bettter.

They are ſold for about twelve crowns the thouſand weight; and pay as much cuſtom to the ſtate of Venice. Zant produces enough yearly to load five or ſix veſſels; Cephalonia three or four; and the other iſlands one. The Engliſh have a factory at Zant; the Dutch two or three merchants, and the French one: the Engliſh conſuming more than ſix times the quantity that both France and Holland do together. Thoſe of Zant know but little of the uſe we make of them; being perſuaded they only ſerve in dying of cloth; and being entirely ignorant of the luxury of Chriſtmas pyes, and Engliſh puddings.

CURRENCY, circulation; paſſing from hand to hand, and acknowledged as legal, applied to coin or money, whether in metal or paper. General reception; conſtant flow; or current; and uninterrupted courſe.

CURRENT, paſſing from hand to hand; eſtabliſhed, or legal, applied to money. Generally received, not contradicted, applied to opinions. Popular, or eſtabliſhed by a majority; faſhionable; paſſable, or to be admitted; what is now paſſing. "The current year." In commerce, account current, is that which is opened by two perſons that have dealings with each other, wherein the different debts and credits of each are regiſtered on oppoſite ſides, in order to form a balance between them.

Current, from *curro*, *I run*, in hydrography, a ſtream or flux of water in any direction. The ſetting of the current, is that point of the compaſs towards which the waters run; the drift of a current, is the rate it runs an hour.

Currents, in the ſea, are either natural and general, as ariſing from the diurnal rotation of the earth on its axis; or accidental and particular, cauſed by the waters being driven againſt promontories, or into gulfs and ſtreights, where, wanting room to ſpread, they are driven back, and thus diſturb the ordinary flux of the ſea. The currents are ſo violent under the equator, where the motion of the earth is the greateſt, that they carry veſſels very ſpeedily from Africa to America; but abſolutely prevent their return the ſame way: ſo that ſhips are forced to run as far as the fortieth degree of latitude, to find a paſſage into Europe. In the Streights of Gibraltar, the currents almoſt conſtantly drive to the eaſtward, and carry ſhips into the Mediterranean; they are uſually, found to drive the ſame way in St. George's Channel. The great violence and danger of the ſea in the Streights of Magellan, is attributed to two contrary currents ſetting in, one from the South, and the other from the North ſea.

Currents, with reſpect to navigation, may be defined, certain progreſſive motions of the water of the ſea, in ſeveral places; by which a ſhip may happen to be carried forward more ſwiftly, or retarded, in her courſe, according to the direction or ſetting of the current, in, with, or againſt, the courſe or way of the ſhip.

Under Currents, are diſtinct from the upper or apparent, and in different places ſet or drive a contrary way. Dr. Thomas Smith, Phil. Tranſ. Nº 158. or Abr. vol. ii. p. 288, 289, makes it highly probable, that in the Downs, in the Streights of Gibraltar, &c. there is an under current, whereby as much water is carried out, as is brought in by the upper currents. This he argues from the offing between the north and ſouth Foreland, where it runs tide and half-tide, i. e. it is either ebb or flood in that part of the Downs three hours before it is ſo off at ſea: a certain ſign, that though the tide of flood runs aloft, yet the tide of ebb runs under foot, i. e. cloſe by the ground; and ſo at the tide of ebb it will flow under-foot.

This he confirms by an experiment in the Baltic Sound, communicated to him by an able ſeaman preſent at the making it: being there, then, with one of the king's frigates, they went with the pinnace into the mid-ſtream, and were carried violently by the current. Soon after that, they ſunk a baſket with a large cannon bullet, to a certain depth of water, which gave a check to the boat's motion; and ſinking it ſtill lower and lower, the boat was driven a-head to the windward, againſt the upper current; the current aloft not being above four or five fathom deep. He added, that the lower the baſket was let down, the ſtronger the under current was found. From this principle, it is eaſy to account for that continual in draught of water out of the Atlantic into the Mediterranean, through the Streights of Gibraltar; about twenty miles broad: yet, without any ſenſible riſing of the water along the coaſts of Barbary, &c. or any overflowing of the lands, which there lie very low.

CURRIERS are thoſe who dreſs and colour leather, after it comes from the tan-yard.

CURRY *Comb*, an inſtrument full of ſmall teeth, uſed for currying horſes.

CURRYING is the art of dreſſing cow-hides, calves-ſkins, ſeal-ſkins, hogs-ſkins, &c. The chief buſineſs is to ſoften and ſupple cow and calve-ſkins, which make the upper leathers and quarters of ſhoes, covering of ſaddles, coaches, and other things which muſt keep out water. 1. Theſe ſkins, after coming from the tanner's yard, having many fleſhy fibres on them, the currier ſoaks them ſome time in common water. 2. He takes them out and ſtretches them on a very even wooden horſe; then with a paring-knife, he ſcrapes off all the ſuperfluous fleſh, and puts them in to ſoak again. 3. He puts them wet on a hurdle, and tramples them with his heels, till they begin to grow ſoft and pliant. 4. He ſoaks thereon train-oil, which by its unctuous quality is the beſt liquor for this purpoſe. 5. He ſpreads them on large tables, and faſtens them at the ends. There, with the help of an inſtrument called a pummel, which is a thick piece of wood, the under ſide of which is full of furrows croſſing each other, he folds, ſquares, and moves them forwards and backwards ſeveral times, under the teeth of this inſtrument, which breaks their too great ſtiffneſs. This is what is properly called currying. The order and number of theſe operations is varied by different curriers, but the material part is always the ſame. 6. After the ſkins are curried, there may be occaſion to colour them. The colours are black, white, red, yellow, green, &c. the other colours are given by the ſkinners, who differ from curriers in this, that they apply their colours on the fleſh ſide; the curriers on the hair ſide. In order to whiten ſkins, they are rubbed with lumps of chalk, or white lead, and afterwards with pumice ſtone. 7. When a ſkin is to be made black, after having oiled and dried it, he paſſes over it a puff dipt in water impregnated with iron; and after his firſt wetting, he gives it another in a water prepared with ſoot, vinegar, and gum arabic. Theſe different dyes gradually turn the ſkin black, and the operations are repeated till it be of a ſhining black. The grain and wrinkles which contribute to the ſuppleneſs of calves and cows leather, are made by the reiterated folds given to the ſkin in every direction, and by the care taken to ſcrape off all the hard parts on the colour ſide.

CURSITOR, an officer or clerk belonging to the court of chancery, who maketh out original writs.

CURSOR, a little ruler, or label of braſs, divided like a line of ſines, and ſliding in a groove, or notch, along the middle of another label, or ruler, repreſenting the horizon, and always at right angles to it. It is uſed in the analemma.

Cursor is alſo uſed for a point ſcrewed on the beam compaſs; and which may be moved, or ſlidden along the beam thereof, for the ſtriking of greater or leſs circles.

CURTATE *Diſtance*, in aſtronomy, the diſtance of a planet's place from the ſun, reduced to the ecliptic: or, the interval between the ſun, and that point where a perpendicular, let fall from the planet, meets with the ecliptic.

CURTATION, in aſtronomy, the interval between a planet's diſtance from the ſun, and the curtate diſtance.

CURTICONE, in geometry, a cone whoſe top is cut off by a plane parallel to its baſis; called alſo truncated ſtone.

CURTIN, Curtain, or Courtin, in fortification, is that part of the rampart of a place which is betwixt the flanks of two baſtions, bordered with a parapet five feet high, behind which the ſoldiers ſtand to fire upon the covered way and into the moat.

CURVATOR *Coccygis*, in anatomy, a name given by Albinus to a muſcle of the coccyx diſcovered by himſelf, and not deſcribed by any other author. It is an oblong, thin, and ſmall muſcle, and for the moſt part tendinous. It ariſes with a double head, one from the inner, and the other from the lower and lateral part of the os ſacrum; and, deſcending, terminates in three extremities. He calls it the *curvator coccygis* from its office, which is the bending the coccyx; and ſays, that he found it in different ſtates, in three ſubjects: one very perfect and entire; in a ſecond, more imperfect and degenerating; and in the third, reſembling a ligament rather than a muſcle.

CURVATURE *of a Line*, is its bending, or flexture; whereby it becomes a curve, of any peculiar form and properties. See Syſtem of Geometry.

CURVE, *Algebraical*, See Algebraical.

Curve, in geometry, a line which running on continually in all directions, may be cut by one right line in more points than one. For the doctrine of curves in general, ſee Syſtem of Geometry.

CURVILINEAR, or Curvilineal *Figures in Geometry*, are ſpaces bounded by crooked lines; as the circle, ellipſis, ſpherical triangle, &c. See Syſtem of Geometry.

CURVIROSTRA, in ornithology, a ſpecies of loxia.

Curvirostra *Foſſilis*, in natural hiſtory, the name of a ſpecies of foſſile ſhell, found very frequently in the ſtone quarries of Northamptonſhire, and the neighbouring counties. It is a ſpecies of cockle, and is diſtinguiſhed by its beak not ſtanding in the middle, but always inclining to one or the other ſide. The ſhell is ſometimes found remaining entire, and in its native ſtate and condition, but more frequently there is ſtony matter depoſited in its place.

CUSCUTA, dodder; a genus of the digynia order, belonging to the triandria claſs of plants. There are two ſpecies; one of which is a native of Britain, viz. the Europæa, dodder, hell-weed, or devil's guts. This is a very ſingular plant, almoſt deſtitute of leaves, paraſitical, creeping, fixing itſelf to whatever is next to it. It decays at the root, and afterwards is nouriſhed by the plant which ſupports it. Hops, flax, and nettles, are its common ſupport; but principally the common nettle.

CUSHION, in engraving, is a bag of leather filled with ſand commonly about nine inches ſquare, and three or four thick, uſed for ſupporting the plate to be engraved.

Cushion, in gilding, is made of leather, faſtened to a ſquare board, from fourteen inches ſquare to ten, with a handle. It is uſed for receiving the leaves of gold from the paper, in order to its being cut into proper ſize and figures.

CUSP, *Cuſpis*, properly denotes the point of a ſpear, or ſword; but is uſed in aſtronomy to expreſs the points, or horns, of the moon, or any other luminary.

CUSPIDATED, in botany, is when the leaves of a flower end in a cuſp, or point, reſembling that of a ſpear.

CUSTOM, a very comprehenſive term, denoting the manners, ceremonies, and faſhions, of a people, which having turned into a habit, and paſſed into uſe, obtain the force of laws; in which ſenſe it implies ſuch uſages, as, though voluntary at firſt, are yet by practice become neceſſary. Cuſtom is hence, both by lawyers and civilians, defined *lex non ſcripta*, "a law or right not written," eſtabliſhed by long uſage, and the conſent of our anceſtors: in which ſenſe it ſtands oppoſed to the *lex ſcripta*, or "the written law."

Custom *and Habit*, in the human œconomy. The former is often confounded with the latter. By cuſtom we mean a frequent reiteration of the ſame act; and by habit, the effect that cuſtom has on the mind or body.

Lord Kaims in his Elements of Criticiſm has treated on the influence of cuſtom and habit on the human mind with ſingular beauty and energy, as will appear from the following extracts; which illuſtrate the ſubject in the moſt ſtriking manner."

"Cuſtom hath ſuch influence upon many of our feelings, by warping and varying them, that its operations demand the attention of all who would be acquainted with human nature. The ſubject, however, is intricate. Some pleaſures are fortified by cuſtom; and yet cuſtom begets familiarity, and conſequently indifference:"

[If all the year were playing holidays,
To ſport would be as tedious as to work:
But when they ſeldom come, they wiſh'd-for come,
And nothing pleaſeth, but rare accidents.] *Shakeſpear.*

"Whatever be the cauſe, it is certain that we are much influenced by cuſtom: it hath an effect upon our pleaſures, upon our actions, and even upon our thoughts and ſentiments. Habit makes no figure during the vivacity of youth: in middle age it gains ground; and in old age governs without controul. In that period of life, generally ſpeaking, we eat at a certain hour, take exerciſe at a certain hour, go to reſt at a certain hour, all by the direction of habit: nay, a particular ſeat, table, bed, comes to be eſſential; and a habit in any of theſe cannot be controlled without uneaſineſs."

"Affection and averſion, as diſtinguiſhed from paſſion on the one hand, and the other from original diſpoſition, are in reality habits reſpecting particular objects. The pleaſure of ſocial intercourſe with any perſon, muſt originally be faint, and frequently reiterated, in order to eſtabliſh the habit of affection. Affection thus generated, whether it be friendſhip or love, ſeldom ſwells into any tumultuous or vigorous paſſion; but is however the ſtrongeſt cement that can bind together two individuals of the human ſpecies. In like manner, a ſlight degree of diſguſt often reiterated with regularity, grows into the habit of averſion, which commonly ſubſiſts for life.

"Objects of taſte that are delicious, far from tending to become habitual, are apt by indulgence to produce ſatiety and diſguſt: no man contracts a habit of ſugar, honey, or ſweet-meats, as he doth of tobacco."

Theſe violent delights have violent ends,
And in their triumph die. The ſweeteſt honey
Is loathſome in its own deliciouſneſs,
And in the taſte confounds the appetite;
Therefore love mod'rately, long love doth ſo;
'Too ſwift arrives as tardy as too ſlow.

Romeo and Juliet, Act II. Scene VI.

"The changes made in forming habits, are curious. Moderate pleaſures are augmented gradually by reiteration, till they become habitual; and then are at their height: but they are not long ſtationary; for from that point they gradually decay, till they vaniſh altogether. The pain occaſioned by want of gratification, runs a different courſe: it increaſes uniformly; and at laſt becomes extreme, when the pleaſure of gratification is reduced to nothing."

———— It ſo falls out,
That what we have we prize not to the worth,
While we enjoy it; but being lack'd and loſt,
Why then we rack the value; then we find
The virtue that poſſeſſion would not ſhew us
Whilſt it was ours.

Much Ado about Nothing, Act IV. Scene II.

The beauty of the human figure, by a ſpecial recommendation of nature, appears to us ſupreme. The various degrees in which individuals enjoy that property, render it an object, ſometimes of a moderate paſſion, admitting frequent reiteration without diminution, and occupying the mind without exhauſting it, turns gradually ſtronger till it becomes a habit. Nay, inſtances are not wanting, of a face at firſt diſagreeable, afterward rendered indifferent by familiarity, and at length agreeable by cuſtom. On the other hand, conſummate beauty, at the very firſt glance, fills the mind ſo as to admit no increaſe. Enjoyment leſſens the pleaſure; and if often repeated, ends commonly in ſatiety and diſguſt. The impreſſions made by conſummate beauty, in a gradual ſucceſſion from lively to faint, conſtitute a ſeries oppoſite to that of faint impreſſions waxing gradually more lively, till they produce a ſpecific habit. But the mind, when accuſtomed to beauty, contracts a reliſh for it in general, though often repelled from particular objects by the pain of ſatiety: and thus a generic habit is formed, of which inconſtancy in love is the neceſſary conſequence; for a generic habit, comprehending every beautiful object, is an invincible obſtruction to a ſpecific habit, which is confined to one.

But a matter which is of great importance to the youth of both ſexes, deſerves more than a curſory view. Though the pleaſant emotion of beauty differs widely from the corporeal appetite, yet when both are directed to the ſame object, they produce a very ſtrong complex paſſion: enjoyment in that caſe muſt be exquiſite; and therefore more apt to produce ſatiety than in any other caſe whatever. This is a never-failing effect, where conſummate beauty in the one party, meets with a warm imagination and great ſenſibility in the other. What we are here explaining, is true without exaggeration; and they muſt be inſenſible upon whom it makes no impreſſion: it deſerves well to be pondered by the young and the amorous, who, in forming the matrimonial ſociety, are too often blindly impelled by the animal pleaſure merely, enflamed by beauty. It may indeed happen after the pleaſure is gone, and go it muſt with a ſwift pace, that a new connection is formed upon more dignified and more laſting principles: but this is a dangerous experiment; for even ſuppoſing good ſenſe, good temper, and internal merit of every ſort, yet a new connection upon ſuch qualifications is rarely formed: it commonly, or rather always happens, that ſuch qualifications, the only ſolid foundation of an indiſſoluble connection, are rendered altogether inviſible by ſatiety of enjoyment creating diſguſt. That the power of cuſtom is a happy contrivance for our good, cannot have eſcaped any one who reflects, that buſineſs is our province, and pleaſure our relaxation only. Now ſatiety is neceſſary to check exquiſite pleaſures, which otherwiſe would engroſs the mind and unqualify us for buſineſs. On the other hand, as buſineſs is ſometimes painful, and is never pleaſant beyond moderation, the habitual increaſe of moderate pleaſure, and the converſion of pain into pleaſure, are admirably contrived for diſappointing the malice of fortune, and for reconciling us to whatever courſe of life may be our lot:

How uſe doth breed a habit in a man!
This ſhadowy deſert, unfrequented woods,
I better brook than flouriſhing peopled towns.
Here I can ſit alone, unſeen of any,
And to the nightingale's complaining notes
Tune my diſtreſſes, and record my woes.

Two Gentlemen of Verona, Act V. Scene IV.

Custom *of Merchants*, denotes certain rules of judging in relation to contracts, bills, &c. eſtabliſhed by the uſual proceeding of merchants.

Customs, in commerce, the dues, duties, or tolls, paid by merchants to the king, for carrying out, and bringing in, of merchandizes.

In caſe goods and merchandiſe are brought to a port, and part of the goods are ſold there, but never landed, they muſt pay the cuſtoms. Ships outward bound, and coming from beyond ſea, having goods and merchandiſe on board, are to be entered at the cuſtom-houſe, and the cuſtoms paid or agreed for, under penalties and forfeiture of the goods; one moiety to the king, and another to the ſeiſor, &c. 13 and 14 Car. II. Officers of the cuſtoms may ſearch ſhips; and having writ of aſſiſtance, ſearch houſes. By other ſtatutes, foreign goods, taken in at ſea by any coaſting veſſel, ſhall be forfeited, and treble value: and, for prevention of clandeſtine running of goods, if any foreign brandy, &c. is imported in veſſels under forty tons, the importer ſhall forfeit the veſſel and brandy. Run goods concealed or offered for ſale, are liable to forfeiture and treble value. 8 and 11 Geo. I.

If any perſon offers any tea, brandy, &c. to ſale, without a permit, the perſon to whom it is offered may ſeize and carry it to the next warehouſe belonging to the cuſtoms or exciſe, and be entitled to a third part of the produce on condemnation. And perſons offering any bribe to officers of the cuſtoms to connive at the running of goods, are liable to a forfeiture of 50*l.* obſtructing ſuch officers in entering and ſearching ſhips, incurs a forfeiture of 100*l.* and if the officers are wounded or beaten on board any ſhip, the offenders incur the penalty of tranſportation, &c. 9 Geo. II. See Drawback, Excise, and Smuggling.

Custom *Houſe*, an office eſtabliſhed by the king's authority in the maritime cities, or port-towns, for the receipt and management of the cuſtoms and duties of importation and exportation, impoſed on merchandiſes, and regulated by books of rates.

CUSTOS *Brevium*, the principal clerk belonging to the court of common pleas, whoſe buſineſs it is to receive and keep all the writs made returnable in that court, filing every return by itſelf; and, at the end of each term, to receive of the prothonotaries all the records of the niſi prius, called the poſteas.

Custos *Rotulorum*, an officer who has the cuſtody of the rolls and records of the ſeſſions of peace, and alſo of the commiſſion of the peace itſelf. He uſually is ſome perſon of quality, and always a juſtice of the peace, of the quorum, in the county where he is appointed.

Custos *Spiritualium*, he that exerciſes the ſpiritual juriſdiction of a dioceſe, during the vacancy of any ſee, which, by the canon law, belongs to the dean and chapter; but at preſent, in England, to the archbiſhop of the province, by preſcription.

Custos *Temporalium*, was the perſon to whom a vacant ſee or abbey was given by the king, as ſupreme lord. His office was, as ſteward of the goods and profits, to give an account to the eſcheator, who did the like to the exchequer.

CUTANEOUS, ſomething that concerns the cutis, or ſkin; whether in the way of diſtemper, or remedy. Thus, we ſay, cutaneous eruptions; the itch is a cutaneous diſeaſe.

CUTICULA, Cuticle, in anatomy, a thin, pellucid membrane, void of ſenſe; ſerving as a cover to the cutis, or ſkin.

The cuticula is that firſt, and outermoſt covering of the body, called alſo epidermis, but more commonly the ſcarf ſkin; or that ſoft tegument which riſes in a bliſter upon a burn, or the application of a cautery. It ſticks cloſe to the ſurface of the cutis, or true ſkin, to which it is alſo tied by the veſſels that feed it; though theſe are ſo ſmall as not to be ſeen. When examined by a microſcope, it appears to conſiſt of ſeveral lays of exceeding ſmall ſcales, which cover one another, more or leſs, according to its different thickneſs, in the ſeveral parts of the body; and in the lips, where the ſcales appear plane; becauſe the ſkin is thinneſt they do little more than barely touch. Theſe ſcales are either the excretory ducts of the glands of the cutis, as is the caſe apparently in fiſhes; or elſe the glands have their tubes, opening between the ſcales. Leewenhoeck reckons, that in one cuticular ſcale there may be 500 excretory ducts; and that a grain of ſand will cover 250 ſcales: ſo that one grain of ſand will cover 125,000 pores, or orifices, through which we daily perſpire. Yet, notwithſtanding the exceeding poroſity of the cuticula, it obſtructs a great part of the ſerous humours, which would otherwiſe be evacuated by the glands of the cutis; as is evident, from that plentiful diſcharge conſequent on the application of a bliſter, or other accident, whereby the cuticula is removed, and the cutis bared. The ſcales are often glued together by the groſſer parts of our inſenſible tranſpiration hardening upon them by the heat of the body. which carries off the more volatile particles; and in this is ſuppoſed to conſiſt that indiſpoſition we popularly call a cold. The humour which is thenceforward ſeparated by the glands of the ſkin, being pent in between the ſcales, cauſes frequent itching; and when the matter has been long pent up, ſmall pimples, and other foulneſſes: for removing of which, nature directs to thoſe wholeſome remedies of frequent rubbing, waſhing, or bathing.

CUTICULAR *Glove*, in the Phil. Tranſ. denotes a ſeparation of the cuticle from the cutis, from the wriſt to the finger's ends, &c. in the form of gloves, occaſioned by a ſingular kind of fever. See the caſe and hiſtory related, ibid. vol. lix. N° 38, an. 1769.

CUTIS, in anatomy, the ſkin; a reticular plexus, or body of veſſels, immediately under the cuticle, or ſcarf ſkin. Dr. Hunter ſays, that when the ſkin is once deſtroyed, it is never regenerated, and that the cicatrix is hardened fleſh. The cutis is generally connected to the ſubjacent parts by the membrana-adipoſa, and its proper veſſels, the veins, arteries, nerves, &c. Its uſe is to wrap up and cover the whole body; to be a general emunctory for the matters of perſpiration; and to be the organ of feeling. The diſeaſes of the cuticula and cutis are, the itch, leproſy, ſmall pox, meaſles, ſcarlet fever, and eryſipelatous inflammations.

CUTTER, in ſea language, denotes a ſmall veſſel commonly navigated in the Engliſh channel, furniſhed with one maſt, and rigged as a ſloop. Many of theſe are uſed in an illicit trade.

Cutter is alſo the name of a ſmall boat belonging to ſhips of war. It is broader, deeper, and ſhorter than the barge or pinnace: fitter for ſailing; and uſually employed in carrying ſtores, proviſions, &c. to and from the ſhip.

CUTTING, a term uſed in various ſenſes, and various arts; in the general, it implies a diviſion or ſeparation.

Cutting is particularly uſed in heraldry, where the ſhield is divided into two equal parts, from right to left, parallel to the horizon, or in the feſſe-way.

Cutting, in ſurgery, denotes the operation of extracting the ſtone out of the bladder by ſection. See Syſtem of Surgery.

Cutting *in Wood*, a particular kind of ſculpture, or engraving. This art was the origin of printing, and firſt introduced by Albert Durer, who uſed it for prints and ornaments. It is uſed for various purpoſes, but in a different manner. Thoſe cuts which are deſigned for letter-preſs printing are cut on box, end ways; thoſe deſigned for callicoes, linens, &c. are cut on pear tree and holly, the flat way.

The method of executing this kind of ſculpture, or engraving, is firſt to procure a ſquare piece of box of the ſize of the cut, deſigned to be engraved. There are different modes of putting the deſign on the face of the block. The firſt is, to paſte the drawing or copy with the face to the block; when dry, to waſh it with a ſpunge dipped in water, and then rub it gently with the finger to take off the paper; but great care muſt be taken not to rub any other part than the paper. For if the deſign is injured, and the engraver does not underſtand drawing, a new deſign muſt be procured. But if the wood engraver underſtands drawing, the beſt method is to draw the deſign with India ink on the block, having prepared it for the purpoſe by rubbing the face with white lead mixed with water till reduced to the conſiſtency of milk. When dry, the hand is to be rubbed over to take off all irregularities. The tools uſed in performing this kind of engraving are very ſimple; a knife, two or three ſmall gouges, a ſcorper and graver, are all that are neceſſary.

The firſt artiſt in this line is Mr. Coleman, whoſe abilities are not confined to the branch of wood cutting only, being at this time engaged in forming matrices and moulds for a new letter, which evidently ſurpaſs all we have heretofore ſeen, and will doubtleſs be models for all nations to copy. We ſhall introduce ſpecimens of this new letter in our Treatiſe on the Art of Printing.

Cuttings, or *Slips*, in gardening, the branches or ſprigs of trees, or plants, cut or ſlipped off to ſet again; which is done in any moiſt fine earth. See Art of Gardening.

CUTTLE *Fiſh*, in entomology, for the generic character, ſee Sepia.

CYCLAMEN, ſowbread; a genus of the monogynia order, belonging to the pentandria claſs of plants. There are but two ſpecies; which however produce many beautiful varieties. They are low herbaceous, flowery perennials, of the tuberous rooted kind, with numerous, angular, heart-ſhaped, ſpotted marbled leaves; with many fleſhy foot ſtalks ſix inches high, carrying monopetalous, five parted reflexed flowers of various colours. All the varieties are extremely ornamental, and ſome of the flowers very fragrant.

CYCLE, from *κυκλοω*, *I revolve*, in chronology, a certain period, or ſeries of numbers proceeding orderly from firſt to laſt, and recurring again from laſt to firſt, ſucceſſively, and without interruption.

Cycle *of the Moon*, or *Lunar* Cycle, a period of 19 ſolar years; called alſo the Metonic period, from its inventor Meton, the Athenian; and the golden number. The uſe of this cycle, in the ancient calendar, is to ſhew the new moon of each year, and the time of Eaſter. In the new one, it only ſerves to find the epacts; which ſhew in either calendar, that the new moon falls eleven days too late.

Cycle *of the Sun*, or *Solar* Cycle, a revolution of 28 years: beginning with 1, and ending with 28; which elapſed, the Dominical or Sunday letters, and thoſe that expreſs the other feaſts, &c. return into their former place, and proceed in the ſame order as before. It is called the *ſolar cycle*, not with regard to the ſun's courſe, which has nothing to do herein; but from Sunday anciently called *dies ſolis*, *the day of the ſun*: becauſe the dominical letter is principally ſought for from this revolution. The reformation of the calendar under pope Gregory occaſioned a conſiderable alteration of this cycle: in the Gregorian calendar, the ſolar cycle is not conſtant and perpetual; becauſe every fourth ſecular year is common; whereas, in the Julian it is biſſextile. The epocha, or beginning of the ſolar cycle, both Julian and Gregorian, is the ninth year before Chriſt.

CYCLOID, in geometry, one of the mechanical, or, as others term them, tranſcendental curves; called alſo the trochoid.

It is demonſtrated by writers on this ſubject, that the time of a complete oſcillation in the cycloid is to the time in which a body would fall through its axis, as the circumference of a circle to its diameter (Prop. 25. Horol. Oſcil. and Keil's Introd. Lect. xv. prop. 46). whence we may eaſily infer, that the vibrations in unequal areas are performed in equal times. The cycloid is a line of the ſwifteſt deſcent; and ſome have imagined that a ray of light paſſing through the atmoſphere deſcribes this curve. See farther on this ſubject, Phil. Tranſ. abr. vol. i. p. 462, &c. vol. iv. p. 351, &c. Maclaurin's Fluxions, art. 405—408. Account of Newton's Phil. Diſc. p. 209. &c. Cotes's Opera. Miſc. p. 80. Stirling. Linæ tenii Ordinis. Appendix.

On this foundation it is, that the pendulum clock is built: on the ſubject whereof, M. Huygens has written a large volume, under the title of Horologium Oſcillatorium.

CYCLOPÆDIA, or ENCYCLOPÆDIA, from *κυκλος* and *ϖαιδια*, *inſtruction*, the circle, or compaſs of arts and ſciences.

The word *cyclopædia* is not of claſſical authority, though frequent enough among modern writers, to have got into ſeveral of our dictionaries. The names and titles of books, engines, inſtruments, &c. are in a great meaſure arbitrary; and authors make no ſcruple even of coining new words on occaſion when there are no old ones to their mind. Thus it is Dr. Hooke calls his book of microſcopical obſervations, Micographia; Wolfius his book on the air, Aerometria; Drake his book of anatomy, Anthropologia, &c. all of them words of modern, if not of their own fabric; and on no better authority ſtand the names of half our later inventions, as *microſcope*, *teleſcope*, *barometer*, *thermometer*, *micrometer*, &c. But it is ſuggeſted the word *cyclopædia*, or *encyclopædia*, is ambigeous, and may denote the *ſcience of a circle*, as well as the *circle of ſciences*: we anſwer, that as cuſtom, the only ſovereign rule of language, has determined the word to the latter ſenſe, it is no more chargeable with ambiguity than a thouſand other words of received uſe; no more, for inſtance, than *micrometer*, which might either denote a *little meaſure*, or a *meaſure of little things*.

We call the preſent work by the name of Encyclopædia, becauſe we mean to treat upon every ſubject which can give either uſeful inſtruction, or rational amuſement. The arts inſpire the human mind with a kind of enthuſiaſm that produces laudable actions; it diſpels doubts, ſurmounts difficulties, and annihilates dangers; it makes the illiterate wiſe, and the wiſe virtuous. There are no arts and ſciences that have not had their uſes in ſociety: the commercial and mechanical aroſe from the love of property; the liberal and literary from the mind, the fancy, and the heart; mere exerciſes of the imagination, in ſearch of improvement and of pleaſure. We ſhall uniformly throughout this work, pay ſuch attention to the *truly uſeful*, as we flatter ourſelves will render it deſerving of the title we give it, "A Circle of Science, or Library of Univerſal Knowledge."

CYCLOPTERUS, the ſucker, in ichthyology, a genus belonging to the order of amphibia nantes. The head is obtuſe, and furniſhed with jaw-teeth; there are four rays in the gills, and the belly fins are connected together in an orbicular form. The ſpecies are three; the lumpus, or lump fiſh; the lyparis, or ſea-ſnail; and the leſſer ſucking fiſh.

CYDER, a briſk, tart, cool liquor, prepared from apples. The apples ſhould remain on the tree, till they are quite ripe; and this is a circumſtance of great importance with reſpect to the quality of the cyder. They ſhould be gathered by the hand in dry weather, and the drieſt part of the day, that they may be guarded both from bruiſes and moiſture. They ſhould then be ſorted, according to their various degrees of maturity; and laid in ſeparate heaps to ſweat and meliorate: ſweating, however, ſeems to be neceſſary only for apples, that are not quite ripe; though ſome recommend it as proper for all apples. The duration of the time of ſweating is beſt determined by the ſmell of the fruit; different kinds require different lengths of time, viz. from eight or ten days to ſix weeks. The harſher the apple is, the more time it needs; they ſhould be well wiped before they are uſed; the rotten part, if any, ſhould be thoroughly pared off, and the ſtalk taken out.

Manner of making CYDER. The fruit is firſt ground in a mill, or pounded in a trough, and the juice ſqueezed out of the pomice in a preſs; then it is ſtrained through a ſieve, or other filtre, and tunned up; the veſſel is not to be full. It is better to put the cyder into tubs or vats during the firſt fermentation, than to tun it immediately from the preſs. The curious in the manufacture of it have a large veſſel in the ſhape of an inverted cone, with a part cut off near the vertex, holding from five to twenty hogſheads, in which they ferment it. In this veſſel the heavier lees ſubſide, and the lighter forms a cruſt at the ſurface, by the breaking and ſinking of which they judge when it is fit for racking; and it is drawn off by a tap near the bottom. For two or three days it is to be ſtopped looſely, then quite cloſed with clay: a ſmall vent hole ſhould be left open for ſeveral days, or looſely ſtopped up with a peg, till the wild ſpirit of the liquor be ſpent; afterwards both the vent-hole and bung may be cloſed. Henceforward, a ſmall quantity is to be drawn every day for ſome weeks, till ſuch time as it be ſuppoſed pretty clear: then it is pierced, to ſee how fine it is; the ſummer fruit after a month: the gennet-moil after the firſt froſts; the redſtreak not till after January; and the other winter fruits about the ſame time. If it be now not found fine enough, it ſtands a month longer; and if after this it be defective it is racked off like wine, ſo as to keep out the air.

Some, inſtead of racking, fine it with iſinglaſs, ſteeped in white wine, and diſſolved over the fire; this they boil in a quantity of the liquor to be fined, and then mix it with the reſt: and others, inſtead of diſſolving the iſinglaſs over the fire, let it ſteep in the white wine for about a month, in which time it diſſolves into a jelly of itſelf; a quantity of this is mixed with ſome of the liquor, and the whole beat to a froth; then mingled, together with ſome broom, with the reſt. The liquor once fine, it is drawn out, or bottled off, as occaſion requires.

When the cyder has done fermenting, two or three handfuls of wheat bran, thrown into each veſſel, will thicken the head or cream of the liquor, and make it keep better; and the cyder is much improved by putting into each hogſhead about three quarts of good wheat, firſt boiled and hulled. Dead or flat cyder may be revived by grinding a ſmall parcel of apples, and putting them into the caſk, to renew the fermentation. This cyder, however, ſhould be drawn off in a few days; otherwiſe the muſt will corrupt the whole maſs.

It is obſerved, that a mixture of fruits is of great advantage to cyder; the worſt apples, mixed together, making as good cyder as the beſt make alone: always obſerving, however, that they be of equal ripeneſs. The beſt mixture, according to Mr. Worlidge, is that of redſtreaks with golden rennets: bitter apples ſpoil the cyder, but the juice of them, and of crabs, yield as good ſpirits as the beſt apples, when fermented: neither the ſour nor bitter taſte ariſing with the ſpirit upon diſtillation. If the apples be pounded in a ſtone mortar, which is the cuſtom of ſome, the kernels and ſtalks are bruiſed with them, which gives the liquor an ill ſavour. The beſt cyder of all the kinds is that made from the redſtreak apple, grafted upon a gennet-moil ſtock. Theſe two ſorts of apple-trees always agree very well, and the ſtalks ſcarce ever canker, as the crab-ſtalks uſually do, when this apple-tree is grafted upon them: The fruit of the redſtreak, on the ſtock here recommended, is always larger and milder, and, when ripe, is a very good eating apple.

It might be a great improvement to many eſtates, to cultivate on the grounds not fit for corn, the proper ſorts of apples for cyder. It is a marketable commodity at all times, and coſts no fuel to brew it; and the labour is but once in the year. The greater quantities of cyder are made together, the better it uſually ſucceeds, but the veſſels ſhould alſo be large in which it is kept. In this caſe it will not only keep many years, but will improve all the time. Phil. Tranſ. N° 134.

Hugh Stafford, Eſq. a Devonſhire gentleman, publiſhed, about 1773, a pamphlet in 4to. on cyder making, which may afford ſome inſtruction and entertainment to thoſe who cultivate apples, and make cyder.

CYDER *Spirit*, a ſpirituous liquor drawn from cyder by diſtillation, in the ſame manner as brandy from wine. The particular flavour of this ſpirit is not the moſt agreeable, but it may, with care, be diveſted wholly of it, and rendered a perfectly pure and inſipid ſpirit, upon rectification. The traders in ſpirituous liquors are well enough acquainted with the value of ſuch a ſpirit as this: they can give it the flavours of ſome other kinds, and ſell it under their names, or mix it in large proportion with the foreign brandy, rum, and arrack, in the ſale, without danger of a diſcovery of the cheat.

CYDERKIN, Purre, or Perkin, is a liquor made of the murk, or groſs matter remaining after the cyder is preſſed out. For this purpoſe, the murk is put in a large vat, with a proper quantity of boiling water, which has ſtood till it be cold again: if half the quantity of water be uſed that there was of cyder, it will be good; if the quantities be equal, the cyderkin will be ſmall. The whole is left to infuſe forty eight hours, and then well preſſed: what is ſqueezed out by the preſs, is immediately tunned up and ſtopped; it is fit to drink in a few days. It clarifies of itſelf, and ſerves in families inſtead of ſmall beer. It will keep if boiled, after preſſure, with a convenient quantity of hops.

CYDONIA, the quince; ſo called from Cydon, a town of Crete, famous for its abounding with this fruit. Linnæus has joined this genus to the apple and pear; but as there is ſuch a remarkable difference between the fruits, we follow Mr. Miller, who treats the quince as a genus by itſelf.

Species. 1. The oblonga with an oblong fruit, lengthened at the baſe. 2. The maliforma, with oval leaves woolly on their under ſide, and lengthened at their baſe. 3. The luſitanica with obverſe oval leaves, woolly on their under ſide. There are ſome other varieties of this fruit propagated in fruit gardens, and in the nurſeries for ſale; one of which is a ſoft eatable fruit, another very aſtringent, and a third with a very ſmall fruit cottony all over, which is ſcarce worth keeping. Theſe Mr. Miller ſuppoſes to be ſeminal variations, but the three others to be diſtinct ſpecies. The Portugal quince is the moſt valuable: its pulp turns to a fine purple when ſtewed or baked, and becomes much ſofter and leſs auſtre than the others; ſo is much fitter for making marmalade. The trees are all eaſily propagated, either by layers, ſuckers, or cuttings, which muſt be planted in a moiſt ſoil.

CYGNUS, or SWAN, in ornithology. See ANAS.

CYLINDER, in geometry, a ſolid body, contained under three ſurfaces; ſuppoſed to be generated by the rotation of a parallelogram. See Syſtem of GEOMETRY.

CYLINDER *Charge*, in gunnery, is that part of a great gun which is poſſeſſed by the powder and ball.

Rolling CYLINDER, in mechanics, a cylinder which rolls upon an inclined plane. See Syſtem of MECHANICS.

CYLINDRICAL, partaking of the nature, or in the form of a cylinder.

CYLINDROID, in geometry, a ſolid body, approaching the figure of a cylinder; but differing from it in ſome reſpect, e. gr. as having its baſes elliptical, but parallel and equal. The word comes from κυλινδρος, *cylinder*; and ειδος, *form*.

CYMA, in botany, the tender ſtalks which herbs ſend forth in the beginning of the ſpring, particularly thoſe of the cabbage kind.

CYMBAL, κυμβαλον, a muſical inſtrument in uſe among the ancients. The cymbal was round, made of braſs, like our kettle-drums, and as ſome think, in their form, but ſmaller, and of different uſe. Ovid gives cymbals the epithet of genialia, becauſe they were uſed at weddings and other diverſions. The Jews had their cymbals, or at leaſt inſtruments which tranſlators render cymbals; but as to their matter and form, critics are ſtill in the dark. The modern cymbal is a mean inſtrument, chiefly in uſe among vagrants, gypſies, &c.

CYNANCHUM, baſtard dogſbane; a genus of the digynia order, belonging to the pentandria claſs of plants. There are ſix ſpecies, of which the following are the moſt remarkable. 1. The acutum, commonly called montpelier ſcammony; and, 2. The monſpeliacum, or round leaved montpelier ſcammony.

CYNARA, the Artichoak; a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants. Of this genus there are four ſpecies, but only two are cultivated for uſe.

1. The ſcolinius, or garden artichoak, hath large, thick, perennial roots, crowned by a conſiderable cluſter of large pennatifid,

tifid, erect leaves, two or three feet long. In the middle are upright ſtalks riſing a yard high, on the top of which is a large round ſcaly head, compoſed of numerous, oval, calycinal ſcales, incloſing the flower, ſitting on a broad fleſhy receptacle, which, with the fleſhy baſe of the ſcales, is the only eatable part of the plant. The varieties of this ſpecies are, 1. The conical green-headed French artichoak. 2. The globular headed red, Dutch artichoak. Of theſe varieties the laſt is deſervedly the moſt eſteemed, both on account of its ſuperiority in ſize, and the agreeableneſs of its flavour. Both varieties are perennial in their root; but the leaves and fruit ſtem die to the ground in winter, and their roots remaining ſend up freſh leaves and ſtems every ſummer, producing a ſupply of artichoaks for 20 years if required. The flowers and ſeed of all the plants of this genus are produced in the centre of the head, the ſcales of which are the proper calix of the flower, which conſiſts of numerous ſmall bluiſh florets, ſucceeded by downy ſeeds ſitting naked on the receptacle.

2. The cardunculus, or cardoon, greatly reſembles the artichoak, but is of larger and more regular growth; the leaves being more upright, taller, broader, and more regularly divided; and the ſtalks of the leaves branched are the only eatable parts of the plant.

CYNICS, a ſect of ancient philoſophers, who valued themſelves upon their contempt of riches and ſtate, arts and ſciences, and every thing, in ſhort, except virtue or morality. The Cynic philoſophers owe their origin and inſtitution to Antiſthenes of Athens, a diſciple of Socrates, who, being aſked of what uſe his philoſophy had been to him, replied, "It enables me to live with myſelf." Diogenes was the moſt famous of his diſciples, in whoſe life the ſyſtem of this philoſophy appears in its greateſt perfection: he led a moſt wretched life, a tub having ſerved him for a lodging, which he rolled before him wherever he went; yet he was, nevertheleſs, not the more humble on account of his ragged cloak, bag, and tub: for one day, entering Plato's houſe, at a time that there was a ſplendid entertainment for ſeveral perſons of diſtinction, he jumped up upon a very rich couch, in all his dirt, ſaying, "I trample on the pride of Plato." "Yes, (replied Plato), but with great pride, Diogenes." He had the utmoſt contempt for all the human race, for he walked the ſtreets of Athens, at noon day, with a lighted lanthorn in his hand, telling the people, "He was in ſearch of a man." He regarded chaſtity and modeſty as weakneſſes; hence Laertius obſerves of him, that he did every thing openly, whether it belonged to Ceres or Venus, though he adds that Diogenes only ran to an exceſs of impudence to put others out of conceit with it; but impudence was the characteriſtic of theſe philoſophers, who argued, that what was right to be done, might be done at all times, and in all places. The chief principle of this ſect, in common with the Stoics, was, that we ſhould follow nature; but they differed from the Stoics in their explanation of that maxim, the cynics being of opinion that a man followed nature, that gratified his natural motions and appetites; while the ſtoics underſtood right reaſon, by the word nature.

CYNIC *Spaſm*, Spaſmus Cynicus, a ſort of convulſion, whereby the patient is brought to imitate the geſtures, ſnarling, howlings, &c. of a dog. Dr. Friend, in the Philoſophical Tranſactions, gives us an account of a very axtraordinary ſpaſmus of this kind, wherewith two families, at Blackthorn in Oxfordſhire, were ſeized. The novelty of the thing drew abundance of viſitors to the village, and among the reſt Dr. Willis; who, a good while before he reached the place, heard a terrible noiſe of barking and howling; upon his entering the houſe, he was immediately ſaluted by five girls, bawling, and anſwering each other by turns, with violent motions of the head. In their face there was no convulſion ſeen, beſide conic diſtortions, and oſcillations of the mouth: their pulſe was pretty regular; their noiſe was rather like that of the howling, than of the barking of dogs; though its returns were more frequent, with deep ſighing between.

Dr. Willis obſerved that the only ſymptom of its approach was a ſwelling of the ſtomach; which riſes gradually up the throat, ſet the muſcles of the larynx and the head upon their uſual convulſions: this riſing was a certain ſymptom of an approaching paroxyſm in them all; and if they endeavoured to ſtop it, it burſt out with the greater violence, and held the longer.

The noiſe they made was inceſſant, and diſagreeable; accompanied with a ſong, conſiſting of three notes, or tones, repeated twice over; and cloſed by deep ſighs, &c. accompanied by extraordinary geſtures and nutations of the head. This diſeaſe the doctor takes to be natural; and to riſe from the common cauſe of all convulſions, viz. from the animal ſpirits growing unruly in the nerves, and driving the muſcles into various contractions, according to the circumſtances of the indiſpoſition.

CYNOGLOSSUM, hound's tongue; a genus of the monogynia order, belonging to the pentandria claſs of plants. There are eight ſpecies, none of them remarkable for their beauty.

CYNOREXY, or CYNODES OREXIS, an immoderate appetite to the degree of a diſeaſe; called alſo fames canina, and bulimy.

CYNOSURUS, in botany, a genus of the triandria dyginia claſs. There are ten ſpecies, four of which are natives of Britain.

CYPERUS *Root*, in the materia medica, the name of a root uſed in medicine, of which there are two kinds, the long and the round; the long cyperus is of our own growth; the round, when genuine, we have from the Eaſt Indies, but what is uſually ſold is the root of a baſtard kind, common about our own ditches, and called by authors, by way of diſtinction from the Indian kind, *cyperus rotundus noſtras.*

The plants which produce them both, grow in watery places, and have leaves and flowers in ſome meaſure reſembling the water graſſes, which from their reſemblance to theſe, are called cyperus graſſes. They are poſſeſſed of the ſame virtues, cure ill-ſcented breaths, are good in nephritic diſorders, in colics, and in diſorders of the womb. They are taken in powder, or decoction. The roots of cyperus are attenuants, and deobſtruents, promote urine, and the menſes, are good ſtomachics, and ſerviceable in the firſt ſtages of the dropſy.

CYPRESS, in botany, a genus of the monœcia monodelphia claſs. See CUPRESSUS.

CYPRUS, an order of knights, called alſo knights of *Silence*, and knights of *the Sword*; inſtituted by Guy de Luſignan, king of Cyprus, in 1192. The deſign of the inſtitution was, to oppoſe the inroads and irruptions of the infidels in that iſland: accordingly, their motto was *ſecuritas regni.*

CYPRUS *Wood*, in the materia medica, a name given by ſome authors to the roſe wood, becauſe much of it is brought from the iſland of Cyprus.

CYRENAICS, a ſect of ancient philoſophers, ſo called from their founder, Ariſtippus of Cyrene, a diſciple of Socrates. The great principle of their doctrine was, that the ſupreme good of man in this life is pleaſure; whereby they not only meant a privation of pain, and a tranquillity of mind, but an aſſemblage of all mental and ſenſual pleaſures, particularly the laſt.

CYST, the bag, or tunic, including all incyſted tumors, as the ſcirrhus, atheroma, ſteotoma, meliceres, &c.

CYST-HEPATIC *Duct*, a canal, by which the *porus biliarus* diſcharges a part of its bile into the gall bladder.

CYSTICUS *Ductus*, or *Meatus*, a biliary duct, about the bigneſs of a gooſe's quill; joined to the *meatus hepaticus*, at about two inches diſtance from the gall-bladder; the two together forming the *ductus communis.*

CYTHEREA, in mythology, the ſurname of Venus, ſo called from Cythera, at preſent Cerigo, an iſland oppoſite to Crete, where ſhe had a temple, eſteemed the moſt ancient in Greece.

CYTHINON, in botany, a name given by the ancient Greeks to the yellow wood, called alſo *thapſum*, and *chryſexylon*, a wood uſed in dying cloths, &c. See CYMENE.

CYTISUS, tree trefoil; a genus of the decandria order, belonging to the diadelphia claſs of plants. There are 11 ſpecies, of which the moſt remarkable are, 1. The laburnum, or large deciduous cytiſus. 2. The ſeſſilifolius, often called *cytiſus ſecundus cluſii.* 3. The nigrican cytiſus. 4. The hirſutus, or hairy evergreen Neapolitan cytiſus. 5. The Auſtriacus, Auſtrian, or Tartarian evergreen cytiſus. Theſe flowers appear in May.

CZAR, a title of honour, aſſumed by the grand dukes, or, as they are now ſtyled, emperors of Ruſſia. The natives pronounce it *tzar*, or *zaar*; and this, by corruption, from Cæſar, emperor; from ſome fancied relation to the Roman emperors; on account of which they alſo bear the eagle as a ſymbol of their empire. The firſt who bore the title of *czar*, was Baſil, ſon of Baſilides, who freed his country from its ſubjection to the Tartars, about the year 1470. The preſent Empreſs of Ruſſia is ſtiled *Czarina*: her ruling ſtar ſeems to be ambition: the hour of power is her hour of harveſt; and her will is univerſal law.

The Editors of this Work having now commenced on the ſecond Volume, and as I have pledged myſelf to introduce it with a New Letter, I need only refer the Subſcribers to a comparative view of the two following Sheets of this Number with the preceding; from which the fulfillment of my promiſe will evidently appear. I truſt it will alſo in every other inſtance, ſuch as paper, print, plates, the ſelection of competent Editors, and the retaining of men of the firſt abilities, to form the Syſtems in the reſpective Sciences, and the Treatiſes on the various Arts.

It is with pleaſure I reflect, that through punctuality in adhering ſo ſcrupulouſly to my engagements, I have gained many liberal Contributors, by whom I ſhall be enabled in this and the ſucceeding Volume, to furniſh my Subſcribers with more originality with reſpect to ſubjects, as well as engravings, than in the preceding Volume.

I cannot forget the obligations conferred on me by my numerous friends, in the loan of ſcarce, curious and valuable books, prints, and drawings, as well as the communications of the learned and ingenious in the various departments of Science.

To the Editors I alſo acknowledge myſelf indebted for their care and circumſpection in compiling, digeſting and arranging the ſeveral Syſtems, Treatiſes, and detached Articles in the courſe of the Work.

Nor can I permit the Volume to cloſe without expreſſing my gratitude to the numerous Subſcribers for their candour and liberality in recommending my Work to their friends, to whoſe commendation I am indebted for its extenſive ſale. The high and flattering encomiums I have received on the abilities of the reſpective Editors, and the praiſes that have been beſtowed on the importance and accuracy of the Engravings, will ever incite me to the exertion of my utmoſt efforts, in order to maintain the reputation I have been ſo fortunate to acquire.

C. COOKE.

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END OF THE FIRST VOLUME.